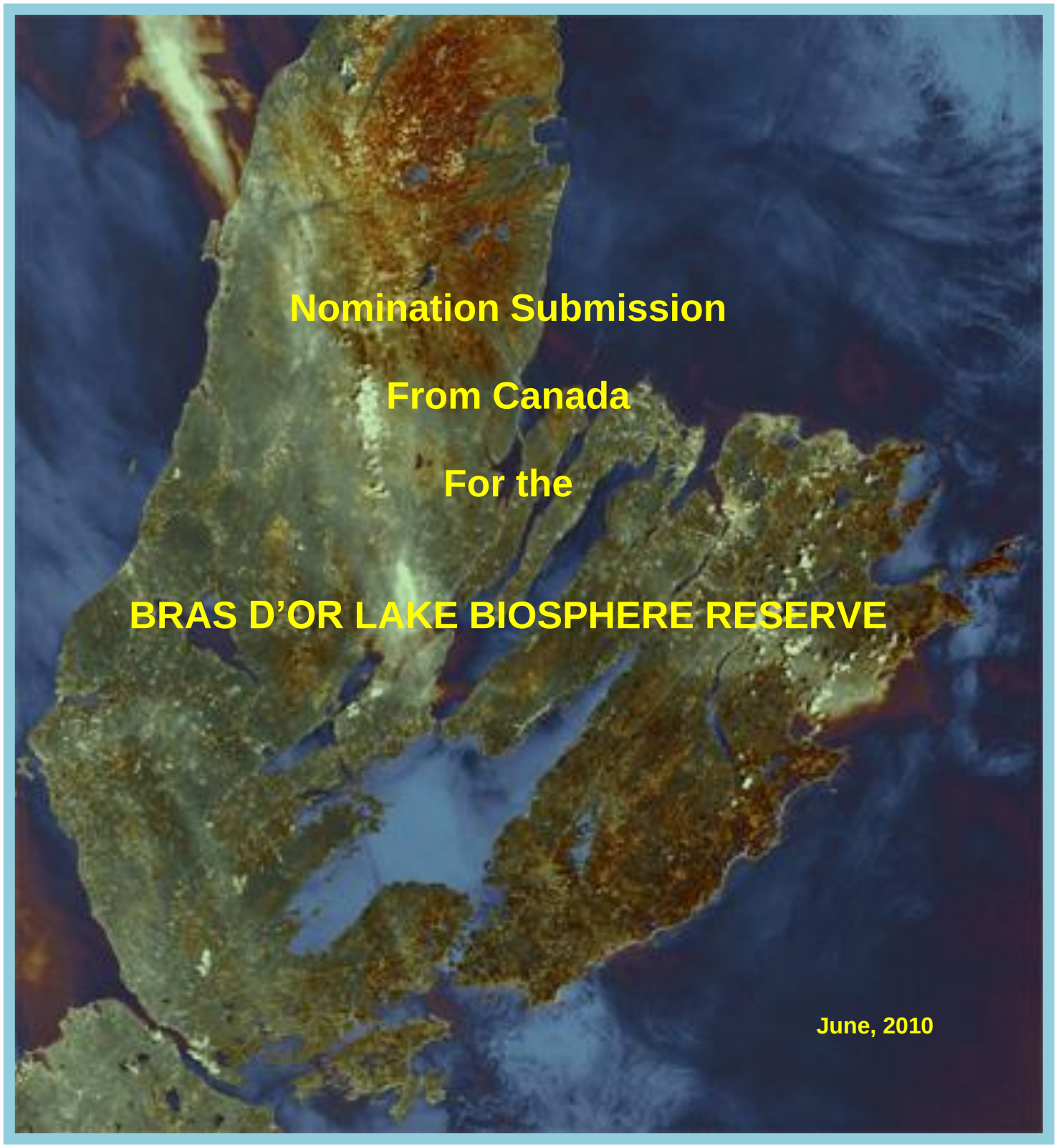

Nomination Submission

From Canada

For the

BRAS D'OR LAKE BIOSPHERE RESERVE

June, 2010

This document has been printed on FSC paper – 30% post-consumer recycled fibre

Note: To reduce costs for hard-copy distribution, this document has been edited as follows:

Appendix 4 removed, except for list of letters
Appendix 5 removed, except for list of pertinent Acts
Maps 1 and 2 are large format mapsheets and, if not included, can be accessed at http://blbra.ca/docs/maps/

This document in its entirety can be downloaded from http://blbra.ca/docs/nomination-doc/

A Choice of Name

Cape Breton Island is located at the northeastern end of the Canadian province of Nova Scotia. It is separated from the rest of the province by a narrow body of water known as the Strait of Canso. A 2 km causeway, built in 1955, now joins Cape Breton Island to the "mainland" part of Nova Scotia. Cape Breton Island is locally known as "Cape Breton" or "the island". These three names are synonymous and are used interchangeably throughout this document.

In the unique area of Cape Breton Island, currently known as the *Bras d'Or* (French colonial for "Arm of Gold"), questions sometimes arise about what to call the central body of water, which is actually a large, complex estuary (scientific term for a coastal water body where fresh and sea water mix). Several well-established and commonly used designations are tied to the particular personal understandings and cultural histories of the various interest groups and communities around the Bras d'Or: "Pitu'paq" (Aboriginal Mi'kmaq for "flowing into oneness"); the "Bras d'Or Lakes," the "Bras d'Or Lake," or simply "the Lakes" or "the Lake." All of these names are in current, common usage and are understood to refer to the same thing by those who live on Cape Breton Island.

For the purpose of linguistic consistency in this document only, the term "Lake" is used, as specified by the national authority for geographical names: *The Gazetteer of Canada*. While other designations are recognized and appreciated (and retained as written in externally sourced text herein), this *Nomination Submission from Canada for the Bras d'Or Lake Biosphere Reserve* uses "Bras d'Or Lake" and its abbreviated form, "the Lake," in the title and throughout the nomination document.

Location of Places

Location of places named in the document may not be found in the figures within the document, but will be found on the maps in the map pocket at the back of the document.

Non-derogation of Aboriginal Rights

This nomination submission and all discussions and correspondence pursuant to it are not intended to recognize, deny, create, define, alter or affect Mi'kmaq Aboriginal rights, including Aboriginal title, treaty rights or other legal rights, or to be construed as an interpretative aid in the determination of any such legal right.

CANADIAN COMMISSION FOR UNESCO
COMMISSION CANADIENNE POUR L'UNESCO
www.unesco.ca

PRESS RELEASE
For immediate release

Bras d'Or Lake is designated a Biosphere Reserve by UNESCO

Ottawa, June 30, 2011. Canada welcomes its 16th Biosphere Reserve, as Bras d'Or Lake, Nova Scotia, is designated a Biosphere Reserve by UNESCO (the United Nations Educational, Scientific and Cultural Organization). Biosphere Reserves are living laboratories of sustainable development, where local communities choose to take the challenge to protect biodiversity while fostering economic and social development. The World Network of Biosphere Reserves now numbers 580 sites in 114 countries.

This new Biosphere Reserve includes the complete watershed of Bras d'Or Lake, a salt-water estuary that constitutes a true inland sea. This estuary has unique oceanographic and biological characteristics as it contains both species typical of Arctic waters and of warm subtropical oceans, living within a few hundred meters of one another. UNESCO's designation of this site is the result of a highly collaborative process that started in 2005, involving First Nation representatives, provincial and federal government agencies, academics, and the nearly 14 000 citizens of the region. This process led to the development of a comprehensive management plan for the lake, to the creation of new jobs and encouraging business opportunities, while respecting the principles of sustainable development.

To learn more about Bras d'Or Lake Biosphere Reserve, please consult: http://www.blbra.ca/

The Canadian Commission for UNESCO operates under the aegis of the Canada Council for the Arts. Its role is to act as a forum for governments and civil society, and to mobilize the participation of Canadian organizations and committed individuals in UNESCO's mandated areas: education, natural and social sciences, culture and communication and information. The United Nations Educational, Scientific and Cultural Organization (UNESCO) is the only member of the United Nations System to have National Commissions performing this role in its Member States.

- 30 -

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ACRONYMS, ABBREVIATIONS and INITIALISMS

ACAP-CB	Atlantic Coastal Action Program (Cape Breton)
ACCDC	Atlantic Canada Conservation Data Centre
ACOA	Atlantic Canada Opportunities Agency
AquaNet	Canadian Network of Aquaculture
BdOI	Bras d'Or Institute, CBU
BLBRA	Bras d'Or Lake Biosphere Reserve Association
BR	Biosphere Reserve
BSS	Bras d'Or Stewardship Society
C2	Crown Land category 2
CBRA	Canadian Biosphere Reserves Association
CBU	Cape Breton University (formerly UCCB)
C-CAIRN	Canadian Climate Impacts and Adaptation Research Network
CCBCVI	Central Cape Breton Community Ventures Inc.
CDC	Conservation Data Centre
CEPI	Collaborative Environmental Planning Initiative
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
CSI	Collaborative Salmon Initiative
DFO	Department of Fisheries and Oceans
EC	Environment Canada
ECBC	Enterprise Cape Breton Corporation
EFWC	Eskasoni Fish and Wildlife Commission
EMAN	Ecological Monitoring and Assessment Network
END	Endangered species
ENGO	Environmental Non-Governmental Organization
ESSIM	Eastern Scotian Shelf Integrated Management Program
EXP	Extirpated species
FSC	Forest Stewardship Council
GIS	Geographic Information System
GPS	Global Positioning System
IOC	Inter-governmental Oceanographic Commission
IRM	Integrated Resource Management
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
Lgt	Transitional Low Boreal Ecoclimatic Region
LEK	Local Ecological Knowledge
LOMA	Large Ocean Management Area
Ma	Million Years
MAB	UNESCO's Man and the Biosphere Program
MABR	Man and the Biosphere Reserve
MSX	Multinucleated Spherical X (disease of oysters)
New Page	NewPage Port Hawkesbury Ltd. (formerly Stora Enso)
NPPH	NewPage Port Hawkesbury Ltd. (formerly Stora Enso)
NRCan	Natural Resources Canada
NSE	Nova Scotia Environment
NSDNR	Nova Scotia Department of Natural Resources
NSLFFPA	Nova Scotia Land Owners and Forest Fibre Producers Association
NSTIR	Nova Scotia Department of Transportation and Infrastructure Renewal
NSYCC	Nova Scotia Youth Conservation Corps
RDA	Regional Development Agency
RSNS	Royal Society of Nova Scotia
SC	Species of Special Concern
SSHRC	Social Sciences and Humanities Research Council
SRDWA	Stewards of the River Denys Watershed Association
TEK	Traditional Ecological Knowledge
TGI	Targeted Geoscience Initiative
THR	Threatened species
UCCB	University College of Cape Breton
UINR	Unama'ki Institute of Natural Resources
UNESCO	United Nations Educational Scientific and Cultural Organization
VUL	Vulnerable species
WMO	World Meteorological Organization

PREFACE

The question of how to maintain and strengthen the local economy has long been the focus of attention in the Bras d'Or Lake region. One objective is to conserve the region's cultural and natural heritage, both as a basis for enjoyable living and as a magnet for tourism. A related question is how governments might help to achieve this end. The idea of developing this region into a model of sustainability dates back at least to 1970, following the gradual decline and demise of the steel and coal-based economy of the former "industrial Cape Breton" around Sydney and Glace Bay.

Given the strong sense of place and the interest in local history among the residents of the Bras d'Or Lake region, combined with the local traditions of cooperative and community-based economic development, there is ample reason to pursue a sustainability agenda.

Among the initial moves within that agenda was the establishment of the Bras d'Or Preservation Foundation in 1993. As a land trust, the Bras d'Or Preservation Foundation developed an interest in exploring the prospect of international recognition for some, or all, of the Bras d'Or ever since the idea was first raised during the conference: The Future of the Bras d'Or Lakes, held at Baddeck, October 1991. Initially, an area thought to be worthy of international recognition was the St. Andrews Channel, a biologically special place because of the relict Arctic marine biota discovered in its depths. However, because the St. Andrews Channel hadn't received protected area status at home, other official international recognition could not be granted.

During the early 1990s, the University College of Cape Breton (now Cape Breton University) coordinated community consultations about the future of the Bras d'Or. The report from this initiative, *Taking Care of the Bras d'Or*, proposed a new representative-management structure for governance that required some independent authority undertake a range of measures for the proper stewardship of the Lake. This report was submitted to the federal and provincial governments in 1995 and was later rejected by the provincial government in 1997.

The resulting disappointment led to the establishment, in 1997, of the Bras d'Or Stewardship Society, an advocacy group promoting effective stewardship for the Bras d'Or. Informal discussions were held (on behalf of the Bras d'Or Preservation Foundation) with a representative of the Canadian Biosphere Reserves Association (then CBRA—known today as the Canadian Biosphere Reserves Association of Canada) when the possibility of a UNESCO Biosphere Reserve designation was raised in 1997.

A strong impetus for First Nations leadership in conservation and management of the fisheries and other resources of the Bras d'Or region followed from the 1999 Marshall Decision, by the Supreme Court of Canada. Revised governance arrangements, negotiated with the First Nations by the Department of Fisheries and Oceans (DFO), conformed to this decision. In 2001, as these events unfolded, mention of the biosphere reserve idea came up again during informal discussions between a member of the Foundation and a representative of CBRA. With encouragement from the Foundation, an informal group was created to pursue the idea in 2002. Discussions were held between some of the members of this proponent group (the Steering Committee) and the CBRA representative in 2003 and 2004 as the group began to explore the concept of biosphere reserve status for the St. Andrews Channel portion of the Bras d'Or. Once again, because that portion did not contain a protected area, it did not fulfill UNESCO criteria for a biosphere reserve. The Steering Committee turned its attention to the entire Lake and its watershed as the area likely to qualify for biosphere reserve designation.

Independent of these initial discussions, in 2003, the First Nations, for whom the Bras d'Or is a traditional and spiritual home, had approached other governments (federal, provincial and municipal) to propose a collaborative initiative to develop an overall management plan for the Bras d'Or Lake and its watershed. This proposal incorporated traditional ecological knowledge (TEK) about the region, along with scientific documentation from research and monitoring undertaken in recent decades. This subsequently gave rise to the Bras d'Or Lakes Collaborative Environmental Planning Initiative (CEPI).

Following a number of informal consultations by the Steering Committee with other organizations about a possible biosphere reserve, the group incorporated as "The Bras d'Or Lake Biosphere Reserve Association" under the provincial **S**ocieties **A**ct (RSNS 1989, c. 435) in 2006. The Association then began to lay a broad base of support for this biosphere reserve nomination. Its Board of Directors includes representatives of eight organizations with programs attending directly to concerns relating to the Bras d'Or and its watershed. As well, it has industry representatives from forestry and mining, a representative of the area's community college along with private citizens from a distribution of locations within the Lake area. Discussions have been held with members of the CEPI to affirm the inherent compatibility of the two initiatives. Information sessions were held with three municipal councils and representatives of a fourth, with representatives of government agencies whose jurisdictions relate to the Lake and its watershed, and with senior representatives of First Nations Band Councils. Informative

brochures have been circulated to residents within the Lake's watershed area and many of Cape Breton's public media have broadcast and published news items about the biosphere reserve initiative. The Association maintains a website (www.blbra.ca) and a master list of interested organizations and individual contacts. A summary of the activities undertaken to engage the peoples of the Bras d'Or is found in **Appendix 6**.

The Cooperation Plan for the Proposed Bras d'Or Lake Biosphere Reserve, in **Appendix 1**, outlines what has been accomplished so far and includes the directions for activities that are planned for the immediate and long-term future. Some additional details can be found under appropriate sections in this nomination submission.

A number of organizations, programs or collaborative initiatives are mentioned in the text. They are described in summary form below for ease of reference. Definitions are also provided for terms that may not be familiar to the external reviewers. Formal government bodies (elected councils, departments, or agencies) and some individual organizations are not included in the list below, but are identified in appropriate sections of the nomination document, especially under Section 4.5 and Section 15.

This nomination submission is based on a wide array of information obtained from websites, libraries and from consultation with knowledgeable individuals. References cited throughout this submission are listed in the Reference section, after Section 20 at the end of Part II.

The biosphere reserve description, for the MABnet Directory is provided in the Annex.

Whycocomagh Bay

FOREWORD

The following presentation of organizations, programs and collaborative initiatives is limited to entities associated directly with the objectives of the Bras d'Or Lake Biosphere Reserve Association (see **Figure F-1**). It includes many of those entities and it acknowledges that others may have inadvertently been excluded. It does not include a much larger number of organizations (such as government departments) whose leaders have expressed interest in the biosphere reserve initiative.

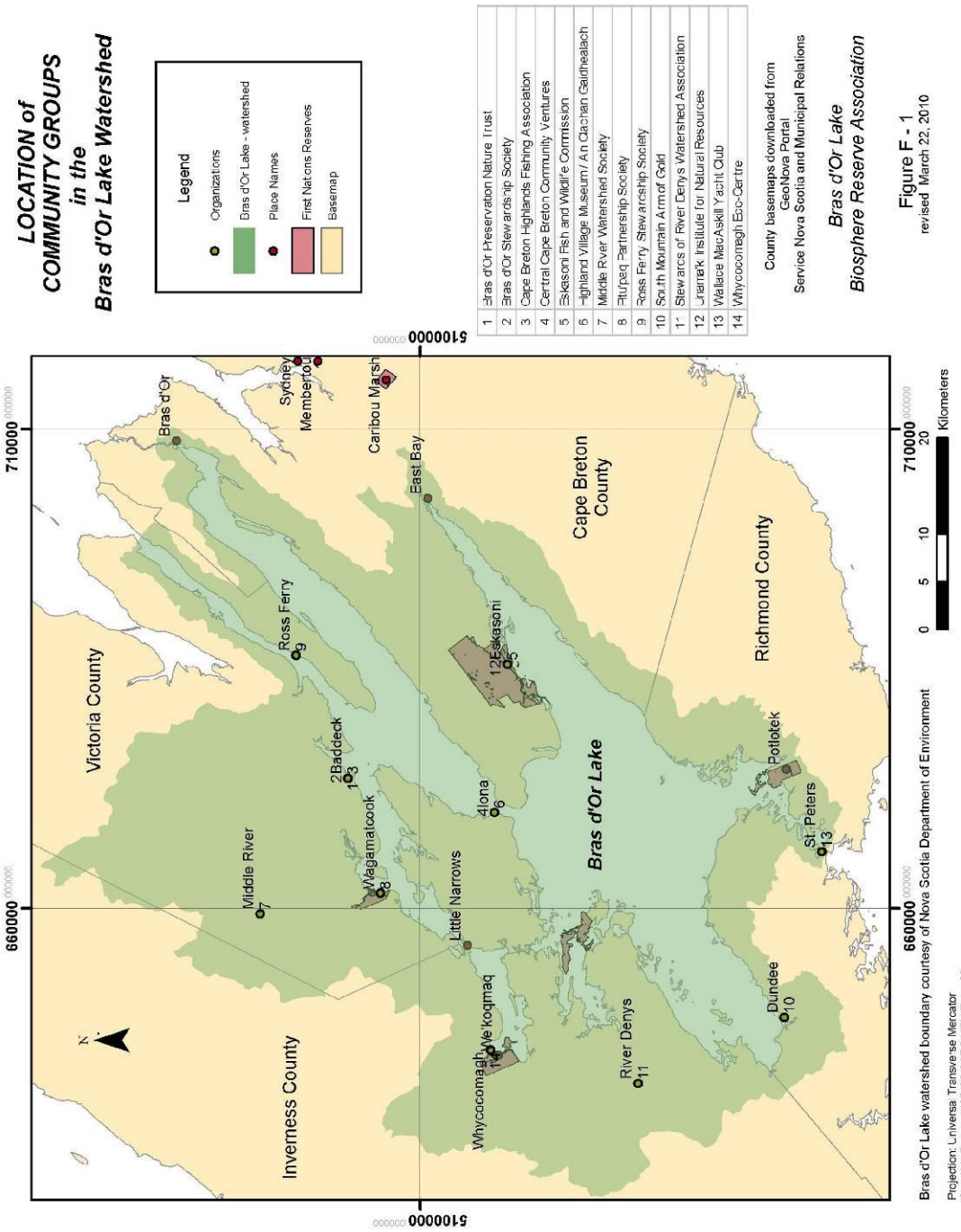
SCIENCE & RESEARCH

Atlantic Canada Conservation Data Centre [www.accdc.com]

The Atlantic Canada Conservation Data Centre (ACCDC) was established as a pilot project by the Nature Conservancy of Canada in 1997. It was later incorporated as an independent non-profit organization and as a registered charity in 2000. The ACCDC is based at Mount Allison University in Sackville, New Brunswick and also has an office in Corner Brook, Newfoundland. The Centre collects and maintains data on protected areas and on the occurrences of imperiled species of plants and animals and plant/habitat communities. Conservation Data Centres in Canada use the criteria and information management systems, designed by The (US) Nature Conservancy for use in their state or other natural heritage information systems. CDCs also conduct field work to extend the databases. ACCDC data were drawn upon for Section 4.5., Section 7. and Section 13.2. in this submission.

Bras d'Or Institute for Ecosystem Research, Cape Breton University, Sydney

The former University College of Cape Breton (UCCB), now Cape Breton University (CBU) established the Bras d'Or Institute in 1974, with the mandate to "apply the resources of the university to the problems of the community." Among many research and community development initiatives, it convened the first Nova Scotian aquaculture symposium in 1975, and assessed the potential of several resource developments in the Bras d'Or region. The *Bras d'Or Lake Watershed Integrated Resource Management Plan Study* (January 1990), prepared for the Institute by the UMA Group, Halifax, was a synthesis of this work. It provided the primary background document for the 1991 conference: The Future of the Bras


LOCATION of
COMMUNITY GROUPS
in the
Bras d'Or Lake Watershed
Legend
Organizations
Bras d'Or Lake - watershed
Place Names
First Nations Reserves
Basemap
1 Bras d'Or Preservation Nature Trust
2 Bras d'Or Stewardship Society
3 Cape Breton Highlands Fishing Association
4 Central Cape Breton Community Ventures
5 Eskasoni Fish and Wildlife Commission
6 Highland Village Museum/ An Clachan Gaidhealach
7 Middle River Watershed Society
8 Piturpaq Partnership Society
9 Ross Ferry Stewardship Society
10 South Mountain Arm of Gold
11 Stewards of River Denys Watershed Association
12 Unamak'i Institute for Natural Resources
13 Wallace MacAskill Yacht Club
14 Whycocomagh Eco-Centre
County basemaps downloaded from
GeoNova Portal
Service Nova Scotia and Municipal Relations
Bras d'Or Lake
Biosphere Reserve Association
Figure F - 1
revised March 22, 2010
Victoria County
Inverness County
Cape Breton County
Richmond County
Bras d'Or Lake
Bras d'Or
Sydney
Memberton
Caribou Marsh
East Bay
Ross Ferry
Baddeck
Wagmatcook
Middle River
Little Narrows
Iona
Eskasoni
Whycocomagh
Potlotek
St. Peters
River Denys
Dundee
660000
710000
5100000
0 5 10 20
Kilometers
Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department of Environment
Projection: Universal Transverse Mercator
Geodetic Datum: NAD 83 CSRS UTM Zone 20

d'Or Lakes. The Institute was decommissioned in 1995, following the retirement of its long-serving director, Don Arseneau.

In 2005, Cape Breton University (CBU) re-established the Institute and appointed the University Chair in Marine Ecosystem Research as Director. A number of initiatives have been taken, including: updating the extensive assemblage of "grey" literature held in the Bras d'Or Collection of the University's library; recovering and digitizing legacy data on the estuarine ecosystem and bivalve resources of the Bras d'Or Lake; initiating research on the biophysical environments and hydrodynamic processes of the subwatersheds, modeling the ecological connectivity amongst various ecosystems in the estuary, using remote sensing to map the littoral and subtidal realms on the Bras d'Or Lake; investigating redevelopment strategies for the oyster industry; and developing new instructional programs. All of this is work done in close collaboration with other organizations, including the ACAP-CB, CEPI, DFO, UINR, Central Cape Breton Community Ventures and the Bras d'Or Lake Biosphere Reserve Association.

Ecological Monitoring and Assessment Network (EMAN)]

The Ecological Monitoring and Assessment Network (EMAN) is made up of linked organizations and individuals involved in ecological monitoring in Canada, to better detect, describe and report on ecosystem changes. The network is a cooperative partnership of federal, provincial and municipal governments, academic institutions, Aboriginal communities and organizations, industry, environmental non-government organizations, volunteer community groups, elementary and secondary schools, and includes other groups/individuals involved in ecological monitoring.

The Ecological Monitoring and Assessment Network (EMAN) was established in 1994 as a national network to coordinate integrated ecosystem monitoring and research to aid understanding and to provide explanations regarding observed changes in ecosystems. EMAN addresses the challenge of coordinating the wide range of agencies, institutions and groups which actively conduct long-term monitoring in order to help integrate various monitoring initiatives.

EMAN has the following objectives:

a. To provide a national perspective on how Canadian ecosystems are being affected by the multitude of stresses on the environment;

b. To provide scientifically defensible rationales for pollution control and resource management policies;
c. To evaluate and report to Canadians on the effectiveness of resources management policies; and
d. To identify new environmental issues at the earliest possible stage.

Surveys of recent ecological literature show that the overwhelming majority of studies are based on two species, in areas less than 2 m^2 and over time periods of less than three years. This does not provide for a regional, provincial or national picture of the status of (or processes within) Canada's varied environments. EMAN contributes to meeting this need on behalf of Environment Canada (EC) and other agencies by providing cross-disciplinary and cross-jurisdictional assessments of ecosystem status, trends and processes based on the coordination of data interpretation and communication among its partners and sites. There is one active EMAN site in the Bras d'Or watershed – see Part II.

CONSERVATION & PRESERVATION

Bras d'Or Preservation Nature Trust [www.brasdor-conservation.com]

The Bras d'Or Preservation Nature Trust (previously the Bras d'Or Preservation Foundation) was created in 1993 as the first land trust under the (original) **N**ova **S**cotia **C**onservation **E**asements **A**ct (SNS 1992, c. 2, OIC 93-944). Its two main objectives are protecting environmentally important private land in the Bras d'Or watershed on Cape Breton Island and educating residents of Cape Breton communities on the importance of the unique Bras d'Or ecology. The former activities are those of a traditional land trust and hold conservation easements and freehold land in the watershed. The Nature Trust sponsors an Interpretive Centre in an historic building in Baddeck (the Old Post Office, a Provincial Heritage Building). The Centre explains the unique Bras d'Or ecology through interactive presentations that emphasize its ecological importance both locally and internationally. It appeals to visitors throughout the busy summer tourist season. During the school year when the Centre would otherwise be closed, it is devoted to the education of children. Displays are designed to provide an understanding of the Bras d'Or Lake economy, its history, and of the need to assist its preservation. Compact Disk copies of the Centre's displays are made available to all schools in the Province of Nova Scotia, financed by a special grant. The Centre also has a conference room, an office for the Nature Trust and a reference collection of library materials. It is in the process of developing an endowment fund to support its work in conservation and community

education. In addition, the Nature Trust anticipates developing a marine ecological reserve on a 40-acre waterfront site it has accepted as an endowed donation.

Bras d'Or Stewardship Society (BSS) [www.baddeck.com/bss]

The Bras d'Or Stewardship Society was incorporated in 1997 as a membership organization to follow up on the intent of the report, *Taking Care of the Bras d'Or* (1995). It currently has between 100-150 members. The Society promotes accountable and responsible stewardship of the Bras d'Or Lake that will serve to protect, conserve and restore the Bras d'Or Lake. Through various kinds of meetings, held at different locations, the BSS serves as a forum to discuss and highlight issues such as sewage contamination, closure of shellfish beds, poorly designed shorefront developments (which also close off public access), lack of effective water quality monitoring and insufficient environmental assessments.

BSS sponsors projects such as the Bras d'Or Green Craft Challenge to encourage best management practices by boaters regarding sewage, solid waste, fuel handling and use of alternative products at boating events. It has also documented water supply and sewage disposal issues posed by municipal units and subdivision developments and has sponsored scholarships for high school students.

BSS partnered with other organizations to undertake projects such as the development of PIKS: the Paqtatek Prism Integrated Knowledge System (with information and data from twenty-seven organizations) and watershed management in the River Denys watershed. It also champions other initiatives such as the Lake's designation under the federal **S**hipping **A**ct (RSC 1985, c. S-9) as a non-discharge area for ballast water by commercial shipping. BSS was chosen as the conduit for federal funds used to implement the experimental reseeding of oyster beds following kill-off from the MSX parasite. It has been a consistent supporter of activities relating to the initiative to gain UNESCO Biosphere Reserve designation for the Bras d'Or Lake and its watershed. The Society's regular publication, *The Blue Heron*, is distributed twice a year since 1998; it reports on various problems of concern and on the progress being made by a number of groups toward the long-term goal of the Society. The Society has been instrumental in promoting cooperation and collaboration among the various bodies that have jurisdiction in the Bras d'Or Lake region and has made persistent efforts to bring Lake-related problems before government.

Cape Breton Highlands Fishing Association

The Cape Breton Highlands Fishing Association formed in 1994 with the objective to assist and promote sport fishing in the southern half of Victoria County, from Cape Smokey to Iona. It has assisted the Atlantic Salmon Association with the purchase and maintenance of fish tanks and has supported the Fish Friends Program for public schools. The Association currently works with schools in Iona, Middle River and Baddeck. It endeavours to work closely with various government agencies whose regulations relate to sport fishing in this area. The Association has raised funds over the years to financially assist landowners along the Baddeck River and Middle River (flowing into the Bras d'Or Lake) with bank stabilization work, rock replacement and other conservation measures.

Middle River Watershed Society

The Middle River Watershed Society was formed in the 1980s to deal with high water and flooding caused by the loss of the forests on the Cape Breton Highlands due to salvage operations from the spruce budworm. The Society raised over 250 thousand dollars to protect meadowlands from erosion and by doing so, slowed resulting siltation problems in Nyanza Bay.

The Society is registered with NS Joint Stocks (Registry ID #2220859). It has partnered with landowners, NS Department of Agriculture and Fisheries to build and maintain a sport fishing platform for physically challenged persons on Grant's Pond, and with the Community Health Board to develop and clear a walking trail around Grant's Pond. It formed a partnership with Middle River Concerned Citizens to close and remediate septic lagoons on Crowdis Mountain which were found to be illegally overflowing into the MacDonald Brook (part of the watershed) and contaminating the water source for four families.

The Society also took over the community economic development organization and supports development of new trails for historical hiking and good health. The Society has also been involved with sport fishing enhancements by applying for habitat improvement projects on tributaries within the watershed. Studies have shown that one of Middle River's tributaries has the highest population of young trout in Nova Scotia. The Middle River watershed is one of the cleanest, most pristine regions on Cape Breton Island. Its headwaters flow from the Cape Breton Highlands, an area now designated as one of the province's protected areas, and home to the largest tract of old growth forest in eastern Nova Scotia.

Ross Ferry Stewardship Society

The Ross Ferry Stewardship Society is a non-profit community-based organization formed in 2002 to conserve and enhance the former ferry wharf and adjacent property at Ross Ferry, Victoria County. The Society believes this property is of superior environmental and historic value that provides citizens and tourists with safe, environmentally sustainable access to the Bras d'Or Lake. The society provides a pump-out facility at the wharf to service holding tanks.

Stewards of River Denys Watershed Association
(The Denys Basin Watershed Fish Habitat Restoration Project)

The Denys Basin watershed is a subwatershed of the Bras d'Or Lake. The Denys Basin watershed is approximately 300 km^2 and is comprised of both the North and South Denys Basins, the River Denys itself and the three catchment areas. The River Denys is one of four major rivers flowing into the Bras d'Or Lake. Important ecological features in the Denys Basin watershed include: mixed hardwood forests; bald eagle nesting sites; salmon, trout and herring spawning areas; a significant wetland complex at Big Marsh; a sensitive breeding wood turtle population; and the historically significant oyster fishery. The natural beauty and the resources of the Denys Basin watershed are very important to the local community and the area is culturally significant to the Mi'kmaq First Nations.

The Stewards of the River Denys Watershed Association is a non-profit community group concerned with restoring, maintaining and protecting the important aquatic environment of the watershed. The group was formed in 1999 and is comprised of volunteers representing various watershed communities and stakeholders. The long-term goal of the group is to restore fish and oyster populations to healthy levels in the Lake.

The Association and their partners have carried out successful habitat restoration projects on MacIntyre Brook, Big Brook and MacLennan Brook, and are in the process of developing a plan for restoration to Glen Brook. These are long-term, ongoing projects. Twenty-five digger logs and deflectors have been installed in MacIntyre and MacLennan Brooks. Thirty-five rock sills have been installed in Big Brook; and bank revegetation, bank stabilization and drainage repair have also occurred there. Georgia-Pacific, a local gypsum mining company, was a key partner in this work. The Association has a close working relationship with the Department of Fisheries and Oceans (DFO) and the Adopt a Stream Program, providing continuous planning and habitat restoration for these projects. Participation by students from the Nova Scotia Youth Conservation Corps (NSYCC) is integral to the completion of these projects.

Nova Scotia Protected Areas Program – Wilderness Areas and Nature Reserves
[www.gov.ns.ca/nse/protectedareas/naturereserves.asp]

Nature reserves are areas selected to preserve and protect, in perpetuity, representative (typical) and special natural ecosystems, plant and animal species, as well as features and natural processes. Scientific research and education are the primary uses of nature reserves and recreation on nature reserves is generally restricted.

Nature reserves are established to:

a. Provide areas suitable for scientific research and education;

b. Protect representative examples of natural ecosystems;

c. Provide examples of ecosystems that have been modified by humans and offer an opportunity to study the natural recovery of ecosystems from modification;

d. Protect rare or endangered native plants or animals in their natural habitats; and to

e. Provide educational or research field areas for the long-term study of natural changes and balancing forces in undisturbed ecosystems.

Nova Scotia currently has eleven designated nature reserves which are protected under the **S**pecial **P**laces **P**rotection **A**ct. This nomination includes three wilderness areas and three nature reserves as part of the Core areas (see Map 1).

Protected Beaches Program

The Province of Nova Scotia has designated 94 beaches as protected under a legislative statute: the **B**eaches **A**ct (Chapter 32 of the revised statutes, 1989 amended 1993, c. 9, s). They are protected against the removal of sand, gravel, stone or other material from a beach and include restrictions on the removal of any natural object, tree, shrub, plant or grass; the removal or displacement of any rock, mineral, fossil, sand, gravel, or other aggregate, or object of natural curiosity or interest. There are also restrictions on the behaviour of people while on the beach. These include impairment by alcohol or drugs, acting disorderly, causing a disturbance and depositing garbage. Four of these beaches are within the proposed biosphere watershed boundary and are part of the Core areas (see Map 1). Violations are subject to fines and/or imprisonment.

CULTURE & SOCIETY

Cape Breton Centre for Craft and Design (CBCCD) [www.capebretoncraft.com]

The Cape Breton Centre for Craft and Design is located in Sydney, Nova Scotia where it carries out its mandate to promote excellence in the field of craft and design through education and training. CBCCD is committed to developing programs that preserve, elevate, expand and enhance the creation of craft. It serves the craft community of Cape Breton Island from beginner and recreational practitioners to highly accomplished professionals, offering instruction as well as resource and support services.

The role of the craft sector as part of Cape Breton's culture is integral and immutable. The craft industry is closely linked to Cape Breton's tourism sector and makes a significant contribution to the economic development of the Island. The dynamic and innovative craft sector is recognized for its excellence and is viewed as a vital part of the social, economic and cultural fabric enhancing Cape Breton's and Nova Scotia's well being.

Celtic Colours Festival Society [www.celtic-colours.com]

The mission of the Celtic Colours International Festival is to promote, celebrate and develop Cape Breton's living Celtic culture and hospitality by producing an international festival during the fall colours that builds relationships across Cape Breton and beyond. It is overseen by the Celtic Colours Festival Society: a not-for-profit, volunteer based organization.

Celtic Colours is an annual, island-wide celebration that takes place at the height of the island's spectacular fall colours (early to mid October), when travelers experience one breathtaking view after another. Over the last 13 years it has featured hundreds of musicians from all over the Celtic world and attracted thousands of visitors to Cape Breton Island. It is a unique celebration of Celtic music and culture, with dozens of concerts and workshops hosted by communities around Cape Breton during the nine days of festival. These communities are the places where the culture has been nurtured for over 200 years providing context for the roots of the music and celebrating each community's contribution to our living Celtic culture. Celtic Colours offers the opportunity to go beyond simply listening to music. Workshops and other cultural activities allow visitors and residents alike to get the hands on experience they desire. More than 120 non-profit community groups and 1700 volunteers work together to host

the events. Visitors make up just over half of the audience of about 12,000 people. They come from all provinces, 45-48 US states and 20 other countries.

Celtic Colours is recognized as a world-class event both locally and internationally. It creates more than $5 million in direct economic impact for Cape Breton Island every year.

South Mountain Arm of Gold

The South Mountain Arm of Gold is a Richmond County community organization with official charitable status. It serves as a base for the community to socialize, share information and when necessary, it provides assistance to local communities.

The organization provides opportunities for residents to gather in the comfortable lakeside hall for Weekly Coffee, Wednesday mornings; for Games Night, Thursday evenings; and for Darts, Sunday evenings. It also serves as a venue for special meetings that affect the communities and it serves as a forum for fellowship, edifying and showing respect for community members, as well as supporting community activities. The organization annually hosts a Celtic Colours Song Session, a program that has been very well received. As a regular feature of the organization, more than 200 people are served Country Breakfast, once each month. It is a very active organization in this aging community situated on the shores of the Bras d'Or Lake, and South Mountain Arm of Gold is considered to be one of the community's greatest resources.

Wallace MacAskill Yacht Club

Located on the Bras d'Or Lake, near the St. Peter's Canal, the Wallace MacAskill Yacht Club is a recreational organization focused on boating—providing programs to reinforce safe and responsible behaviour on the water, and to help open the opportunities for recreation and sportsmanship on the water, to youth and the general public. These activities are focused on creating opportunities for healthy and safe enjoyment of the Lake, and at the same time creating public awareness and appreciation for what is special about the Yacht Club's location on the Lake. Emphasis is placed on the importance of ongoing stewardship of the Bras d'Or Lake so that it can be enjoyed and appreciated for generations to come.

ECONOMIC DEVELOPMENT

Central Cape Breton Community Ventures Inc.

Central Cape Breton Community Ventures Inc. (CCBCVI) is a community-based not-for-profit company serving central Cape Breton Island. It is a company in business to generate profit for further investment in the economic development of the community. The region of Central Cape Breton generally encompasses the area west of Barrachois Harbour and all the Iona/Washabuck Peninsula. Central Cape Breton is essentially the geographic centre of the Island and is strategically surrounded by the waters of the Bras d'Or Lake and is linked at the Barra Strait by two transportation bridges. The area is populated with the descendents of the Mi'Kmaq peoples who lived there over the last 11 000 years as well as the descendents of its Scottish settlers who lived there over the last 200 years.

The Vision Statement of CCBCVI is to make the region the ideal place where people will want to live and to which new people will want to come—to visit, to relocate, to retire and to stay. Its Mission Statement is to enhance the quality of life in the region by promoting and initiating economic, social and cultural development.

With the increase in world environmental awareness, the effects of global warming and the dramatic decline in fish stocks, the Bras d'Or Lake will play an increasingly dramatic role in marine research while it continues to enthrall the residents of its watershed as an outstanding place to live—and for tourists, as a delightful destination. The Bras d'Or Lake is an internationally unique ecosystem: a primary task of CCBCVI is to encourage and contribute to its community by promoting global awareness of this rich, immense natural asset within Cape Breton Island.

Targeted Geoscience Initiative (TGI): Geological Mapping for Mineral Development in South-central Cape Breton Island. [www.gov.ns.ca/NATR/meb/tgi/tgihome.asp]

This one component of a federal-provincial multi-year program was completed in 2000 to obtain geoscience data and to produce new geological maps for under-explored regions with high-potential mineral deposits in Canada. It was carried out by the Geological Survey of Canada and the Nova Scotia Department of Natural Resources (NSDNR) for Cape Breton. The region of interest included most of the Bras d'Or Lake watershed and the areas immediately to the west and south of the Lake. Seismic surveys, test drilling, geophysical and geochemical analyses provided the geoscience database from which maps

of bedrock (sedimentary) geology, surficial geology and potential mineral deposits were prepared. This area of Cape Breton is considered to have potential to become a rich source of gypsum, anhydrite, limestone, crushed stone aggregate, salt, potash, barite, base metals, clay and high unit value silica and kaolin. The maps and data are intended to help stimulate resource exploration and exploitation.

RESOURCE MANAGEMENT

Eskasoni Fish & Wildlife Commission (EFWC) [www.efwc.ca]

The Commission was established in 1991 to deal with environmental issues of concern to Aboriginal people in the entire Bras d'Or Lake watershed. The EFWC works in partnership with other organizations, including the Department of Fisheries and Oceans, to train Native Fishery Guardians to conduct fisheries monitoring and enforcement actions on the Bras d'Or; the Netukulimk GIS Management Project with the Union of Nova Scotia Indians to help integrate TEK into community planning (starting with the Malagawatch Medicine Project); and with the Union of Nova Scotia Indians on the development of the Gillis Cove Oyster Research Station site. It has also negotiated agreements with Georgia-Pacific Canada Inc. to undertake a TEK study of areas associated with the Melford gypsum mine, NewPage Port Hawkesbury Ltd. (NPPH--formerly Stora Enso) to update forestry maps, Environment Canada for water quality testing in Bras d'Or as part of the Canadian Shellfish Sanitation Program and Parks Canada for studies of moose in the Cape Breton Highlands.

In 1999 the Supreme Court of Canada ruled that under the terms of the Treaty of Peace and Friendship, signed with the British in 1760-1761, the Mi'kmaq people in Nova Scotia had a constitutionally protected treaty right to engage in commercial fishing to secure a moderate livelihood (R v. Marshall (#1) [1999] 3 S.R.C. 456), subject to conservation restrictions imposed by the Department of Fisheries and Oceans (DFO) on an entire fishery (R v. Marshall (#2) [1999] 3 S.R.C. 533). This two-part decision applied to bands living in New Brunswick, Prince Edward Island, the Gaspé region of Quebec as well as Nova Scotia.

The DFO has had an Aboriginal Fisheries Strategy in place since 1992 to work with Aboriginal groups on matters relating to fisheries access and management. Following the Marshall decision, DFO initiated negotiations to seek agreements with thirty-four affected

First Nations. Under a series of interim agreements, followed by longer-term agreements with the Eskasoni First Nation (through the EFWC) in 2000, DFO provided funding to acquire two multi-purpose vessels along with fishing licenses for snow crabs, shrimp and ground fish from willing sellers (for transfer to EFWC); for two new vessels and equipment; for new buildings (offices, meeting rooms and laboratories) to serve the Commission and the Unama'ki Institute of Natural Resources (UINR), along with a floating dock and related facilities and equipment (in Eskasoni); support for scientific research in the Bras d'Or; and training for offshore commercial fishing. Similar capacity-building expenditures were committed to other First Nations in the Bras d'Or area on a much smaller scale. The Commission has organized training courses for young band members with the goal of creating a professional Mi'Kmaq fishing industry. Courses include a Master Class Program (for navigation in coastal and offshore waters), Boat Maintenance and Diesel Mechanics, and Inshore Deckhand Training.

The Pitu'paq Partnership Society "Flowing Into Oneness" [www.pitupaq.ca]

The Pitu'paq Partnership Society was created in 2001 by leaders of Cape Breton's five First Nations and five Cape Breton municipalities (four counties and The Town of Port Hawkesbury). Its purpose is to work together to remediate the Lake's sewage contamination from on-site septic systems, boating, and inadequate sewage treatment plants and to create public awareness and understanding of the issues. The vision is to restore the Lake to its original state and manage the waters and lands around the Lake to support aquaculture, wild fisheries and tourism. The Society has had the problem areas mapped (by GIS and GPS) through the Geo-Connections Sustainable Communities Initiative (Natural Resources Canada). Major improvements and upgrades have been secured for municipal treatment plants in Baddeck, Eskasoni and St. Peter's. A number of private landowners have installed new, or upgraded, on-site systems. The Society sponsored a series of public meetings to discuss designation of the Bras d'Or Lake as a non-discharge zone for boating sewage under the federal **S**hipping **A**ct; this designation was received in July 2006. The Society has also drafted model by-laws for community maintenance of on-site waste treatment systems and is promoting the establishment of wastewater management districts under the province's **M**unicipal **G**overnment **A**ct (Section 342, Part 14). The Society now has sixteen member organizations, a number of partnerships and a provincially funded Bras d'Or Lakes Coordinator to oversee its work.

Unama'ki Institute of Natural Resources (UINR) [www.uinr.ca]

The UINR, established in 1998 by the Eskasoni Fish and Wildlife Commission (EFWC), represents the five First Nations communities on issues pertaining to management and stewardship of resources in the traditional territory of Unama'ki (Cape Breton).

The UINR goals are:

a. To provide resources for First Nations equal participation in natural resource management in Unama'ki and its traditional territory;
b. To strengthen First Nations research and natural resource management while maintaining [our] traditions and worldviews; and
c. To partner with other groups sharing the same desire to protect and preserve [our] resources for future generations.

Long-term core funding has been received from the Department of Fisheries and Oceans through the Aboriginal Aquatic Resource and Ocean Management Program (AAROM). A partnership agreement, *Science for the Integrated Management of the Bras d'Or Lakes* (SIMBOL), was signed in 1999 and a DFO research vessel, Navicula, is made available for two months a year for research and monitoring on the Bras d'Or Lake. The CEO of the Eskasoni Fish & Wildlife Commission (EFWC) is Director of the Institute. UINR has a number of other collaborative agreements concerning areas within the proposed biosphere reserve. They include: EFWC and the Nova Scotia Union of Indians for GIS mapping to document important TEK sites for use in community planning; CEPI for secretariat and facilitation services; Environment Canada for conducting monitoring programs for different purposes; NewPage for updating GIS forestry maps and conducting some silviculture operations; Georgia-Pacific for work associated with gypsum mines; and several organizations for operating the Oyster Farm Research Station at Gillis Cove. UINR has published a bimonthly newsletter, *Marten*, since late 2005.

Eastern Scotian Shelf Integrated Management Program (ESSIM)
[www.mar.dfo-mpo.gc.ca/oceans/e/essim/essim-intro-e.html]

Under the federal **O**ceans **A**ct (SC 1996, c. 31) and the accompanying Oceans Strategy to implement it, the Department of Fisheries and Oceans (DFO) identifies Large Ocean Management Areas (LOMAs) for each of the marine regions in Canada. LOMAs extend from the coastlines to the limits of national jurisdiction offshore.

DFO then leads a collaborative planning and management process to prepare integrated ocean management plans for each LOMA in order to address large-scale ecosystem and economic development issues. ESSIM, launched in 1998, is one of the first LOMA programs. It covers the entire Eastern Scotian Shelf, a region of some 325 000 km^2. It deals with fisheries issues, offshore oil and gas and potential mineral development, submarine cables, maritime defensive operations and marine conservation (including establishment of a marine protected area for Sable Gully, a 70-km long, 20-km wide, and up to 2-km deep undersea canyon at the eastern edge of the Shelf). ESSIM has prepared a multi-year strategic-level plan for 2006-2011 with assistance from a 24-28 member multi-stakeholder advisory body. Selected coastal management areas are included as smaller-scale nested components within LOMAs. The Bras d'Or is a major example of this approach for ESSIM and CEPI exemplifies the collaborative planning and management required to prepare integrated ecosystem-based management plans.

Nova Scotia Provincial Parks Program [www.novascotiaparks.ca/]

Nova Scotia's provincial park system provides access to some of the best opportunities to enjoy the rich natural and cultural heritage our province has to offer.

The Parks and Recreation Division is responsible for:

a. Administering the **P**arks **A**ct, the **T**rails **A**ct and the **B**eaches **A**ct;
b. Planning for parks, trails and outdoor recreational opportunities;
c. Inventorying and evaluating outdoor recreational and heritage resources for parks planning and input to integrated resource management (IRM) on Crown lands;
d. Planning for trails on abandoned railways;
e. Providing expertise for beach protection and related coastal zone management;
f. Evaluating parkland acquisition options;
g. Site planning, park development and project management and inspection—either directly or in an advisory capacity to others;
h. Coordinating the preparation of development and operating standards for parks;
i. Negotiating partnerships for the development and operation of park system components;
j. Procuring parks system facilities, equipment and services;
k. Providing input on park operating seasons and fees;

l. Liaising with the Nova Scotia Department of Economic Development and Tourism and other provincial departments on marketing of parks and outdoor recreation; and

m. Producing and distributing information regarding park programs and the preparation of interpretive materials.

This nomination includes five provincial parks as part of the Core areas (see Map 1).

Nova Scotia Integrated Resource Management Program

[www.gov.ns.ca/natr/irm/introduction.html]

Integrated resource management (IRM) is a planning and decision-making process that coordinates resource use so that the long-term sustainable benefits are optimized and conflicts among users are minimized. IRM brings all resource groups together, rather than each working in isolation, to balance the economic, environmental and social requirements of society. IRM includes planning for minerals, forests, recreation, wilderness, energy, wildlife and parks. This program applies to all Crown land in the province of Nova Scotia and, for the purposes of this nomination, is a key decision-making process fosters sustainable resource harvesting in Buffer areas of the proposed Biosphere Reserve (see Part I Section 4.5 B and Part II Section 12.2.4).

Integrated Resource Management Goals for Nova Scotia

Goal 1. Use renewable resources within long-term sustainable levels.

Objectives:

- Harvest of forest products is not to exceed the long-term sustainable levels.
- Honour existing contracts, licenses and leases for resource use and production on Crown lands.
- Use of wildlife species is not to exceed sustainable levels.
- Manage wildlife habitat within the framework of forestry/wildlife guidelines and standards for Nova Scotia.

Goal 2. Ensure environmental protection and biodiversity.

Objectives:

- Provide for the maintenance of natural ecosystem integrity and diversity.
- Manage significant wildlife habitats to protect their values.
- Provide for recovery of endangered or threatened species and habitats.

- Protect appropriate representative landscapes and ecosystems, and sites and features that are considered to be unique, rare, or of otherwise outstanding natural value.

- Ensure that resource production and resource use is conducted in a manner that minimizes environmental disturbance.

Goal 3. Meet outdoor recreational and heritage protection needs.

Objectives:

- Provide a wide variety of outdoor recreational and tourism opportunities, either directly or through partnership arrangements.

- Manage and operate designated parks, trails, beaches and waterways.

Goal 4. Use mineral and petroleum resources in keeping with sustainable development principles.

Objectives:

- Maximize opportunities for exploration/development of minerals and petroleum.

- Ensure access to land and stability of mineral and petroleum tenure.

Goal 5. Provide equitable opportunities for Nova Scotians to share benefits from resources on Crown lands.

Objective:

- Ensure that the Integrated Resource Management planning process for Crown lands identifies and recognizes the wide range of land uses desired by Nova Scotians and that it balances the benefits to the various stakeholders.

Goal 6. Maintain a base for jobs and incomes.

Objectives:

- Natural resources are to be used to benefit the economies of communities and the province.

- Maximize the supply of wood products through appropriate management techniques within the limits of sustainability.

- Maximize the supply of parks, recreation and tourism opportunities through appropriate management techniques within the limits of sustainability.

- Maximize the supply of minerals and energy resources through appropriate management techniques that operate within the limits of sustainability.

Bras d'Or Lakes Collaborative Environmental Planning Initiative (CEPI) [www.brasdorcepi.ca/]

The CEPI arose from a request from First Nations Chiefs in 2003 to develop an overall environmental management plan for the Bras d'Or Lake and watershed lands. The collaborative partnership is among five First Nations, four counties, three provincial government departments, three federal government departments, and with several non-governmental organizations. The Unama'ki Institute of Natural Resources provides secretariat and facilitation services. A charter adopted by the governmental partners, in November 2005 articulates a vision, purpose and statement of objectives for CEPI. The ongoing work incorporates traditional ecological knowledge with "western science" and takes guidance from the Aboriginal medicine wheel concept to maintain the appropriate scope and balance to address management issues. A document entitled Bras d'Or Lakes Development Standards provides an excellent example of CEPI's situation as a mechanism to assist the planning efforts of the area's municipalities. Commissioned by CEPI, with assistance from one municipality (Cape Breton Regional Municipality) and one non-government organization (Bras d'Or Stewardship Society), the study attends to "non-structural' best management practices "which are institutional and regulatory measures that do not generally involve construction of infrastructure." This report presents the results of an analysis of suitability of lands for development, watercourse buffers, and wastewater management districts. It concludes with a set of recommendations and includes as an Appendix, the Bras d'Or Lakes Development Standards Handbook. This document has been presented to the respective Municipal Councils as a guide they might employ as they develop their respective planning strategies. As the lead federal agency, the Department of Fisheries and Oceans (DFO) also views CEPI as a pilot project demonstrating how this coastal and watershed planning complements the much larger Eastern Scotian Shelf Integrated Management (ESSIM) program that was initiated in 1998 under the **O**ceans **A**ct (SC 1996, c. 31) and the Canadian Oceans Strategy.

PUBLIC AWARENESS & EDUCATION

Atlantic Coastal Action Program Cape Breton (ACAP-CB) [www.acapcb.ns.ca]

The Atlantic Coastal Action Program (ACAP-CB) is home to the Centre for Sustainable Communities, located in Sydney, Nova Scotia. Opening in 1992, the Centre is a public information resource relating to the local ecosystem and the wildlife residing in it. Program highlights include interactive displays on various projects, a wide selection of information brochures and tours for school and community groups.

As a community-based organization, ACAP-CB cooperates with the local workforce to achieve its goals. Through job creation grants from local businesses and partnerships with the Cape Breton Regional Municipality, more than 300 people have been employed by Atlantic Coastal Action Program–Cape Breton, to the mutual benefit of the respective projects and those who gained work experience through them.

Stream/Habitat restoration is an example of ACAP-CB's community projects. Because of the link between human activity and changes in stream beds, ACAP-CB works to educate people to modify their activities, with the objective to restore disturbed stream beds to their natural state. The use of digger logs and ATV fording sites are measures employed to help sustain these areas and the many hundred kilometres (km) that ACAP-CB has protected to date.

Canadian Biosphere Reserves Association (CBRA) [www.biospherecanada.ca]

The CBRA was created in 1997 as an association of biosphere reserves to provide support and networking relationships that help develop and maintain biosphere reserves in Canada. CBRA also helps organize collaborative projects among biosphere reserves and fosters coordination with biosphere reserves in other countries, with the Canadian Commission for UNESCO and with the UNESCO Man and the Biosphere Programme. The proposed biosphere reserve will be invited to join the CBRA after the nomination has been approved.

Highland Village Museum (*An Clachan Gàidhealach*)
[http://museum.gov.ns.ca/hv/research.html]

Highland Village is a living-history museum and folklife centre for Nova Scotia's Scottish Gaelic language, culture and traditions. The site brings to life various aspects of Gaelic linguistic and cultural expression through the animation of eleven period buildings on its 43-acre site. Costumed staff members share Gaelic life from the late 18th century, to early in the 20th century through demonstrations of language, song, story, music, crafts, chores and more. The site features the only replica of a Hebridean-style black house in North America, as well as rare farm animals including Soay sheep and Highland cattle. Other features include a log house, several styles of framed houses, a church, a schoolhouse, a general store, a blacksmith shop, a carding mill and a barn within a working farm area. The site is situated at Hector's Point on the Barra Strait and provides spectacular view planes of the Bras d'Or Lake and its watershed area.

In addition to the interpretation of Gaelic life through the living-history museum, the Highland Village also offers an array of outreach programming and community leadership initiatives. Such programs include special language-based (and experiential) programs and internships for children and youth; special theme-based tours of the site; workshops and lectures on various aspects of Gaelic language and culture; language classes; special programs around traditional Gaelic feast days; cultural presentations and sponsorship of language and cultural development projects. The Highland Village sponsors one of Cape Breton's original Scotch concerts, a Highland Village Day (dating back to 1962) and it offers family history research services.

The Highland Village, a living-history site, is open from June 1st to mid-October with some off-season programming. The Visitor Centre includes Administration Office, Family Research Centre and the Gift Shop (open year round).

The Highland Village is a part of the Nova Scotia Family of Provincial Museums through the Nova Scotia Department of Tourism, Culture & Heritage. It is managed by the Nova Scotia Highland Village Society, a local, independent, non-profit organization and registered charity.

Silver Dart Centennial Association [www.flightofthesilverdart.ca]

Flight in Canada had its birth on the frozen Bras d'Or Lakes in 1909, led by Alexander Graham Bell and a team of aviation pioneers. 2009 marked the 100th Anniversary of the first powered, heavier-than-air, controlled flight in Canada. No other nation in the world owes more to flight than Canada. Aviation opened up the country and remains a life-line to many Northern and remote areas of our country.

The Silver Dart Centennial Association (SDCA) is a Baddeck based, not-for-profit organization established for the sole purpose of planning and implementing the 100-year anniversary celebration of airplane flight in Canada. A multi-year volunteer led planning process not only commemorated and celebrated the Silver Dart's flight and all that it represents, but they are also working on an exciting legacy project that will continue to celebrate innovation, technology and flight well into the future.

The community of Baddeck, via the SDCA, has been discussing a lasting legacy project which would consist of an appropriate memorial of Alexander Graham Bell's association with Baddeck and his achievements in Aerial Experimentation. A capital legacy plan is currently active, with a goal of developing a capital expansion to the AGB Museum in which to house the Silver Dart replica and an Innovation Centre.

Whycocomagh Eco-Centre [www.whycocomaghecocentre.com]

The Eco-Centre began operation in late 2005, after an incubation period of over fifteen years. The Centre is located in the Whycocomagh Education Centre and includes an Eco-Lab space, administrative office, gardens, and facilities that access the shores of the Bras d'Or Lake and the Skye River Estuary.

The Eco-Centre encourages connections with nature through environmental programs and encourages awareness of the pristine environment of Cape Breton. The Eco-Centre is located on, and overlooks, the incredible shores of the Bras d'Or Lake.

The Centre's focus on the development and understanding of ecological Identity gives a fresh starting point to the approach taken to environmental education. This involves opportunities for participants to share their personal stories and connections to the planet, as well as to engage in experiences that allow for identification and acknowledgement of these

connections. Learning about the world they are a part of individually, and as group members, allows participants to think in new ways, with new understandings regarding the interconnectedness of all life. It can be said the Eco-Centre embraces a bio-centric worldview in which all life has intrinsic value.

SPECIAL DEFINITIONS

First Nations

The formal term for native Aboriginal peoples, especially in their capacity as equals in government-to-government negotiations. There are five First Nations bands associated with the proposed biosphere reserve: Waycobah, Eskasoni, Membertou, Potlotek and Wagmatcook. These five bands are also co-owners of Malagawatch, an area that is set aside for sustainable recreational use by these First Nations communities. Over the past decade especially, the First Nations have negotiated co-management agreements with non-Aboriginal governments and corporations for resource and environmental management in the proposed biosphere reserve. See EFWC, CEPI and UINR for more information. First Nations peoples living on reserves represent 30% of the human population within the watershed.

Indian Reserves

The official term for areas of land dedicated entirely for Aboriginal communities and administered under the terms of the federal **I**ndian **A**ct. The main Aboriginal communities within the proposed biosphere reserve existed prior to the first administrative decisions to recognize some of them as Reserves in the early 19th century. Since then, all five First Nations bands have been brought under the terms of this **A**ct which has been administered by the federal government since Canada became a self-governing entity in 1867. More recently, the Reserves have evolved self-government for education, social services and other components of Reserve administration.

Part I

Summary

Nomination Submission

From Canada

For the

BRAS D'OR LAKE BIOSPHERE RESERVE

PART I: SUMMARY

1. PROPOSED NAME OF THE BIOSPHERE RESERVE

USE A LOCALLY ACCEPTED GEOGRAPHIC, DESCRIPTIVE OR SYMBOLIC NAME WHICH ALLOWS PEOPLE TO IDENTIFY THEMSELVES WITH THE SITE CONCERNED (E.G. RIO PLATANO BIOSPHERE RESERVE, BOOKMARK BIOSPHERE RESERVE). EXCEPT IN UNUSUAL CIRCUMSTANCES, BIOSPHERE RESERVES SHOULD NOT BE NAMED AFTER EXISTING NATIONAL PARKS OR SIMILAR ADMINISTRATIVE AREAS.

BRAS D'OR LAKE BIOSPHERE RESERVE

2. COUNTRY

CANADA

3. FULFILLMENT OF THE THREE FUNCTIONS OF BIOSPHERE RESERVES

ARTICLE 3 OF THE STATUTORY FRAMEWORK PRESENTS THE THREE FUNCTIONS OF CONSERVATION, DEVELOPMENT AND LOGISTIC SUPPORT. EXPLAIN IN GENERAL TERMS HOW THE AREA FULFILLS THESE THREE FUNCTIONS.

Note: *Please see **Figure 3-1** (Location Map) and **Map 1** (Proposed Biosphere Reserve Configuration) in **Appendix 2** to locate places named in this nomination submission.*

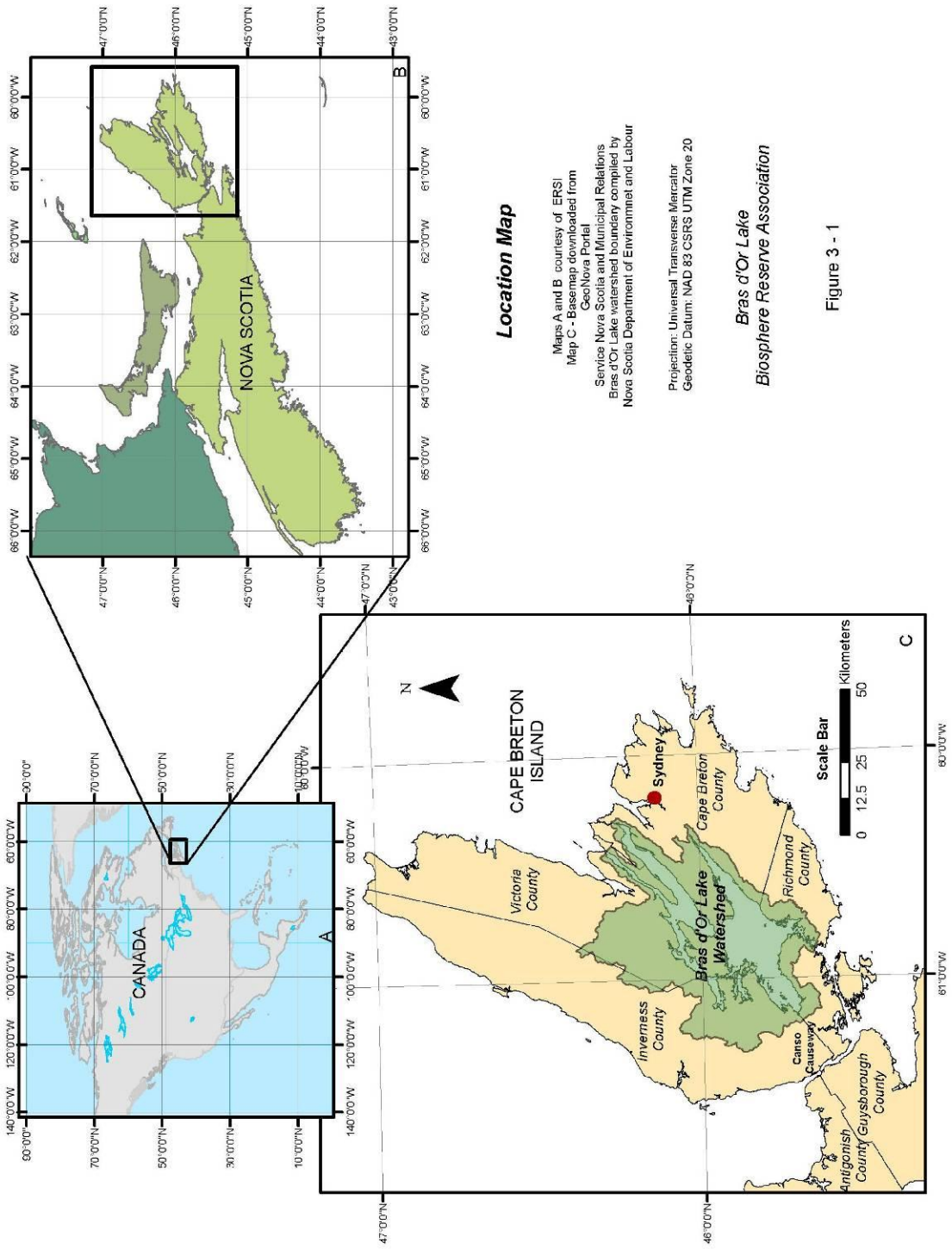
The comments below are directed to the perceived significance of the proposed biosphere reserve being able to fulfill each of the three functions: conservation, development and logistic support. Included are comments about the current opportunities to fulfill these functions in the region and the rationale of the proponents in seeking a biosphere reserve designation.

3.1. Conservation

CONTRIBUTES TO THE CONSERVATION OF LANDSCAPES, ECOSYSTEMS, SPECIES AND GENETIC VARIATION. STRESS IS GIVEN TO THE IMPORTANCE OF THE SITE FOR CONSERVATION AT THE REGIONAL OR GLOBAL SCALES.

Conservation: Significance

The Bras d'Or Lake and watershed is a 3 566 km^2 region of forest, freshwater and marine ecosystems in the centre of Cape Breton Island, Nova Scotia, Canada. The Lake occupies 1 109 km^2 (31 percent) of the area, with the rest of the 2 474 km^2 (69 percent) constituting the watershed (catchment area). The length of the coastline of the Lake is approximately 1 230 km. It exhibits a highly varied topography of steep hills surrounding rather narrow coastal areas, a complex bathymetry of deep canyons, underwater drumlins and sills and karst sinkholes. Four main rivers enter the Lake, mainly from the west. There are also two narrow openings to the Gulf of St. Lawrence to the North and a small canal connection between the Lake and the Atlantic Ocean at the south end. This leads to



Location Map

Maps A and B courtesy of ERSI
Map C - Basemap downloaded from GeoNova Portal
Service Nova Scotia and Municipal Relations
Bras d'Or Lake watershed boundary compiled by
Nova Scotia Department of Environmnet and Labour

Projection: Universal Transverse Mercator
Geodetic Datum: NAD 83 CSRS UTM Zone 20

Bras d'Or Lake
Biosphere Reserve Association

Figure 3 - 1

considerable variability in depth, salinity, upwellings, downwellings and current patterns throughout different parts of the Lake—generally considered a brackish water estuarine system.

The marine biota range from a mix of fresh water, Gulf of St. Lawrence and "relict Arctic" species, to warmer Virginian enclave species—a mix representing species associations that otherwise range over a 30^{o} latitude of marine ecosystems along the Atlantic Coast. The Lake also has fishing and shellfish aquaculture. The former is limited by declines of some fish stocks (e.g. herring, *Clupea harengus* and American plaice *Hippoglossoides platessoides*), and the latter is limited by bacterial contamination from sewage in some areas and the accidental introduction of parasitic disease among oysters. Sport fishing is thriving, especially for salmonids in the main rivers.

The forested watersheds are representative of both upland deciduous forests (sugar maple, *Acer saccharum*; yellow birch, *Betula alleghiensis*; and beech, *Fagus grandifolia*) and conifer forests (white spruce, *Picea glauca*; black spruce, *Picea mariana*; and balsam fir, *Abies balsamea*) in upland flats and ravine slopes. Most are cutover forests, to varying degrees, and some are regenerating as red maple (*Acer rubrum*), white birch (*Betula papyrifera*), or as white spruce with some balsam fir (on abandoned farmland). The topographic variety, combined with recent land use history, adds to habitat mosaics. This is reflected in the biota. Larger mammals of the forested watershed include lynx (*Lynx canadensis*), bobcat (*L. rufus*), coyote (*Canis latrans*), moose (*Alces alces*), deer (*Odocoileus virginianus*), and black bear (*Ursus americanus*).

Conservation: Current Opportunities

A major collaborative study of the Bras d'Or watershed, launched in 2003, came about at the request of the First Nations bands living in the area of the proposed biosphere reserve. This Collaborative Environmental Planning Initiative (CEPI) is co-led by the First Nations (with a secretariat based in the Unama'ki Institute of Natural Resources, in Eskasoni) and the federal Department of Fisheries and Oceans (DFO). Guided by a Steering Committee, it is composed of five First Nation governments, four counties with local jurisdiction in the Bras d'Or watershed, three departments of the Nova Scotia provincial government, three federal departments, industry and several non-government organizations.

The CEPI is funded mainly by DFO as an example of how significant coastal estuarine ecosystems can be incorporated into a Large Ocean Management Area, which has been designated to develop the Eastern Scotian Shelf Integrated Management program under the federal **O**ceans **A**ct. In late 2006, a major compilation and synthesis of knowledge (traditional ecological knowledge as well as knowledge from scientific research and monitoring) was published in the *Ecosystem Overview and Assessment Report* (Parker *et al*., 2006). A draft ecosystem-based environmental management plan (*Management Plan Framework Document*, June 2006) was also prepared as a two-tiered strategic plan for the entire watershed and Lake, along with twelve subwatershed plans that relate land use issues with protection for coastal zones and for ecological/biological significant areas identified in the Lake.

The comprehensive approach taken by CEPI to develop an overall management plan provides partnership opportunities for various organizations such as those described above, whose attention relates to the vitality of the Lake and its watershed. These opportunities become especially promising when many existing resources focus on objectives established by CEPI. For example, chances of success for such a major undertaking increase greatly when programs take into account particular concerns of respective interest groups and stakeholders. Then the outcome is mutually beneficial—the ideal of true partnerships.

It follows that the resulting support for CEPI‘s management plan will serve as a model for other regions, and further the goals of Canada‘s Oceans Strategy. It is an opportunity to demonstrate leadership on issues of integrated coastal and ocean management that may be of international interest. The proponents of this nomination understand the importance of forging and exploring the links between the Bras d‘Or Lake initiatives and UNESCO‘s five Inter-governmental science programmes, including the IOC, IHP, IGCP and MOST, as well as the “Man and the Biosphere” (MAB) programme. They recognize that the strength and benefits of such linkages are a demonstration of a Biosphere Reserve’s success to the International Coordinating Council for MAB.

Conservation: Rationale for a Biosphere Reserve

The Bras d’Or Lake Biosphere Reserve Association (proponent of the proposed biosphere reserve) envisions a role in relation to efforts of the Lake’s existing (and additional) organizations to foster best practices to achieve a connection between residents

and the environment of the Bras d'Or Lake and its watershed. Such a connection helps to ensure mutual benefit to humans and the ecosystem. UNESCO's Man and the Biosphere Programme promotes innovative approaches to working and living in harmony with nature.

Conservation of biodiversity in the proposed biosphere reserve has been secured largely by provincial programs administered by Nova Scotia Environment, the Nova Scotia Department of Natural Resources, Canada's Department of Fisheries and Oceans, industry efforts (forestry, fishery and mining) and activities of environmental and non-government organizations. The proposed biosphere reserve will actively strengthen the work of each of these entities by bringing forward national and international examples, and at times, resources found through the World Network of Biosphere Reserves. As well, it will be a source of pride for all who value the beauty and quality of the Lake, to realize it is recognized internationally as an ecological treasure, and that by being part of the world's Biosphere Reserve Network increases its chances of remaining so.

The biosphere reserve philosophy of man working in harmony with nature is also consistent with Mi'kmag perspectives, especially the concept of "Netukulimk" This is the Mi'kmawey concept of harvesting resources without jeopardizing the integrity, diversity, or the productivity of the environment (Barsh, 2002, UINR, 2010). This respectful approach to human activity in the ecosystem underpins the Collaborative Environmental Planning Initiative for the Bras d'Or, and thus encapsulates a philosophy to be embraced in the Bras d'Or Biosphere Reserve.

3.2. Development

FOSTERS ECONOMIC AND HUMAN DEVELOPMENT WHICH IS SOCIO-CULTURALLY AND ECOLOGICALLY SUSTAINABLE (INDICATE THE POTENTIAL OF THE PROPOSED BIOSPHERE RESERVE IN FULFILLING THIS OBJECTIVE).

Development: Significance

Development in the proposed biosphere reserve is based largely on natural resources including mining, agriculture, forestry, fisheries, shellfish aquaculture and tourism. Initiatives have been taken to promote best practices in each of these sectors including site rehabilitation for quarries; environmental farm plans for agriculture; comprehensive sustainable forest management for fibre production, wildlife and recreational purposes; pollution control for fisheries; other aquatic resources; and tourism and ecotourism services for visitors

In addition, Nova Scotia has a long tradition of community economic development based on self-help or self-reliance strategies. These promote community-based production, consumer cooperatives, and credit unions following principles established in Northeastern Nova Scotia through the Extension Department of St. Francis Xavier University in the 1920s and 30s. Cape Breton Island was, until recently, included within its jurisdiction. Its fundamental philosophy is to foster adult education through economic cooperation. In time, the method became widely known as the Antigonish Movement. For the past fifty years students from the world's less developed nations have come to the University's Coady Institute to study ways of applying the principles of the Antigonish Movement in their home countries. There is also experience with small businesses organized on the Mondragon model, a cooperative system developed in the Pays Basque region of Spain, emphasizing reinvestment of earnings back into the community to develop mutually supportive enterprises (e.g. New Dawn Enterprises, Sydney). Concurrent with closures of the steel and coal industries, a number of government-driven regional economic development programs are in place through such federal agencies as the Atlantic Canada Opportunities Agency (ACOA), Enterprise Cape Breton Corporation (ECBC) and the province's Regional Development Agencies (RDAs). These promote and assist the development of high technology and export-oriented growth, in part through value-added enterprises in the resource industry sectors, as well as through local small businesses. Some of these programs relate to the tourism sector.

Development: Current Opportunities

The industrial area of Cape Breton Island, based on steel production, coal mining and related industries, gradually lost its heavy industrial base over several decades. These activities had flourished in the Sydney-Glace Bay region about 15 km due east of the proposed biosphere reserve. Changing markets in the global economy resulted in a loss of thousands of jobs—affecting significant out-migration of people, and resulting in the decline of the tax base with a related decline in community services. Social stresses caused by all this had a noticeable impact on the economy of the Bras d'Or Lake region and stimulated a search for alternative employment and community enterprise.

Some alternative sources of employment are found in association with enhancement of the resource industries. NewPage (formerly Stora Enso), an international pulp and paper mill, and the NS Department of Natural Resources, have long-term integrated forest

management plans that cover more than a third of the lands comprising the Bras d'Or Lake watershed. NewPage has maintained a registered Environmental Management System to the ISO 14001, the international standard since 1998, and it continues to maintain certification to the CSA Z809 (Canada's National Standard for Sustainable Forest Management CSA) since 2001. It has recently received Forest Stewardship Council (FSC) certification for its woodland operations. The FSC is an international, non-profit organization that supports environmentally appropriate, socially beneficial, and economically viable management of the world's forests. FSC certification is given to paper and wood products that come from responsibly managed forests, and verified recycled sources.

Other opportunities come from the mining sector. Surface mining operations such as the open-pit quarries at Melford and Little Narrows are to be remediated after operations close. Already, over 200 hectares have been remediated at the River Denys quarry and 65 ha have been reclaimed from a limestone quarry in Irish Cove.

CEPI is producing an ecosystem-based management plan for the aquatic and marine resources of the proposed biosphere reserve. The Nova Scotia Sustainable Communities Initiative for the Bras d'Or identified twenty-five sustainability themes covering all, or most, of the watershed (in 2000). In 2006, the Strait-Highlands Regional Development Agency (which includes the southern portion of the proposed biosphere reserve in Inverness and Richmond counties) launched a green plan for energy efficiency, solid waste management and water conservation. Tourism-related development plans encompassing the Bras d'Or are proposed by consultants (retained by governments in the last two to three years). Please see Section 14 for details.

Development: Rationale for the Biosphere Reserve Designation

The mission of the Bras d'Or Lake Biosphere Reserve Association is to engage all people in balanced and sustainable development of the exceptional cultural, environmental, and economic assets within the Bras d'Or Lake watershed. The development function of the proposed biosphere reserve program will take advantage of models and examples provided through the World Network of Biosphere Reserves. These will build on the existing climate of work and aspirations of organizations and agencies currently associated with the Bras d'Or Lake. They will inspire measures for safeguarding ecological characteristics as ways are found to improve livelihoods and increase employment opportunities.

Research programs will necessarily increase. These research programs are needed to monitor measures for safeguarding the environment, to discover measures for enhancing natural resources, and for enabling residents to participate more fully in those measures. These research efforts will require qualified personnel. Similarly, the job of enabling a public to live in harmony with nature requires skills and programs that are effective locally and have the potential to be marketed in other localities. Undoubtedly, an area where the population is attentive to safeguarding ecological characteristics becomes a magnet for tourism, thereby contributing to the tourist industry in the Bras d'Or Lake setting.

The addition of the overarching development function of a biosphere reserve to the existing strengths of organizations and agencies currently associated with the Bras d'Or Lake, will produce a solid base for launching development projects to benefit the economic, social, cultural and aesthetic life of the area.

3.3. Logistic Support

SUPPORTS DEMONSTRATION PROJECTS, ENVIRONMENTAL EDUCATION AND TRAINING, AND RESEARCH AND MONITORING RELATED TO LOCAL, REGIONAL, NATIONAL AND GLOBAL ISSUES OF CONSERVATION AND SUSTAINABLE DEVELOPMENT.

Logistic Support: Significance

In this document, logistic support is interpreted as capacity building, with learning being the fundamental builder of capacity. A biosphere reserve provides endless opportunities to build capacity through research, monitoring, education, training and organizational development.

There are several compilations and syntheses of management-oriented knowledge about the resources of the proposed biosphere reserve (most recently by Petrie 2002, and Parker and others 2007). These reports lay out directions for developing research and monitoring programs and for citing gaps in existing monitoring programs. Over the past several years, the capacity for undertaking management-oriented research and monitoring has been strengthened considerably by the work of the Eskasoni Fish and Wildlife Commission along with the Unama'ki Institute for Natural Resources. The Aros Na Mara Marine Science Centre is proposed for Iona, on the Barra Strait. These are all within the area of the proposed biosphere reserve. In addition, Cape Breton University re-established the Bras d'Or Institute for Ecosystem Research in 2005, and the Bedford Institute for Oceanography has become much more involved in the Bras d'Or through the CEPI

(Descriptions of the scope of work of these and other organizations are presented in the section “Organizations, Programs…” above).

There are approximately ten cultural, heritage and education centres that offer information and educational programs for residents and visitors, notably the Alexander Graham Bell National Historic Site and Museum in Baddeck, the Wagmatcook Cultural and Heritage Centre for Aboriginal History, and the Highland Village Centre for Scots’ (Celtic and Gaelic) Heritage, in Iona. Programs relating to the Lake are also offered by the Bras d’Or Preservation Nature Trust, the Bras d’Or Stewardship Society and by several smaller local museums and galleries in the region.

Logistic Support: Current Opportunities

There has been a notable increase in collaboration among the different research and education programs for the Bras d‘Or region in recent years. This has provided opportunity for greater community involvement and effective use of funding from various sources that, in turn serves to develop collective capacity for sustainable living in the region. The claim that a biosphere reserve will strengthen this collaboration is supported by the organizations and entities already represented on the Board of Directors of the Bras d‘Or Lake Biosphere Reserve Association (**Appendix 1**; footnote 11)

Logistic Support: Rationale for the Biosphere Reserve Designation

The evolving governance for the Bras d‘Or opens up opportunities for a biosphere reserve to play a supportive role that would further collaboration, and possibly to bring a larger measure of expertise in the social and natural sciences to bear on research and management. In particular, a biosphere reserve would support existing environmental stewardship efforts through public education programs. It would assist citizens to identify and remedy factors that lead to environmental degradation and unsustainable use of human and natural resources. It might also help evaluate effectiveness of remedial measures and report findings. One special role for the biosphere reserve would be to develop and maintain an overview of the range of logistic activities undertaken by the various organizations in the region. This would build the capacity needed to issue periodic reports to both public and official interests on matters of concern to each; or to contribute to reports such as *The State of the Bras d’Or Environment*

prepared for the CEPI. Because the general goals of the people of the Bras d'Or are not dissimilar to those of peoples in other Man and the Biosphere Reserves around the world, one signal rationale for designation is the great potential to learn from the experience of research programs on sustainability in other members of the global network. There are particularly relevant examples in Australia, France and Sweden. In summary, three principal goals characterize the logistic support / capacity-building aspect of a biosphere reserve: education, research and provision of information about best practices.

4. CRITERIA FOR DESIGNATION AS A BIOSPHERE RESERVE

Article 4 of the Statutory Framework presents 7 general criteria for an area to be qualified for designation as a biosphere reserve; these are given in order below.

4.1. Ecological Systems

ENCOMPASSES A MOSAIC OF ECOLOGICAL SYSTEMS REPRESENTATIVE OF MAJOR BIOGEOGRAPHIC REGIONS, INCLUDING A GRADATION OF HUMAN INTERVENTION. (THE TERM "MOSAIC" REFERS TO A DIVERSITY OF NATURAL HABITATS AND LAND COVER TYPES DERIVED FROM HUMAN USES SUCH AS FIELDS, MANAGED FORESTS, ETC. THE TERM "MAJOR BIOGEOGRAPHIC REGION" IS NOT STRICTLY DEFINED BUT USE WAS MADE OF THE MAP OF THE "WORLD NETWORK OF BIOSPHERE RESERVES" WHICH PRESENTS 12 MAJOR ECOSYSTEM TYPES AT A GLOBAL SCALE.

The proposed biosphere reserve is located within the Temperate Needleleaf Forests and Woodlands area (UNESCO major ecosystem types, 1996) and mainly within the Atlantic Maritime Ecozone (Canadian Ecological Land Classification, 1996). It comprises an area of approximately 357 000 hectares. The actual lake accounts for about 31 percent of the area of the proposed biosphere reserve (109 154 hectares) which is composed of estuarine ecosystems with different salinities, temperature ranges, upwellings, downwellings, and water circulation patterns. These characteristics arise from the narrow links to the Gulf of St. Lawrence and Atlantic Ocean, a complicated bathymetry, low rates of flushing and freshwater discharges into the Lake from twelve different subwatersheds, especially along the western side. The surrounding terrestrial area (247 434 hectares) of relatively steep hills in back of a narrow coastal plain provides topographic variety that includes elevated plateaus/tablelands, deep ravines, and bottomlands that have diverse forest mosaics. Much of the area is second growth successional forests resulting from extensive forest cutting in earlier years. There are also a number of small farms around the Lake. The two largest settlements in the area of the proposed biosphere reserve are Baddeck, with a population of 2 377 (2001 census) and Eskasoni, with a population of 2 952

(2006 census). Human interventions range from shipping, fishing and shellfish aquaculture, quarries and open pit gypsum mining, intensive forest uses, mixed agriculture, golf courses, a number of small settlements and extensive seasonal tourism.

4.2. Conservation Significance

SIGNIFICANCE OF THE CORE AREA FOR BIOLOGICAL DIVERSITY CONSERVATION. THIS REFERS TO THE NUMBERS OF ENDEMIC SPECIES, RARE AND ENDANGERED SPECIES AT THE LOCAL, REGIONAL OR GLOBAL LEVELS, AND ALSO SPECIES OF GLOBALLY ECONOMIC IMPORTANCE, RARE HABITAT TYPES, OR UNIQUE LAND USE PRACTICES (TRADITIONAL GRAZING OR ARTISANAL FISHING) FAVOURING THE CONSERVATION OF BIOLOGICAL DIVERSITY.

As previously noted, the bathymetric configuration of the Lake and its aquatic habitats support a distinctive mix of marine and freshwater fauna. A number of taxa exist close to their physiological thresholds given the differences in salinities and temperatures. Some species assemblages that occur are associated with Arctic, through to coastal Virginia marine ecosystems. Inventories are incomplete, but at least 46 species of fish have been captured in trawl surveys (which would likely miss smaller species nearer shore) and about 92 species and varieties of seaweeds and algae have been recorded. During winter months the mammalian fauna include top trophic species such as harbour seals (*Phoca vitulina*) and grey seals (*Halichoerus gryptus*). Terrestrial species include lynx (*Lynx canadensis*), bobcat (*L. rufus*), coyote (*Canis latrans*) and marten (*Martes americana*), as well as larger herbivores, especially moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*) and black bear (*Ursus americanus*). A local population of bald eagles (*Haliaeetus leucocephalus*) around the Lake is included in advertising The Bras d'Or as a tourist attraction. A disjunct population of wood turtles (*Glyptemys insculpta*) was recently discovered in the River Denys watershed. Databases maintained by the ACCDC note about 190 species at risk within the Bras d'Or region (Please see Section 13.2. for further details).

4.3. Opportunity for Sustainable Development

PROVIDES AN OPPORTUNITY TO EXPLORE AND DEMONSTRATE APPROACHES TO SUSTAINABLE DEVELOPMENT ON A REGIONAL SCALE
(A DESCRIPTION IS GIVEN, IN GENERAL TERMS, OF THE POTENTIAL OF THE AREA TO SERVE AS A PILOT SITE FOR PROMOTING THE SUSTAINABLE DEVELOPMENT OF ITS REGION (OR "ECO-REGION").

The comprehensive forest management plans prepared by NewPage and the NS Department of Natural Resources, along with the watershed and subwatershed plans being prepared by CEPI provide frameworks within which best stewardship practices can be publicized and promoted for wider adoption in the proposed biosphere reserve. NewPage

has recently received Forest Stewardship Council (FSC) certification (February 2008). These elements represent a significant opportunity for this area to promote sustainable development more widely. Mining operations are under increased regulations to manage their impact on the environment and represent what is now referred to as “responsible mining”. There are stringent environmental assessment procedures and limits on their operating licenses (to minimize or eliminate impacts outside the footprint of the mine) as well as the requirement to remediate lands after mining has ceased. Currently there are about 1 000 hectares being mined for gypsum. These operations currently serve as models for best practices, and will provide opportunity to promote responsible mining in the future.

A number of applied research and monitoring programs, such as those sponsored by the EFWC and UINR, contribute to improved stewardship practices. Collaborative endeavours, especially by the Pitu’paq Partnership Society and the Bras d’Or Stewardship Society are remediating where there are pollution problems in the Lake, and promoting pollution prevention through measures such as upgrading local sewage and waste treatment facilities, and obtaining federal regulatory prohibitions against boats discharging waste into the Lake. These initiatives offer the opportunity to be promoted further once the area gains UNESCO designation.

More and more often the attention of regulating authorities and the general population is given to the relationship between economic development and the health of the ecosystem. This can be seen through the Environmental Goals and Sustainable Prosperity Act (2007) of Nova Scotia which sets out a broad direction for greater sustainability within the province. The proposed Biosphere Reserve will be an integral part of this initiative.

4.4. Biosphere Reserve Size

APPROPRIATE IN SIZE TO SERVE THE THREE FUNCTIONS OF BIOSPHERE RESERVES.

The size of the proposed Bras d’Or is appropriate to serve the three functions of biosphere reserves. The Bras d’Or has 19 core area sites comprising 7 712 hectares, with a number of separate buffer areas totalling at least 61 460 hectares. This constitutes 19 percent of the entire area, and 28 percent of the land area (excluding the Bras d’Or Lake). Four of the core areas overlap the watershed boundary, affording an additional 12 342 hectares of protected lands contiguous with the biosphere reserve. Most of the human population of 14 579 people live in small coastal towns and villages in the terrestrial

transition area. The entire area of the proposed biosphere reserve is 3 566 km^2, made up of the Bras d'Or Lake (1 092 km^2) and the surrounding watershed (2 474 km^2).

4.5. Core, Buffer and Transition Areas

THROUGH APPROPRIATE ZONATION: (A) A LEGALLY CONSTITUTED CORE AREA OR AREAS DEVOTED TO LONG TERM PROTECTION, ACCORDING TO THE CONSERVATION OBJECTIVES OF THE BIOSPHERE RESERVE AND OF SUFFICIENT SIZE TO MEET THESE OBJECTIVES.
(see **Figure 4-1**; **Map 1**)

Core areas:

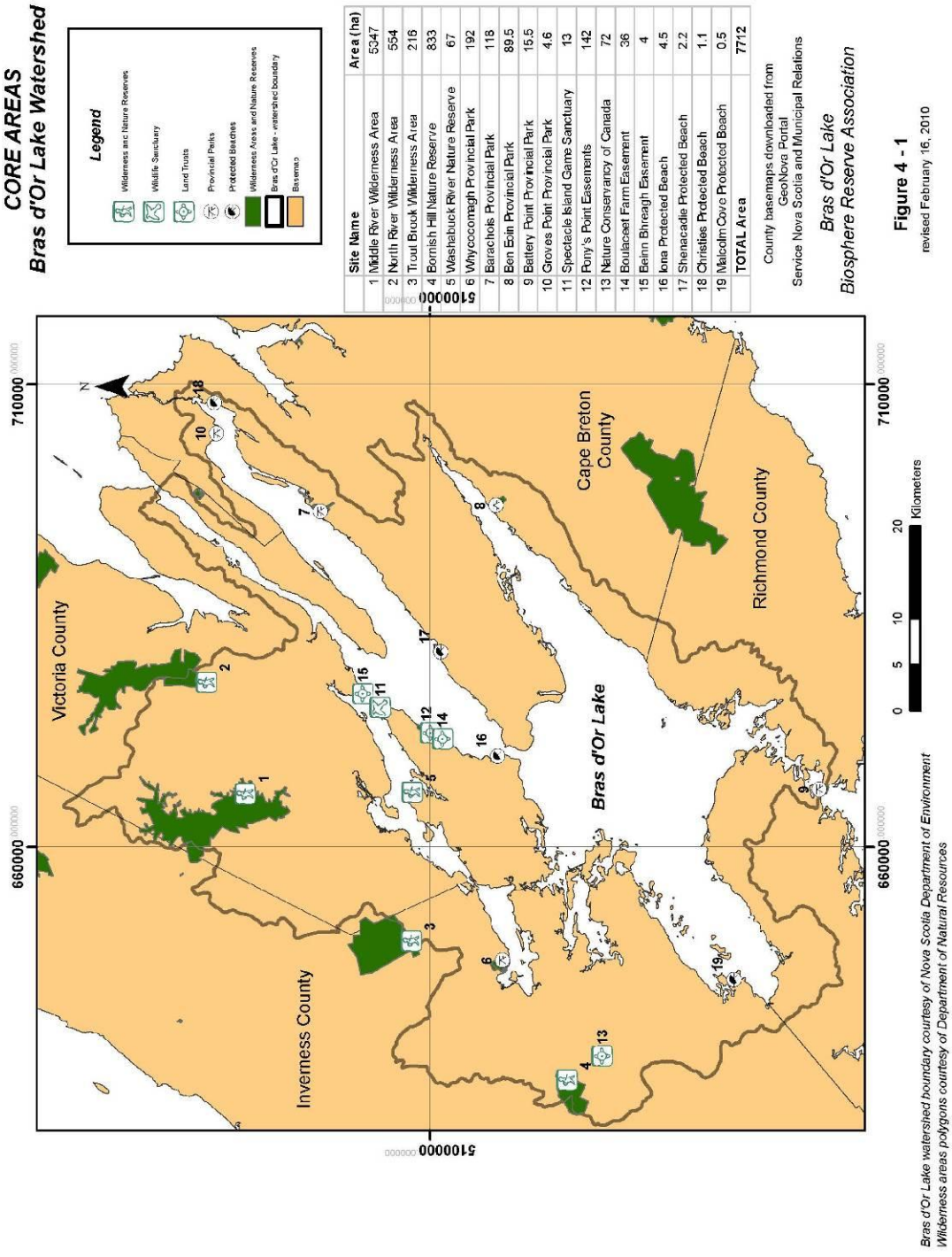
Nineteen core areas are included in the proposed biosphere reserve, for a total of 7 712 hectares. These core areas include wilderness areas, nature reserves, provincial parks, a game sanctuary, land trusts and protected beaches.

The core areas include three wilderness areas:

Middle River Wilderness Area	5 347 ha	IUCN[1] Cat. Ib
North River Wilderness Area	554 ha	IUCN Cat. Ib
Trout Brook Wilderness Area	216 ha	IUCN Cat. Ib

These core areas are administered by NS Environment (NSE) under the **W**ilderness **A**reas **P**rotection **A**ct (SNS 1998, c. 27 as amended 2005, c. 56). The legislation provides "…for the establishment, management, protection and use of wilderness areas, in perpetuity, for present and future generations, in order to…(a) maintain and restore the integrity of natural processes and biodiversity; (b) protect representative examples of natural landscapes and ecosystems; (c) protect outstanding unique, rare and vulnerable natural features and phenomena…." Resource extraction and development (roads, power lines and pipelines) are prohibited. Non-motorized wilderness recreation, fishing, traditional hunting and trapping are allowed.

[1] International Union for Conservation of Nature – see definition of Categories in **Appendix** 3



	Site Name	Area (ha)
1	Middle River Wilderness Area	5347
2	North River Wilderness Area	554
3	Trout Brook Wilderness Area	216
4	Bornish Hill Nature Reserve	833
5	Washabuck River Nature Reserve	67
6	Whycocomagh Provincial Park	192
7	Baracholis Provincial Park	118
8	Ben Eoin Provincial Park	89.5
9	Battery Point Provincial Park	15.5
10	Groves Point Provincial Park	4.6
11	Spectacle Island Game Sanctuary	13
12	Pony's Point Easements	142
13	Nature Conservancy of Canada	72
14	Boulacet Farm Easement	36
15	Beinn Bhreagh Easement	4
16	Iona Protected Beach	4.5
17	Shenacadie Protected Beach	2.2
18	Christies Protected Beach	1.1
19	Malcolm Cove Protected Beach	0.5
	TOTAL Area	7712

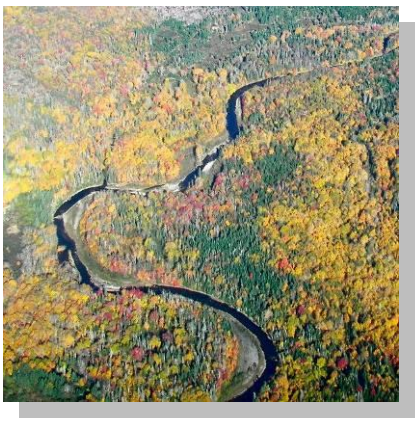
County basemaps downloaded from GeoNova Portal
Service Nova Scotia and Municipal Relations

Figure 4 - 1
revised February 16, 2010

Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department of Environment
Wilderness areas polygons courtesy of Department of Natural Resources

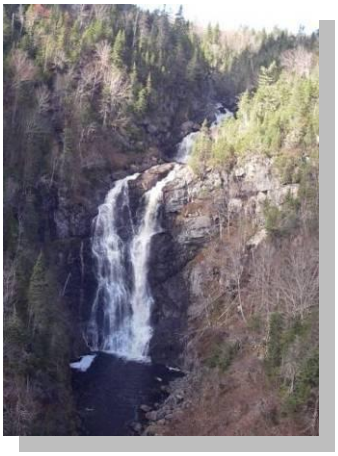
Projection: Universal Transverse Mercator
Geodetic Datum: NAD 83 CSRS UTM Zone 20

The Middle River Wilderness Area protects typical regional features which are characterized by steep talus-covered slopes, well-developed deciduous forests, deep faults, undulating valleys, canyon complexes and river systems. At 5347 ha, it is the largest single core area within the proposed biosphere reserve. Spanning the forested slopes and canyons next to the agricultural lowlands of the Middle River Valley, the wilderness area contains steep-sided canyons, and many examples of outstanding geomorphological and fluvial processes, including some of the oldest rocks in the province, talus-covered slopes, deep faults, river terraces and floodplains. There are an additional 1 344 hectares of this protected wilderness area that lie just outside the watershed boundary.



Middle River

North River and Trout Brook Wilderness Areas straddle the watershed boundary on the north and west sides of the Biosphere Reserve. In total, they represent 11 641 hectares of protected area and, although only 770 hectares lie within the watershed, the conservation function of their entire area is ecologically relevant to the proposed biosphere reserve.



North River

The core areas include two nature reserves:

Bornish Hill Nature Reserve	833 ha	IUCN Cat. Ib
Washabuck River Nature Reserve	67 ha	IUCN Cat. Ib

These reserves are administered by the NSE under the **S**pecial **P**laces (Nature Reserves) **A**ct (RSNS 1989, c. 438). The policy provides "…for the protection, regulation, acquisition and study of ecological sites which are considered important parts of the natural heritage of the province…." Other sections of the act cover palaeontological, archaeological and historic sites. All development, resource extraction and most recreational pursuits are not allowed. Sites provide for scientific research and public education.

Bornish Hill

The Bornish Hill Nature Reserve protects a representative example of the Skye River hills and valleys natural landscape. The Bornish Hill Nature Reserve is the least-disturbed area of climax hardwood forest remaining in the Creignish Hills region and represents its dominant landscape/ecosystem type. Historically, this area was once part of the Canadian EMAN program although it is not currently active.

The reserve contains an entire hill as an enduring ecological unit, including ravines, bogs and other ecosites. Much of the forest is in an old-growth condition. One hundred twenty-seven hectares of the reserve is just outside the watershed boundary.

The core areas include five provincial parks:

Whycocomagh Provincial Park	192 ha	IUCN Cat. II
Barachois Provincial Park	118 ha	IUCN Cat. II
Ben Eoin Provincial Park	89.5 ha	IUCN Cat. II
Battery Point Provincial Park	15.5 ha	IUCN Cat. II
Groves Point Provincial Park	4.6 ha	IUCN Cat. II

Whycocomagh Provincial Park

These parks are administered by the NSDNR under the **P**rovincial **P**arks **A**ct (RSNS 1989, c. 367). The parks have wayside picnic facilities and some walking trails set within larger forest environments. Resource extraction, hunting and trapping and most types of development are prohibited in provincial parks. Fishing, non-motorized recreation and wilderness recreation are allowed.

One game sanctuary is located within the proposed biosphere reserve:

Spectacle Island Game Sanctuary	13 ha	IUCN Cat. IV

This sanctuary is administered by the NSDNR under the **W**ildlife **A**ct (RSNS 1989, c. 504) as amended. The policy is to "…maintain diversity of species at levels of abundance to meet management objectives." The site is a nesting/roosting site for colonial water birds such as the double-crested cormorant (*Phalacrocorax auritis*).

Three Land Trusts are located within the proposed biosphere reserve:

Pony's Point Easement	142 ha	IUCN Cat. V
Boulaceet Farm Easement	36 ha	IUCN Cat. V
Beinn Bhreagh Easement	4 ha	IUCN Cat. V

Land trusts are administered by the NSDNR under the **C**onservation **E**asements **Act** (2001, c28, s.l.) as passed. A conservation easement is an agreement made between a property owner and an eligible body such as the local Bras d'Or Nature Trust (the first to be established in Nova Scotia), the Nova Scotia Nature Trust or any municipal, provincial, and/or federal government or agency. A conservation easement is made for the protection, restoration or enhancement of land with natural ecosystems providing habitat for rare, threatened or endangered, plant or animal species—land with outstanding biological or physical features, exceptional scenery and land with opportunities for scientific or educational programs dealing with aspects of the natural environment. Conservation easements may exist for a stated period or in perpetuity.

One property owned by the Nature Conservancy of Canada is within the proposed biosphere reserve:

Nature Conservancy of Canada (River Denys Project)	72 ha	IUCN Cat. V

The Nature Conservancy of Canada (NCC) (www.natureconservancy.ca) is a national, non-profit conservation organization that works to protect Canada's most ecologically significant natural habitats. Their mission is to protect areas of biological diversity for their intrinsic value and for the benefit of future generations. They work with individual landowners, community stakeholders and other conservation organizations and partners to secure lands through

outright purchase, land donations and conservation easements. They own this land in the River Denys watershed. The property is part of a 165-hectare shallow marsh, deep marsh, bog, and meadow complex with a Golet score of 86.5 – indicating an ecologically significant wetland habitat.

Four protected beaches are located within the proposed biosphere reserve:

Iona Protected Beach	4.5 ha	IUCN Cat. V
Shenacadie Protected Beach	2.2 ha	IUCN Cat. V
Christies Protected Beach	1.1 ha	IUCN Cat. V
Malcolm Cove Protected Beach	0.5 ha	IUCN Cat. V

Coastal areas are protected under the **B**eaches **A**ct (RSNS 1989, c. 32, amended 1993, c. 9). The policy protects beaches and associated dune systems as significant and sensitive environmental and recreational resources, and it regulates or controls land use activities and recreational uses of beaches that may otherwise cause undesirable impacts. Most sites in the Bras d'Or are small (1-5 hectares--e.g. Shenacadie, on St. Andrews Channel, 2.1 hectares, designated by NS Reg 160/78).

"(B) A BUFFER ZONE OR ZONES CLEARLY IDENTIFIED AND SURROUNDING OR CONTIGUOUS TO THE CORE AREA OR AREAS, WHERE ONLY ACTIVITIES COMPATIBLE WITH THE CONSERVATION OBJECTIVES CAN TAKE PLACE..." A BRIEF DESCRIPTION OF THE BUFFER ZONES(S), THEIR LEGAL STATUS, THEIR SIZE AND THE ACTIVITIES WHICH ARE ONGOING AND PLANNED THERE.
(see **Figure 4-2**; **Map 1**)

Buffer Areas and IUCN Classification:

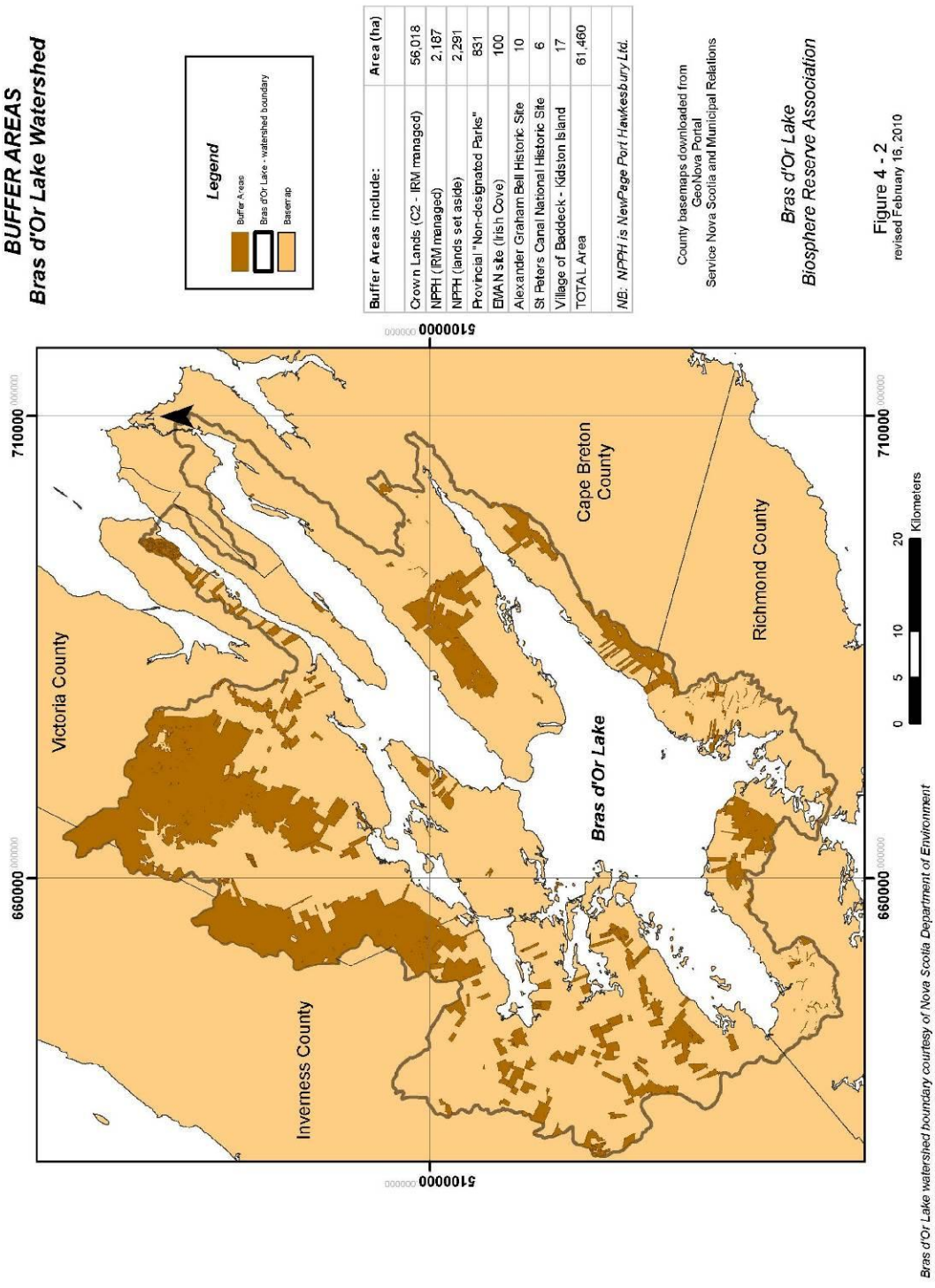
Crown Lands (C2 – IRM managed)	56 018 ha	IUCN Cat. VI
NewPage Port Hawkesbury Ltd. (lands set aside)	2 291 ha	IUCN Cat. IV
NewPage Port Hawkesbury Ltd. (IRM managed)	2 187 ha	IUCN Cat. VI
Provincial "Non-designated Parks" e.g. Barra Forest, McCormack Picnic Park	831 ha	IUCN Cat. V
EMAN Site at Irish Cove	100 ha	IUCN Cat. Ia
Kidston Island	17 ha	IUCN Cat. V
Alexander Graham Bell National Historic Site	10 ha	IUCN Cat. II

St. Peter's Canal National Historic Site 6 ha IUCN Cat. II

These areas are made up of federal, provincial (Crown) lands, municipal lands, private lands, non-designated parks, lands set aside for long-term ecological monitoring and historic sites. They represent a cluster of land areas in which sustainable activities take place that help to serve the conservation function in the core area as well as provide examples of ongoing sustainable activities.

St. Peter's Canal

Of particular note is the large area of C2 (category 2) Crown land (22 percent of land area) and private land managed by NewPage Port Hawkesbury Ltd. that fall under the Integrated Resource Management (IRM). Provincial category 2 lands are typically lands with conflicting values for land and resource use. The purpose of this category is to ensure that all values are taken into account in the planning process. It is acknowledged that balancing the interests of all resource sectors may require that management practices for one resource use, be modified to enhance compatibility with others. In some instances, critical values identified on a parcel of land may be given overriding consideration in establishing management practices, whereas compromise may be appropriate in other parcels. The IRM framework is a working tool to provide sustainable development. The woodlands unit for NewPage has a long-term forest management plan with a one hundred-year strategic planning horizon that is updated every five years. The plans conform to the NSDNR Integrated Resource Management Process, the six principles of Sustainable Forest Management (adopted by the Canadian Council of Forest Ministers) and the Forest Stewardship Council's (FSC) Maritime Standard.


BUFFER AREAS
Bras d'Or Lake Watershed
Legend
Buffer Areas
Bras d'Or Lake - watershed boundary
Basemap
Buffer Areas include:
Area (ha)
Crown Lands (C2 - IRM managed) 56,018
NPPH (IRM managed) 2,187
NPPH (lands set aside) 2,291
Provincial "Non-designated Parks" 831
EMAN site (Irish Cove) 100
Alexander Graham Bell Historic Site 10
St Peters Canal National Historic Site 6
Village of Baddeck - Kidston Island 17
TOTAL Area 61,460
NB: NPPH is NewPage Port Hawkesbury Ltd.
County basemaps downloaded from
GeoNova Portal
Service Nova Scotia and Municipal Relations
Bras d'Or Lake
Biosphere Reserve Association
Figure 4 - 2
revised February 16, 2010
660000
710000
5100000
Victoria County
Inverness County
Cape Breton
County
Richmond County
Bras d'Or Lake
0
5
10
20
Kilometers
Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department of Environment
Buffer area polygons courtesy of Department of Natural Resources
Projection: Universal Transverse Mercator
Geodetic Datum: NAD 83 CSRS UTM Zone 20

In 1998, NewPage (then Stora Enso) commissioned a study to identify which of its private landholdings maintained ecological values compatible with the implementation of protected areas in the Province of Nova Scotia. The project marked one of the first attempts within the province, to systematically and concurrently allocate parcels of private property from a single landowner into a system of privately owned nature reserves. Upon completion of the coarse-filter analysis, 103 of the 168 landholdings were eliminated as candidate protected areas. Most of these properties had been previously harvested, had extensive road systems, and in some cases, were converted to conifer plantations. However, 32 properties were found to maintain sufficient ecological integrity to pass through the coarse filter analysis. Subsequently, company policy was put in place in 1998, to allocate these as protected areas and at that time they were removed from all harvest activities.

Municipalities have powers with respect to land use in the watershed, although land use plans (referred to as municipal planning strategies in Nova Scotia) are not in effect in all areas. Only the Cape Breton Regional Municipality has a municipal planning strategy that covers all areas of the watershed within its jurisdiction. There are also municipal planning strategies in effect in St. Peter's and at Sporting Mountain, in Richmond County, Whycocomagh, in Inverness County, and Baddeck, in Victoria County. Some of these municipal planning strategies include setback requirements from the shoreline for new developments but these do not necessarily function as buffer zones.

In April 2008, a report on development standards for the watershed prepared for CEPI by Environmental Design and Management Ltd. recommended that consideration be given to restricting development within prescribed buffer zones varying in width from 20-75 metres, depending on local conditions.

CEPI has identified Ecological Biological Significant Areas (criteria used for Marine Protected Areas) for bays within the Bras d'Or, noting five such areas in particular: Great Bras d'Or Channel, St. Andrews Channel, North Basin, Denys Basin and St. Peter's Inlet. Protection measures will include lake-wide pollution control and prevention measures and subwatershed plans that include these bay areas.

"(C) AN OUTER TRANSITION AREA WHERE SUSTAINABLE RESOURCE MANAGEMENT PRACTICES ARE PROMOTED AND DEVELOPED". (THE SEVILLE STRATEGY GAVE INCREASED EMPHASIS TO THE TRANSITION AREA SINCE THIS IS THE AREA WHERE THE KEY ISSUES ON ENVIRONMENT AND DEVELOPMENT OF A GIVEN REGION ARE TO BE ADDRESSED. THE TRANSITION AREA IS BY DEFINITION NOT DELIMITED IN SPACE, BUT RATHER IS CHANGING IN SIZE ACCORDING TO THE PROBLEMS THAT ARISE OVER TIME.) DESCRIBE THE TRANSITION AREA ENVISAGED AT THE TIME OF NOMINATION, THE TYPES OF QUESTIONS TO BE ADDRESSED IN THE NEAR AND LONGER TERMS.

The transition area (area of cooperation) extends to the limits of the Bras d'Or Lake watershed. It includes all of the 1 092 km^2 Lake system and about 2 474 km^2 of lands. The types of issues to be addressed concerning the transition area include: restoration of water quality in the Lake so that it can support sustainable levels of fishing, aquaculture and recreational tourism; promotion of best stewardship practices for land and resource management in the general context of subwatershed planning and management; protection of coastal areas around the Lake; and local community economic development to enhance sustainable livelihoods and strengthen the viability of towns and villages. With regard to these issues, the Cooperation Plan in **Appendix 1** presents strategic directions and immediate priorities for action in relation to conservation of biodiversity, sustainable development and capacity building.

Activities in the transition area are regulated by a variety of provincial and federal government departments. All major developments, such as mineral resource extraction or industrial development, are subject to environmental impact assessment legislation at either the provincial or federal level. These assessments are comprehensive studies that address the potential impacts from the activity on the environment—both natural and human.

4.6. Organizational Arrangements

ORGANIZATIONAL ARRANGEMENTS FOR THE INVOLVEMENT AND PARTICIPATION OF A SUITABLE RANGE OF *INTER ALIA* PUBLIC AUTHORITIES, LOCAL COMMUNITIES AND PRIVATE INTERESTS IN THE DESIGN AND THE CARRYING OUT OF THE FUNCTIONS OF A BIOSPHERE RESERVE.

As noted elsewhere, a non-governmental organization, the Bras d'Or Lake Biosphere Reserve Association (BLBRA) was legally incorporated in 2006 through the Registry of Joint Stock Companies of the Province of Nova Scotia, Canada, and was assigned a Business Number by Canada Customs and Revenue Agency. The Association is governed by a Board of Directors, elected by the Annual Meeting of members. The duties of Board members include participation at Board meetings, (usually a minimum of 6 per year) to determine policy and practice, and participation on committees as required by the Board's agenda. One of those is a Committee on Administration that attends to developing an

administrative and operational plan for, at least, the initial years of the Bras d'Or lake Biosphere. The Association has no staff. Officers are elected from and by the Board, including the positions of Chair, Vice-Chair, Secretary and Treasurer. A revised Constitution and By-Laws will be presented to the Annual Meeting in May, 2010. A draft is included here as **Appendix 8**.

BLBRA Board Meeting

Currently, the Board of Directors is comprised of 19 members: 3 representing voluntary organizations dedicated to issues relating to the area's ecology; 3 representing educational institutions; 2 representing major industrial interests; 1 representing an organization of First Nations' Chiefs; 2 representing an alliance of municipal governments and First Nations organized in the interest of protecting the Lake; 4 representing 4 municipal governments of the area; and, 4 representing a geographic distribution of local communities around the Lake.

As yet, the Association does not have a clear definition of qualifications for membership. The practice is to establish trusting relationships with a very wide range of interest groups/organizations/individuals. The purpose is to build membership policy gradually, in a way that adds value to the work already being done throughout the area to advance conservation, sustainable development, and capacity-building in relation to the Lake and its watershed. For now, the Association's membership meetings are public, and its Master List of members includes names of all who express an interest in assisting the establishment of a UNESCO Biosphere Reserve.

Although insufficiently defined, "members" of this Association have a strong sense of place regarding the Bras d'Or. Each in their own way is quite involved with other organizations and groups promoting the social, ecological and economic well-being of the region. The Association has no legal powers (in a regulatory sense), nor does it seek them. Instead, it exercises positive and supportive influence where it can in collaboration with others, guided by the aims of a biosphere reserve. Once UNESCO designation is achieved, the existing organizations, programs and collaborative initiatives (See Foreword) will be brought closer together because of a shared commitment. This will make them all more effective in what they do. The Association has links to the Canadian Biosphere Reserves Association and anticipates building relations with biosphere reserves in other countries, as

a member of the world network. These will undoubtedly bring new and useful ideas to the attention of people in the area. The Association's website, www.blbra.ca will continue to be developed as a source of information about its program and the programs of biosphere reserves of the world.

4.7. Mechanisms for Implementation

THE PROPOSED BIOSPHERE RESERVE'S (A) MECHANISMS TO MANAGE HUMAN USE AND ACTIVITIES IN THE BUFFER ZONE OR ZONES.

This proposed biosphere reserve has an important international distinction, but this distinction for the Bras d'Or does not entail any new regulations, plans, administration or requirements for land use change. Instead, the proposed biosphere reserve area is governed by the legislative authority and policies of the appropriate administrative agencies responsible for the different categories of its buffer zone lands. The proposed reserve also includes lands managed by private-sector organizations (e.g. NewPage) under long-term conditions negotiated with the Nova Scotia government.

THE PROPOSED BIOSPHERE RESERVE'S (B) MANAGEMENT PLAN OR POLICY FOR THE AREA AS A BIOSPHERE RESERVE

Appendix 1, A Cooperation Plan for the Bras d'Or Lake Biosphere Reserve, sets out provisions to guide, at least for initial years, direction for the proposed Bras d'Or Lake Biosphere Reserve. It includes a Vision statement, strategic directions and immediate priorities. The plan is organized around the three headings of biodiversity, sustainable development, and capacity building. It is influenced in large measure by the programs and concerns of various partner organizations, most of whom are represented on the BLBRA Board of Directors. The reader will note references throughout the plan to partner organizations such as the Collaborative Environmental Planning Initiative (CEPI), or to a mining or forestry industry, that are in a position to appropriately assist achievement of strategic objectives for each of the principal goals: conservation of biodiversity, sustainable development, and capacity building.

The plan is also affected by the reality of legal requirements and programs of various agencies of government (federal and provincial), such as Fisheries, Environment, Natural Resources, Rural and Economic Development, and Agriculture. These agencies, and others, were consulted during the process of establishing the management plan.

Directors of the Association anticipate that with a biosphere reserve designation they will be in a position to benefit from examples of biosphere reserve programs elsewhere. Sharper focus and higher international profile are expected to facilitate planned initiatives within the overall institutional arrangements governing the Lake, the watershed and, especially the people who reside in the area. As the Association continues to plan for achieving the Biosphere Reserve designation, the Board is actively addressing questions about organization, governance and administration. These questions come with practical considerations of coordination, location, communication, staffing and, not least, financing.

THE PROPOSED BIOSPHERE RESERVE'S (C) DESIGNATED AUTHORITY OR MECHANISM TO IMPLEMENT THIS POLICY OR PLAN

The management plans and policies are provided by statutes, and different policies are administered by different governmental entities. The proposed biosphere reserve comes under a federal system of government that divides jurisdiction among the national (federal), Nova Scotia (provincial) and local levels (municipal). Special recognition is also given to Aboriginal rights. There are collaborative networks comprised of government and non-governmental organizations (e.g. CEPI) with long-term contractual arrangements among organizations (e.g. NPPH). Initiatives taken by the Biosphere Reserve Association will be within this overall framework for governance in the region.

THE PROPOSED BIOSPHERE RESERVE'S (D) PROGRAMMES FOR RESEARCH, MONITORING, EDUCATION AND TRAINING

Despite its small human population, the people of the Bras d'Or are relatively well served by a diversity of institutionalized and ad hoc programmes of research and education in the natural and social sciences. Long term monitoring programmes are harder to find, and have been sporadic at best in space and time. In addition to significant bodies of aboriginal and local traditional and ecological knowledge, which is incompletely documented at best, there is a history of formal research, education and training activity focused on the natural and cultural resources, of Cape Breton Island. Much of this is geographically focused in the Bras d'Or ecosystem because it was the preferred place of vocation and residence for many of the early inhabitants (e.g. four of the five Mi'kmaq communities are located on the shores of the estuary, and the largest of the early Scottish settlements were also adjacent to the bras d'Or Lake). The Bras d'Or shore is now the preferred place of retirement for a rapidly aging population. Thus, there has always been a strong interest in this ecosystem.

The Original French settlers started the documentation of the people and natural history of the area, primarily through the auspices of the Catholic Church. The Nova Scotia Institute of Science (founded 1831) continues to publish definitive research results on both the natural and social science of the region. Fisheries and Oceans Canada has (since 1962), and continues to support a range of marine studies of the Bras d'Or estuary and associated ocean and riverine habitats and commercially important species as a basis for developing and sustaining fisheries and aquaculture. The Bras d'Or Institute (founded 1974) at the local University produced several studies of relevance to water quality, aquaculture, environmental degradation and local community development. Research at the CBU Institute now focuses on synoptic analyses of ecosystem structure and function, and University researchers study a wide variety of ecosystem elements, ranging from the impacts of invasive species to forest diversity, to the origins of localized musical traditions. The Eskasoni Fish and Wildlife Commission and the Unama'ki Institute of Natural Resources (founded in 1998) together cover the entire span of natural resources harvested by Mi'kmaq peoples in the ecosystem for food, ceremonial and commercial purposes. They pay particular attention to studies that collect and utilize Aboriginal Traditional Ecological Knowledge, and incorporate this effectively in science, education and policy. Private sector corporations have undertaken considerable work on forest management (NewPage, formerly Stora Enso) and the hydrogeology and water resources of the region (ADI Ltd). The local Gypsum mining companies (Georgia Pacific Ltd., Melford Mines Ltd.) have undertaken many studies of the effects of mining activities on riparian and littoral habitats and their species, and have used these to mitigate and remediate. The Provincial agencies and departments of Environment, Fisheries and Aquaculture, Natural Resources and Agriculture have a long history of conducting targeted research and monitoring, as well as maintaining geospatial data sets.

This diverse and competent research community, while small and under-funded, is improving its capacity to work together on research that supports integrated planning and adaptive management. This collaboration takes place at several levels, from individuals to institutions, and is increasingly guided by the work of the Collaborative Environmental Planning Initiative for the Bras d'Or. Current priorities for collaborative research include developing and monitoring indices of ecosystem health, mapping and modeling land-ocean interactions in the littoral zone, tracking the spread of introduced and invasive species, adapting to local climate change impacts, and exploring business models that reconcile ecological and economic sustainability. Over-arching goals of research include incorporating TEK more firmly into the ongoing studies, enlarging networks of inter- organizational cooperation, and drawing more

regularly upon research expertise in institutions outside the immediate area of the proposed biosphere reserve. There are at least ten accessible centres that provide opportunities to learn about Bras d'Or ecosystems and the local and cultural history of the area. Two additional centres are being developed.

It is clear, however, that attention to research relating to the natural sciences far outweighs that allocated to the social sciences. There is a dearth of management and socio-economic studies that hampers balanced planning and decision making. There is also a very limited capacity for social research in the local institutions. This is an imbalance to be addressed through the MAB program. Specific training courses are offered by two centres within the area of the proposed biosphere reserve, as well as by outside institutions conducting work in the area. There is considerable scope for advancement, and capacity building in all arenas of research that represents a critical benefit of Biosphere reserve designation that is evident in other MABRs in Nova Scotia, Canada and beyond. See Section 15 for details.

5. ENDORSEMENTS

See **Appendix 4** for copies of letters of support.

5.1. Authorities in Charge of the Management of the Core and Buffer Areas
SIGNED BY THE AUTHORITY/AUTHORITIES IN CHARGE OF THE MANAGEMENT OF THE CORE AREA(S):

Full name: Nova Scotia Environment Sterling V.W. Belliveau

Signature: Sterling Belliveau

Title: Minister

Date: June 1/2010

Full name: Nova Scotia Department of Natural Resources

Signature: John MacDonell

Title: Minister

Date: May 12/10

Full name: Nova Scotia Department of Economic and Rural Development

Signature: Percy A. Paris

Title: Minister

Date: May 2/10

Full name: Bras d'Or Preservation Nature Trust

Signature: Governor Blais

Title: Chairs

Date: March 5, 2010

Full name: Henry Fuller

Signature:

Title: Land Agent

Date: March 21, 2010

Full name: NewPage Port Hawkesbury

Signature:

Title: MANAGER, FOREST OPERATIONS & RESOURCES

Date: MARCH 29/2010

Full name: Baddeck Village Commission

Signature:

Title: Chairperson

Date: March 5th 2010

Full name: Parks Canada

Signature:

Title: Field Unit Superintendent - Cape Breton

Date: March 25/10

5.2. Government Responsible for Management of Core and Buffer Zones

SIGNED AS APPROPRIATE BY THE NATIONAL (OR STATE OR PROVINCIAL) ADMINISTRATION RESPONSIBLE FOR THE MANAGEMENT OF THE CORE AREA(S) AND THE BUFFER ZONE:

Signatures as above.

5.3. Local Government Authorities and Communities in Area of Cooperation

SIGNED BY THE AUTHORITY/AUTHORITIES, ELECTED LOCAL GOVERNMENT RECOGNIZED AUTHORITY OR SPOKESPERSON REPRESENTATIVE OF THE COMMUNITIES LOCATED IN THE AREA OF COOPERATION.

Full name: Unama'ki Institute of Natural Resources

Signature:

Title:

Date: March 8/10.

Full name: Municipality of the County of Richmond John Boudreau

Signature: John Boudreau

Title: Warden

Date: April 12, 2010

Full name: Cape Breton Regional Municipality

Signature:

Title: Mayor

Date: March 23, 2010

Full name: Municipality of Victoria County

Signature:

Title: Warden

Date: Mar 17/10

5.4 MAB National Committee

SIGNED ON BEHALF OF THE MAB NATIONAL COMMITTEE OR FOCAL POINT:

Full name: ERNEST FREDERICK ROOTS E. F. Roots

Title: CHAIR. CANADIAN NATIONAL COMMITTE FOR UNESCO MAB

Date: 2 AUGUST 2010

Part II

Nomination Submission

From Canada

For the

BRAS D'OR LAKE BIOSPHERE RESERVE

PART II: DESCRIPTION

6. LOCATION

LATITUDE AND LONGITUDE: INDICATED IN DEGREES--MINUTES, SECONDS FOR THE COORDINATES OF THE CENTRAL POINT AND THE EXTERNAL LIMITS OF THE PROPOSED BIOSPHERE RESERVE TO BE USED FOR A GEOGRAPHIC INFORMATION SYSTEM (GIS).

The location of central point and external limits of the proposed biosphere reserve:

Extremity of Area	Latitude	Longitude
Northern extremity	lat. 46°23'22.783" N	long. 60°51'42.560" W
Eastern extremity	lat. 46°02'37.117" N	long. 60°18'39.788" W
Western extremity	lat. 45°52'29.350" N	long. 61°19'34.999" W
Southern extremity	lat. 45°38'16.668" N	long. 61°08'07.717" W
Centroid	lat. 45°53'12.992" N	long. 60°42'13.608" W

7. AREA

(See **Map 1**, **Appendix 2**)

The proposed biosphere reserve includes these areas:

Total Area of Biosphere Reserve:	356 588 ha
Total Land Area:	247 434 ha
Total Marine Area:	109 154 ha

7.1 Size and IUCN Category of Terrestrial Core Areas 7 712 ha

Please, also see **Figure 4-1**: Core Areas.

The sizes of terrestrial core areas within the proposed biosphere reserve are:

AREA	SIZE	IUCN Category*
1. Middle River Wilderness Area	5 347 ha	Ib
2. North River Wilderness Area	554 ha	Ib
3. Trout Brook Wilderness Area	216 ha	Ib
4. Bornish Hill Nature Reserve	833 ha	Ia
5. Washabuck River Nature Reserve	67 ha	Ib
6. Whycocomagh Provincial Park	192 ha	II
7. Barachois Provincial Park	118 ha	II
8. Ben Eoin Provincial Park	89.5 ha	II
9. Battery Point Provincial Park	15.5 ha	II
10. Groves Point Provincial Park	4.6 ha	II
11. Spectacle Island Game Sanctuary	13 ha	Ia
12. Pony's Point Easement	142 ha	V
13. Nature Conservancy of Canada	72 ha	V

14. Boulaceet Farm Easement	36 ha	V
15. Beinn Bhreagh Easement	4 ha	V
16. Iona Protected Beach	4.5 ha	V
17. Shenacadie Protected Beach	2.2 ha	V
18. Christies Protected Beach	1.1 ha	V
19. Malcolm Cove Protected Beach	0.5 ha	V

* See category descriptions in **Appendix 3**.

7.2. Size and IUCN Category of Terrestrial Buffer Zone 61 460 ha

Please, also see **Figure 4-2**: Buffer Zones.

AREA	SIZE	IUCN Category
1. C2 lands Under the Integrated Resource Management (IRM) Land Use Plan for Crown Lands in Eastern Nova Scotia	56 018 ha	VI
2. NewPage Port Hawkesbury Ltd. (set aside)	2 291 ha	IV
3. NewPage Port Hawkesbury Ltd. (IRM lands)	2 187 ha	VI
3. Non-designated Parks	831 ha	II
4. Irish Cove EMAN Site	100 ha	Ia
5. Kidston Island	17 ha	V
6. Alexander Graham Bell National Historic Site	10 ha	II
7. St. Peter's Canal National Historic Site	6 ha	II

7.3. Size of Transition Area

Terrestrial buffer zones and size:

APPROX. SIZE OF TERRESTRIAL TRANSITION AREA	1 810 km^2
APPROX. SIZE OF MARINE TRANSITION AREA(S)	1 098 km^2

7.4. Rationale for Zonation

BRIEF RATIONALE OF THIS ZONATION (IN TERMS OF THE VARIOUS ROLES OF BIOSPHERE RESERVES) AS IT APPEARS ON THE ZONATION MAP. PLEASE INDICATE HOW IT COEXISTS WITH THE REQUIREMENTS OF THE BIOSPHERE RESERVE ZONATION SYSTEM:

The general boundaries for the proposed biosphere reserve follow the perimeter of the entire watershed of the Bras d'Or Lake ecosystem. Within that catchment area, there exist a number of core areas that are protected for their natural heritage by public and private landowners. The provincial government has established wilderness areas and nature reserves that are located within the proposed biosphere reserve and these areas are

protected by legal statutes (**N**ova **S**cotia **W**ilderness **P**rotection **A**ct and **N**ova **S**cotia **S**pecial **P**laces **A**ct). Private landowners have also protected their lands through the **N**ova **S**cotia **S**pecial **P**laces **P**rotection **A**ct and have restricted the land use of their holdings through the **N**ova **S**cotia **C**onservation **E**asement **A**ct. These private lands, held in trust, are protected from development. Four of the largest protected areas overlap the boundary of the watershed affording 12 342 hectares of protected lands outside, but contiguous with the proposed biosphere reserve.

The buffer areas often overlap with the core areas but are stand-alone areas as well. The Integrated Resource Management (IRM) framework from the Nova Scotia Department of Natural Resources is a mechanism to ensure the sustainable harvest of natural resources throughout the province. The 56 018 hectares of provincial Crown lands are managed using the IRM framework, and therefore, ideally represent the concept of buffer areas within a biosphere reserve. This is similar to the buffer zone in the Southwest Nova Biosphere Reserve.

There is the potential for both increased core and buffer areas from various initiatives: As stated in the Environmental Goals and Sustainable Prosperity Act (2007), the Province of Nova Scotia is committed to protect 12 percent of the land base of the province by the year 2015, and as such, will need to designate new protected areas that may increase the size of the core. The Province of Nova Scotia has recently (2008) allocated almost 23 million dollars to support private land conservation through a trust fund available to land trusts in Nova Scotia. The Crown Share Land Legacy Trust will provide funds to land trusts for private land conservation. Since private lands comprise approximately 70 percent, this initiative is relevant to encourage landowners to protect private lands of high conservation value. Another potential is from First Nations' participation, by the designation of their lands (**Map 1**) as either core or buffer. A dialogue to investigate this possibility is ongoing.

While not yet included as core or buffer areas, First Nation's lands, which in total comprise 5 673 hectares (2 percent of the proposed area of the biosphere reserve) are a special case: there is restricted access to these lands by a relatively small portion of the local population (Mi'kmaq comprise less than 4 percent of the population of Cape Breton Island). There is a particular respect that these indigenous peoples show for their land; an example is the Malagawatch Reserve (**Map 1**), which is shared by all five First Nations

bands. But Malagawatch has few permanent residences; it is used sparsely for recreational and ceremonial purposes and for the gathering of country foods and medicinal plants.

8. BIOGEOGRAPHICAL REGION

THE GENERALLY ACCEPTED NAME OF THE BIOGEOGRAPHICAL REGION IN WHICH THE PROPOSED BIOSPHERE RESERVE IS LOCATED.

The Bras d'Or watershed lies entirely within the island of Cape Breton in the Province of Nova Scotia. As such, it falls within the Temperate Needleleaf biogeographical region of Forests and Woodlands, according to the UNESCO Ecosystem Type classification (1996). At the national level, the ecosystem falls within the Atlantic Maritime Terrestrial Ecozone.

As shown in **Figure 8–1**, five ecodistricts, as defined by the Nova Scotia Ecological Land Classifications Series (2003), are represented in the Bras d'Or Lake watershed. These ecodistricts are: Cape Breton Highlands (#210), Cape Breton Hills (#310), Inverness Lowlands (#320), Cape Breton Coastal (#810) and the Bras d'Or Lowlands (#510).

9. LAND USE HISTORY

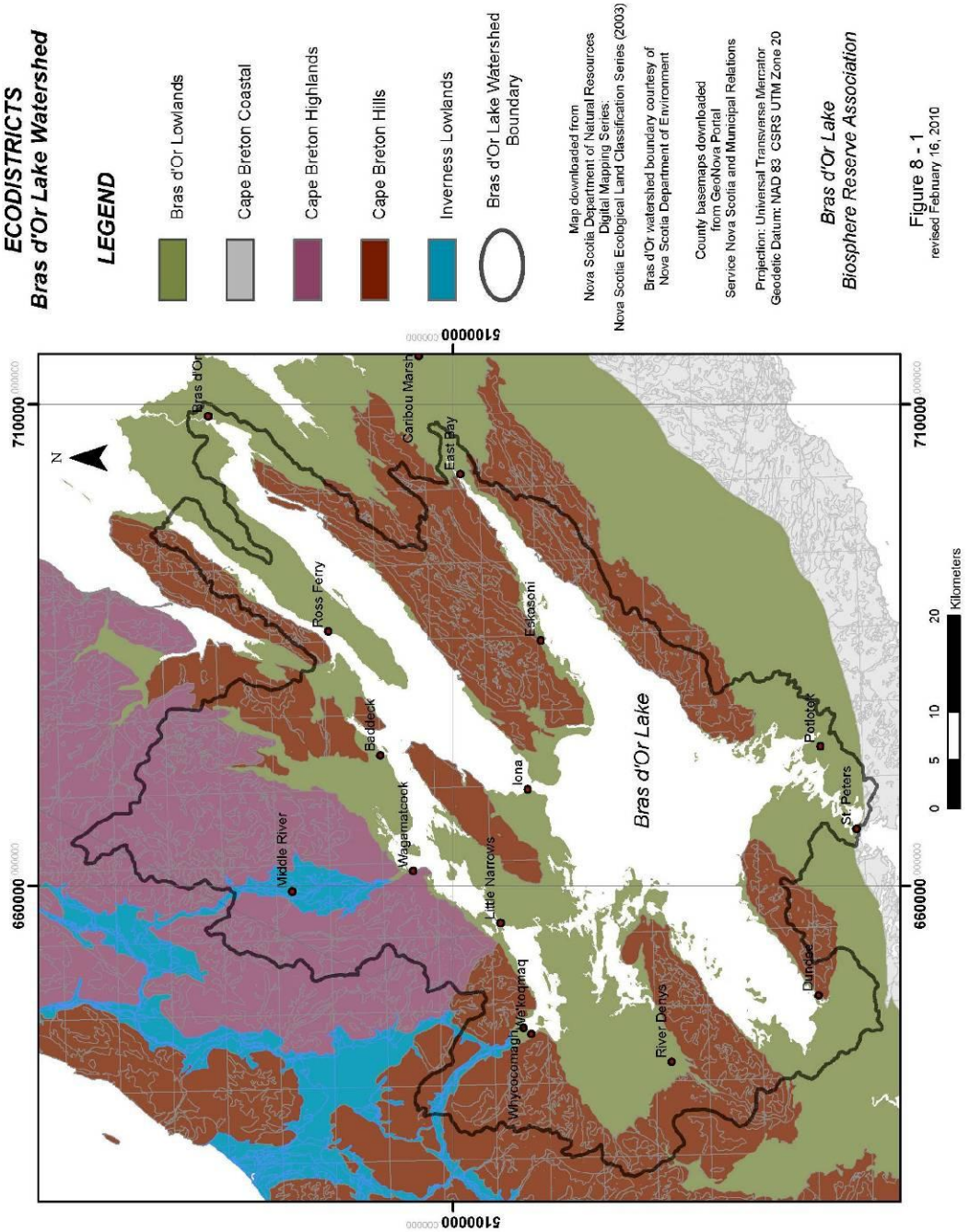
IF KNOWN, GIVE A BRIEF SUMMARY OF PAST/HISTORICAL LAND USES OF THE MAIN PARTS OF THE PROPOSED BIOSPHERE RESERVE.

Note: This section, in the main, was contributed by James St. Clair. Dr. St. Clair is a teacher and historian who sustains a life-long enthusiasm for genealogy and family history of Cape Breton Island people of many ethnic strains. He is a tireless communicator through published books, lectures, newspaper columns and radio broadcasts

This overview is meant to convey something of the rich human and cultural history that has shaped the region of the proposed biosphere reserve. The narrative is arbitrarily divided into three sections: an aboriginal period that extended over 9,000 years; European contact with, and by, aboriginal populations extending over about 700 years; and the European colonization and settlement during the last 300 years. Information has been gleaned from a number of sources, including some that gave aboriginal perspectives on this historical experience (e.g. Pastore 1990; Paul 2000). This sets a context for more recent information about the proposed biosphere reserve in the concluding section.

Land Use on Adjacent Regions - Human History

From as early as 11,000 years prior to the Common Era, human beings have been engaged in activities around and on the waters of the present Bras d'Or Lake. On the shores of the fresh water lakes of the period, people known as the Paleo-Indians, the earliest Indian inhabitants of the Americas, hunted the large mammals of the period. Significant archeological items were found in at least one location in the proposed biosphere reserve.


ECODISTRICTS
Bras d'Or Lake Watershed
LEGEND
Bras d'Or Lowlands
Cape Breton Coastal
Cape Breton Highlands
Cape Breton Hills
Inverness Lowlands
Bras d'Or Lake Watershed Boundary
Map downloaded from Nova Scotia Department of Natural Resources Digital Mapping Series: Nova Scotia Ecological Land Classification Series (2003)
Bras d'Or watershed boundary courtesy of Nova Scotia Department of Environment
County basemaps downloaded from GeoNova Portal Service Nova Scotia and Municipal Relations
Projection: Universal Transverse Mercator Geodetic Datum: NAD 83 CSRS UTM Zone 20
Bras d'Or Lake Biosphere Reserve Association
Figure 8 - 1
revised February 16, 2010
N
Bras d'Or
Caribou Marsh
East Bay
Ross Ferry
Eskasoni
Baddeck
Iona
Wagmatcook
Middle River
Little Narrows
Whycocomagh
Potlotek
St. Peters
River Denys
Dundee
Bras d'Or Lake
660000
710000
5100000
0 5 10 20 Kilometers

Following the years from approximately 9,000 to 2,500 before the Common Era, during the Archaic Period, as the lakes became connected to the sea, it is thought that descendants of the Paleo-Indians and possibly other migratory peoples known as the Paleo-Eskimos hunted and fished along the shores of the Bras d'Or Lake. There are few archeological remains probably because appropriate sites for research are now under water.

By 500 years before the Common Era, the Mi'kmaq people were moving across Cape Breton Island in seasonal migrations as they hunted and gathered. Related to the Penobscot and Passamaquoddy aboriginals of the Province of New Brunswick and the State of Maine, they were active members of the Wabenacki Confederacy, a regional meeting of aboriginals, and have left behind many traces of their lives around the Bras d'Or Lake. Several long-standing place names such as Baddeck and Eskasoni are of Mi'kmaq origin.

While some evidence suggests that Europeans may have sailed into the Bras d'Or Lake as early as 985 C. E., or a bit later at the time of the Leif Erickson. It is well established that fishing fleets from England, Spain, France and Portugal were regularly coming to the shores around Cape Breton Island in the 1500s, soon after the journey of John Cabot in 1497. There are maps from this period that include "Cape Briton" or "Breton".[2] It is believed that current archeological investigations at St. Peter's in the proposed biosphere system will confirm that Portuguese fishers were using that location in the 1520s and may well have established the name San Pedro that is still used in its English form.

From the early 1600s down through the mid 1700s, the French were the dominant European presence on Cape Breton Island and established a number of trading posts for the exchange of goods and services with the aboriginal people. Throughout that time First Nations people continued to use the lake as a place to fish, and as their transportation route. A major contact point was established by Nicholas Denys at St. Peter's where remnants of buildings are identified. Denys was a Frenchman who took over fur-trading posts in two areas of the Island in 1650. St. Peter's was one of them. Morgan describes Denys as one who "would leave a deep mark on the history of Cape Breton, emerging as the first European we can identify with a clear-cut character that featured endurance, energy, intelligence, and physical strength."[3] A strong, interdependent relationship formed between the First Nations people and the French, beginning with Denys and his brother. Earlier (1630), Jesuit priests from France began the conversion of the the Mi'kmaq to Catholicism. Although the Jesuits left Cape Breton Island in 1641, and Denys

[2] Robert J. Morgan, Rise Again: The Story of Cape Breton Island, Book 1, Breton Books, 2008 p.16
[3] ibid, pp. 24-26

was forced to leave in 1653, the strong French: Mi'kmaq relationship prevailed until the French fortress of Louisbourg fell to the British in 1758. With the 1763 Treaty of Paris, Cape Breton Island came under British rule.

A story survives both in the oral traditions of Cape Breton and on the Island of Barra in Scotland that a British soldier from Barra, named Donald MacNeil, was on board a British vessel searching for French ships in the Bras d'Or Lake after the capture of Louisbourg. When he went back to Barra, he reported to his relatives there that land along the inland sea would be a fine place for them to settle if and when they needed to emigrate. In c. 1801, a small group of his relatives found the location that he had described when they searched following their emigration. For generations, the story was told about how they met representatives of the Mi'kmaq people at what is now called Grand Narrows and established peaceful relationships. It is also part of local tradition that the native people assisted the incomers to learn about the plants that were edible and the process of making maple sugar.

From the years just after the American Revolution (1783), settlers from New England and New York, people loyal to the British Crown, began to take up residence on the land adjacent to the Bras d'Or Lake. The lake was a major transportation route to and from the centre of government at Sydney - both by boat and in the winter across the ice.

During the last years of the 1700s and particularly after the war of 1812, immigrants from the southeastern and southwestern sections of Ireland came to Cape Breton and settled in many parts of the Bras d'Or region , including St. Peter's, Irish Cove, and Baddeck. Morgan[4] estimates that the Irish population was never large or sufficiently concentrated to sustain old customs. He reports that although "no native Irish language survived in Cape Breton, the Irish had a strong influence on stepdancing and certain square dances …" (p.180). Both these dance forms remain popular today at community gatherings around the Lake.

Baddeck, Cape Breton

Arrival of the MacNeils to the Grand Narrows area in 1801 foreshadowed a major migration from the Western Islands of Scotland and adjacent sections of the mainland, to Cape Breton during the first four decades of the century. Motivated by the pressure of over population in Scotland, changes in the economy and the threat of evictions, they settled in kinship groups around the lake. For instance, people from North Uist and Tiree and Skye settled in

Whycocomagh ; others from South Uist and Barra at East Bay and Christmas Island; related families from Isle of Mull at Orangedale and West Bay. They fished in the lake and used it as well as a “road” on which to transport goods for sale to Sydney and North Sydney Their descendants remain today in many communities and have to some degree preserved the music and dance and language of their ancestors.

During the early and mid 1800s, ocean-going sailing vessels were constructed at shipyards in and near Baddeck, West Bay and Boularderie. These ships carried timber, potatoes and butter to Newfoundland, New England, the Caribbean and to Europe. They also transported tons of dried fish to many ports. Several schooners as well carried more than one thousand people from Cape Breton, many from the Bras d’Or area, to Australia and New Zealand.

Morgan mentions that the entire island of Cape Breton held a population of not more than 2,500 people in 1800, having decreased substantially since the heyday of Louisbourg. Approximately 450 of that number were Mi’kmaq.[5] Stories remain about the extensive use of the lake as a road way. For instance in 1853, more than six thousand people assembled in October of that year, all Gaelic-speaking and singing Presbyterians. At least one-third of them came by boat from many small communities around the lake. At this time steam boats were carrying people and goods from one end of the lake to the other - particularly from West Bay to Grand Narrows, East Bay and then on to North Sydney and Sydney. Construction of the St. Peter’s Canal in the mid 1800s provided another entrance to the lake and for many years saw vessels carrying people and goods to places near and far. It is currently used primarily by recreational boats.

Beginning as early as 1820 and into the early 1900s, roads were gradually being built and bridges constructed across narrow parts of the lake. Many small ferries carried people from one shore to another - places such as Grand Narrows, West Bay, Little Narrows, East Bay had their respective ferry operations. Only one remains today, that at Little Narrows. The building of the railway from the Strait of Canso to Sydney at the end of the 1800s, along with road-building, slowly brought an end to use of the lake as a principal transportation route. Still, hundreds of boatloads of limestone were carried from the quarry at Marble Mountain to the steel plants in the Sydney area up until 1921. Gypsum continues to be transported to the United States over the lake from an operation at Little Narrows.

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[4] ibid. p.180
[5] ibid. p. 77

During the mid and late 1800s, major reservations of land were set aside for First Nations peoples as they changed their mode of life from being seasonal migratory hunters and gatherers to living on small farms and fishing, gathering oysters and making baskets. Of their five major settlements on Cape Breton Island, four are on the shore of the Bras d'Or Lake in locations long identified with the Mi'kmaq people: Nyanza (Wagmatcook), Eskasoni (We'kogmaq), Chapel Island (Potlotek), and Whycocomagh (Waycobah). Historic sites at Malagawatch and Big Harbour Island remain, as well as a place where some First Nations people live during a part of the year and care for an ancient burial ground.

The lake was a major attraction for the slowly developing tourist business in the later decades of the 1800s. In 1874 Charles D. Warner published "Baddeck and that Sort of Thing: Notes of a Sunny Fortnight in the Provinces" which served to encourage many U. S. residents and some Upper Canadians to come to Cape Breton for recreation and relaxation. The family of Alexander Graham Bell is perhaps the most noted among them. Bell built a very large home there which he referred to as "The Lodge" on a headland he had purchased called Beinn Bhreagh[6]. The magnificent building is maintained and used today, and the site remains a popular retreat for many of Bell's descendants. Bell's experiments with kites, sheep-raising, and the early airplane flight in 1907 all occurred either on the shores or on the surface of the lake. Baddeck has come to be a major centre for visitors and is the location of Parks Canada's Alexander Graham Bell Museum. The Bras d'Or Interpretation Centre in Baddeck is a program of the Bras d'Or Preservation Trust. It was established through the initiative of Bell's great grandson, Grosvenor Blair, who maintains a home in Baddeck and is a strong supporter and Board member of the BLBRA. These legacies of Alexander Graham Bell's influence on science and education are valued assets within the proposed biosphere reserve.

One of the early schools of great significance to the cultural and intellectual life of Cape Breton, Boularderie Academy, was established in 1837 near the shore of the Great Bras d'Or entrance to the lake on Boularderie Island. It was established by the Presbyterian Church of Cape Breton under the leadership of Alexander Munro and his wife. There, young men were taught astronomy, mathematics and navigation and young women were taught contemporary methods of making clothes. All were taught to read and write in English. Boularderie Academy had a major effect both around the lake and across the whole Island of Cape Breton.

[6] A comprehensive account of Alexander Graham Bell's years in Baddeck is contained in the 2006 publication written by Charlotte Gray and published by HarperCollins, entitled Reluctant Genius: the Passionate Life and Inventive Mind of Alexander Graham Bell.

Perhaps the first novel based on pioneer life around the lake was written by Margaret MacPhail who grew up at Estmere and lived her adult life at Marble Mountain. The book which is still valued today is "Loch Bras D'or."[7] It is a symbol of the great affection which people of the area had for the lake and for the way of life around it.

Today, the four major divisions of the Island of Cape Breton are found around the lake: Cape Breton Regional Municipality, the former Cape Breton County, the eastern part of the island; Victoria County, established in 185l; Inverness County, created from Cape Breton County in 1835; and Richmond County in the southern part of the island, established in 1847. The people of each of these regions identify with, and enjoy, the scenery, boating and swimming around the lake.

During the later twentieth century and the first years of the twenty-first, life around the lake changed a great deal from the years of the first arrival of the native people and the coming of Europeans many centuries later. Few people today live on small farms on which sheep and cattle are raised for home use and export. Very few are fishing as their ancestors did. Many of the former subsistence farms are now being divided up into house lots for summer homes of people who live in Europe, the United States or other parts of Canada. The beauty of the lake has attracted many to try to live at least a portion of the year near its shores.

For thousands of years, the Bras d'Or Lake area has been a home and a resource for human beings. The name "Arm of Gold" is significant not just for its historicity, but for its recognition of the beauty and the emotional value of this body of water and the adjacent shore. People of different backgrounds now live together and are learning to respect the importance of the Bras d'Or.

10. HUMAN POPULATION OF PROPOSED BIOSPHERE RESERVE

APPROXIMATE NUMBER OF PEOPLE LIVING WITHIN THE PROPOSED BIOSPHERE RESERVE

Population figures within the different areas and zones of the proposed biosphere:

	Type of Area	Permanent/Seasonal Residents
10.1.	Population in the Core Areas	0/0
10.2.	Population in the Buffer Zones	0/0

[7] Margaret MacPhail, Loch Bras D'or, Lancelot Press Ltd., Windsor, Nova Scotia. First published in 1970; 18th printing in 1991;199 pages

10.3. Population in the Transition Area(s) 14 579/32 000

10.4. Description of Communities within the Biosphere Reserve

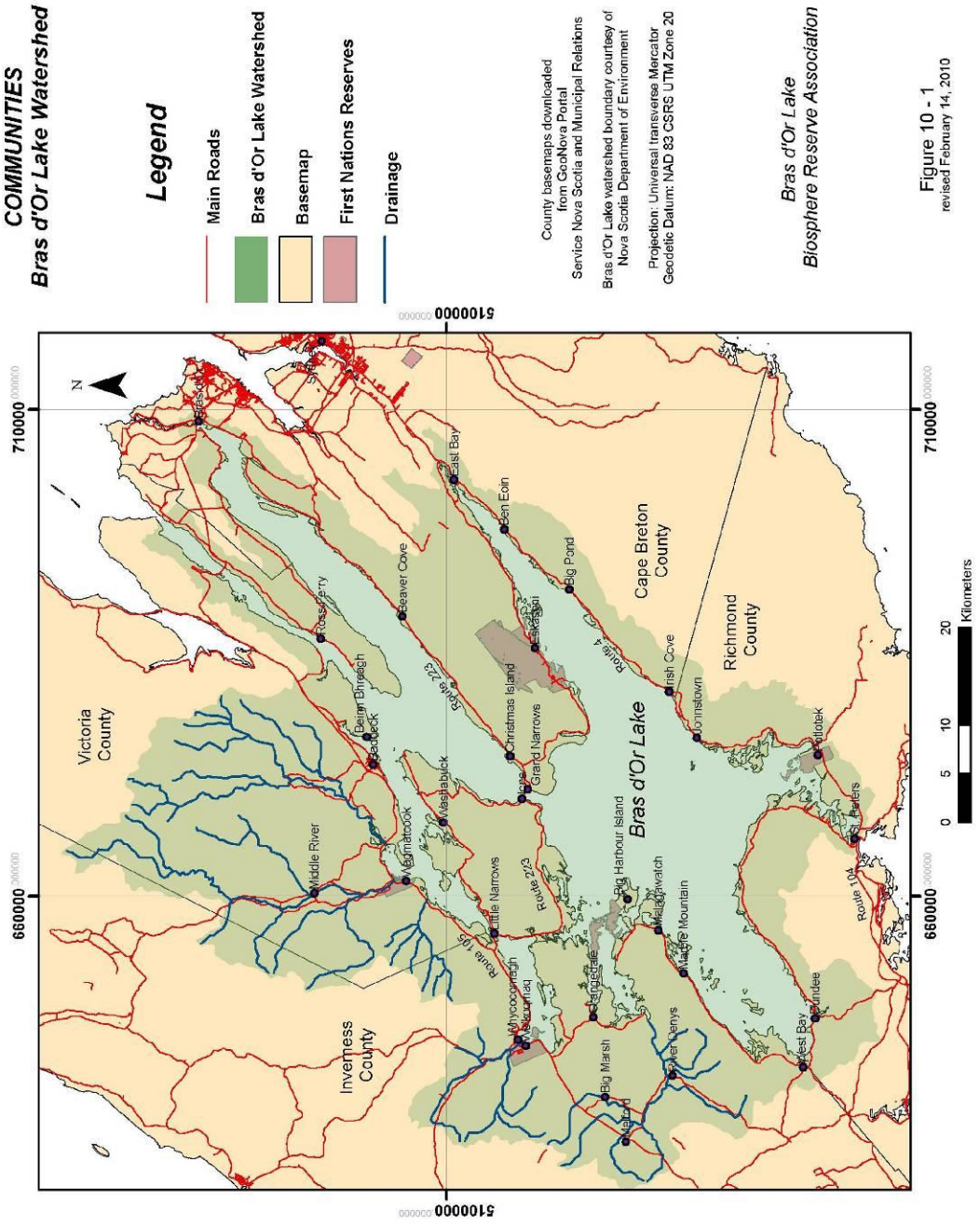
COMMUNITIES WITHIN OR NEAR THE PROPOSED BIOSPHERE RESERVE: INDICATE ETHNIC ORIGIN AND COMPOSITION, MINORITIES ETC., THEIR MAIN ECONOMIC ACTIVITIES (E.G. PASTORALISM) AND THE LOCATION OF THEIR MAIN AREAS OF CONCENTRATION, WITH REFERENCE TO A MAP IF NECESSARY.

Please see **Figure 10-1** (Communities)

The Canso Causeway entry to Cape Breton Island connects to the three principal routes that access the Bras d'Or Lake. The southerly Route 4 through St. Peter's and East Bay provides access to Eskasoni. The Trans Canada Highway, Route 105, on the north side, passes through the communities of Baddeck and Bras d'Or, with access to routes leading off to other communities, such as West Bay and Marble Mountain / North Mountain. Exit 6, off the Trans Canada Highway at Little Narrows, provides the third option, Route 223. This route 223 cuts through the geographic centre of Cape Breton Island, affording views of the heart of the Bras d'Or Lake as the road crosses over the Barra Strait Bridge from Iona to Grand Narrows. During the 1880s this last route was the preferred route selected by Canada's railroad builders and it served the whole region well. The railroad tracks also snake their way along the scenic shoreline of the beautiful Bras d'Or. As well, Route 223 is an integral component of the provincially designated Bras d'Or Lakes Scenic Drive, a drive that comprises over 900 km of roads, allowing easy access to all communities along the Lake's shoreline.

Barra Strait

As outlined in Section 9, the watershed includes a number of small towns, mainly along the coast of the Lake, with populations in the order of several hundred each. St. Peter's, Baddeck and Eskasoni are largest with a combined population of nearly 7 000 out of a total population of 14 579 (2006 census) for the area. Although there is no reliable record of the summer population residing along the Lake, the estimated number of summer residences is in the range of 2 000.


COMMUNITIES
Bras d'Or Lake Watershed
Legend
Main Roads
Bras d'Or Lake Watershed
Basemap
First Nations Reserves
Drainage
County basemaps downloaded from GeoNova Portal Service Nova Scotia and Municipal Relations
Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department of Environment
Projection: Universal transverse Mercator Geodetic Datum: NAD 83 CSRS UTM Zone 20
Bras d'Or Lake Biosphere Reserve Association
Figure 10 - 1
revised February 14, 2010
N
710000
660000
510000
Victoria County
Inverness County
Cape Breton County
Richmond County
Bras d'Or Lake
Baddeck
Middle River
Washabuck
Grand Narrows
Christmas Island
Big Pond
Irish Cove
Johnstown
Little Narrows
Big Harbour Island
Marble Mountain
Big Marsh
Malagawatch
Route 223
Route 105
Route 104
Kilometers
0
5
10
20

Aboriginal populations within the proposed biosphere reserve are Mi'kmaq, with most living in four (of the six) official Reserves: We'koqmaq (Whycocomagh), Wagmatcook, Eskasoni and Potlotek; the fifth Reserve, Malagawatch (occupied seasonally), is also within the proposed biosphere reserve area. A sixth Reserve, Membertou, is near Sydney, just outside of the biosphere reserve area, but otherwise closely associated with Aboriginal communities within the proposed biosphere reserve (i.e. they share seasonal residence in Malagawatch). The population of the four Reserves within the proposed biosphere reserve was 4 240, with Eskasoni the largest—at 2 952 (2006 census). The average population growth over the previous decade was in the order of 33 percent.

Eskasoni First Nation

Employment is mainly in the tertiary service industry, although there is also fishing, resource extraction, trading and research related to natural resources.

Residents of the other communities are generally descendents of Scottish immigrants, as well as descendents of Acadian, English, Irish, American and a few other European groups. Sources of employment range from forestry and mill work (associated with NewPage Port Hawkesbury Ltd. (NPPH--formerly Stora Enso, at the Strait of Canso) to work associated with several quarries (gypsum and marble); inshore fishing and shellfish aquaculture; health, education, social services and consumer business operations—including tourism; and a small number of businesses relating to building products and high-value craft products.

Many residents are employed in Cape Breton's two largest centres: Port Hawkesbury and Sydney. There they work in hospitals, wholesale and retail establishments, higher education institutions, call centres and government agencies. People often commute as far as 75 kilometres to their place of work in those centres. The absence of secure and rewarding employment is a principal reason why the population of the watershed area has declined by more than 6 percent over the past decade. It tends to be the norm that young people leave these communities upon completion of high school, college or university education programs.

Recently there has been an increase in year-round (winterized) homes built in communities around the Lake by persons who reside in them seasonally, for up to six months of the year. These year-round homes are usually owned by Canadians, Germans and Americans who are retired, or who conduct their business while living away from their home area. In

addition to contributing to municipal taxation, these new constructions contribute to employment within the building trades and enterprises—creating employment for property managers to manage these vacant lands and dwellings.

Please see **Figure 10-2** for the locations of these population centres.

10.5. Names of Nearest Towns

Urban centre to the nearest point in the proposed biosphere reserve:

Urban Centre	Distance	Population	Description
Sydney	~15 km	33,012	The major urban centre of Cape Breton
Halifax	~285 km	282,924	The provincial capital

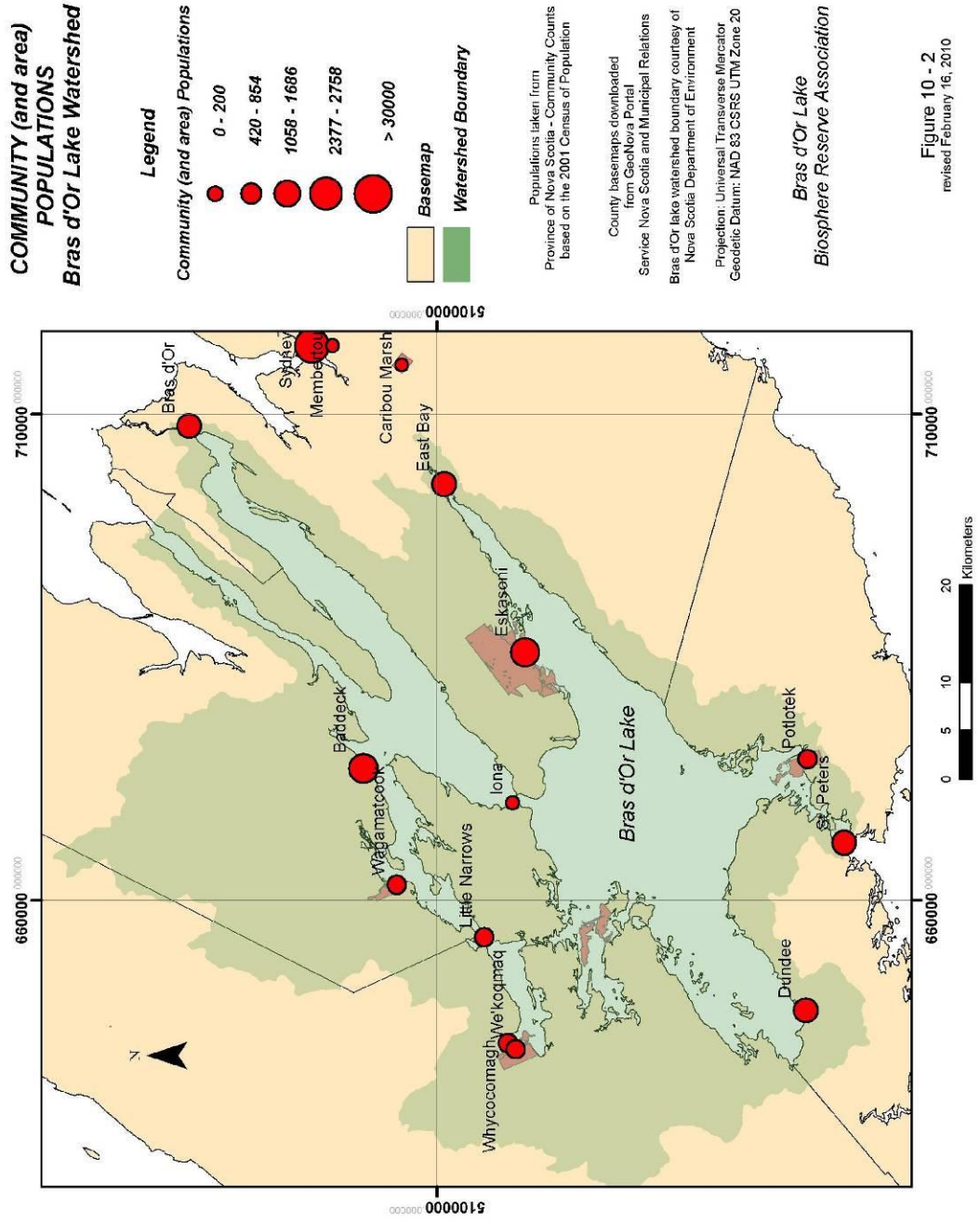
10.6. Cultural Significance

BRIEF DESCRIPTION OF THE PROPOSED BIOSPHERE RESERVE'S IMPORTANCE IN TERMS OF CULTURAL VALUES [RELIGIOUS, HISTORICAL, POLITICAL, SOCIAL, ETHNOLOGICAL].

Note: The following includes excerpts from contributions prepared, respectively, by Michael Denny who described himself as "a young resident of Eskasoni, and post-secondary science student at Cape Breton University", and Betsy Jardine, a young woman who grew up on the south side of the Bras d'Or Lake and who now is a staff member of the Whycocomagh Eco-Centre on the north side, and who is a member of the Board of the BLBRA .

The Bras d'Or mystique permeates the minds and hearts of those who live along its shores. Songs, stories and folklore speak of the Lake. Evidence that an insular culture has formed around the lake is found in the way different cultural strands meld during cherished cultural events that take place in communities around it. For instance, strains of highland Scottish music come through the fiddle tunes of such accomplished Mi'kmaq fiddlers as the late Lee Cremo. As well, it is not easy to differentiate purely Acadian tunes. Evident in the weave is the mutual respect and appreciation of those who shared and survived harsh winters living in the place of their choice, beside the Bras d'Or.

Historically, Mi'kmaq used the Bras d'Or lake for a home, recreation, transportation, medicine and food; and the growing populations of the First Nations' communities utilize the lake to a large extent today. There isn't a place like home! The Bras d'Or lake is what makes a sense of place or home for the Mi'kmaq people who lived around it since time immemorial.


COMMUNITY (and area)
POPULATIONS
Bras d'Or Lake Watershed
Legend
Community (and area) Populations
0 - 200
420 - 854
1058 - 1686
2377 - 2758
> 30000
Basemap
Watershed Boundary
Populations taken from Province of Nova Scotia - Community Counts based on the 2001 Census of Population
County basemaps downloaded from GeoNova Portal Service Nova Scotia and Municipal Relations
Bras d'Or lake watershed boundary courtesy of Nova Scotia Department of Environment
Projection: Universal Transverse Mercator Geodetic Datum: NAD 83 CSRS UTM Zone 20
Bras d'Or Lake
Biosphere Reserve Association
Figure 10 - 2
revised February 16, 2010
Bras d'Or
Sydney
Membertou
Caribou Marsh
East Bay
Eskasoni
Baddeck
Wagmatcook
Iona
Little Narrows
Whycocomagh
We'koqma'q
Bras d'Or Lake
Potlotek
St. Peters
Dundee
710000
660000
510000
0
5
10
20
Kilometers
N

Mi`kmaq have traditionally lived by its waters during the spring and summer months and into early fall; and in the winter would move inland up rivers (such as the Middle River which flows into the Bras d'Or) into the forests. Today Mi`kmaq still have their homes beside the Bras d'Or lake. Some things won't ever change.

Piper's Cove, near Eskasoni Reserve, is a really good swimming spot with a beautiful beach and long sandbar. There are many swimming spots like this along the Bras d'Or where Mi'kmaq people take the time to go and enjoy. Surely Mi'kmaq people thousands of years ago used the same locations for the same reason, to enjoy a nice hot summer's day cooling off in the water. Today for recreation Mi`kmaq use the lake for swimming, boating, canoeing, and any other water activity. Camping along the Bras d`Or is another favourite pass time for Mi`kmaq today. Mi`kmaq people camp on the beach in Eskasoni, and on Chapel Island (**Figure 10-3**).

Figure 10-3. Views across the water to Chapel Island and the Church of St. Anne, from Potlotek, N.S. L. Circa 1930. Photograph by Clara Dennis. William Dennis Collection, Nova Scotia Museum, Halifax. P113/73.180.623/N-6099 http://museum.gov.ns.ca/mikmaq/mp0693.htm). R. 2006. B.G. Hatcher.

Later arrivals to the area hold a similar view of the lake. Summer recreational interests appreciate the lake system as a way to find both a sense of wilderness adventure, and opportunity for social interaction though regattas, hiking, and biking. The many cottages of summer residents that dot the shores bring people to the water's edge and into the water itself. Cottage living has grown to be a significant cultural aberration on its own. Children who enjoyed the pleasures of the lake return as adults to recapture them, often to build their own cottage, or even, a permanent home. They unite with those whose past cultures brought diversity to the Island of Cape Breton. Recognizing that the density of summer populations can threaten the pristine quality of the lake, education about its vulnerability becomes essential in order to foster a healthy appreciation of the resource. Those who have come to love the lake as part of their

families' traditional summering practices do and will continue to unite permanent and part-time residents on the shores. Together, they have reason to dialogue about ways to carefully use and conserve their treasured, common resource for future generations.

Over the years, the Bras d'Or provided a livelihood for residents living near it. For the Mi'kmaq, fishing in the Bras d'Or has been a major component of food-gathering activity. Mi'kmaq today still rely on the Bras d'Or to supply food such as eels, cod, smelts, trout, salmon, gaspereau, lobster, herring, perch, stripped bass, flounders, and many other fish species. Some of these fish are still caught in the traditional way, with a spear. Digging for clams and gathering other shell fish are continuing practices today. Sadly, most areas are now closed because of water contamination. Quohogs, clams, razor clams, oysters, and mussels are all gathered from the Bras d'Or. Programs of groups such as the Bras d'Or Stewardship Society, the Pit u'Paq Partnership, and of the Unama'ki Institute of Natural Resources endeavour to deal with the sources of contamination. An enriched resource that is certain to emerge through a UNESCO Biosphere Reserve will strengthen the efforts of these associates of the Bras d'Or Lake Biosphere Reserve Association.

The Mi'kmaq people also found food on the land beside the lake's shores and on the islands in the Bras d'Or. Wild berries such as raspberries, blueberries, gooseberries, blackberries, and Strawberries were plentiful. Also along the shores and islands in the Bras d'Or were nesting birds whose eggs were an important food source for the Mi'kmaq people.

Taking a shorter view of the area's history, say the past two hundred years, communities around the Bras d'Or have also demonstrated examples of divisiveness. For instance, separation of communities (within and between) occurred along lines of religious denominations; of differing ethnic backgrounds; and, of local and provincial politics. Although these lines are gradually disappearing, some remain, often the result of official political jurisdictions. These divisions are obstacles when the objective is to develop shared responsibility for a Bras d'Or Lake community.

The ability for the Bras d'Or lake to support livelihoods, at least for a few dozen people, is threatened by development on its shores. Too much of this development has come from summer residences, often replacing wooded and grassland areas. Heavy rains wash large quantities of silt into the lake from developments on its shores. Although the water may clear in time for recreational users, the impact to local fish stocks needs to be taken into account. Increasingly, residents are becoming conscious of the Lake's fragility. In many cases stewardship groups attend carefully to the importance of involving various cultural identities to

study and express their concern about introducing measures to protect the watershed. Seen in this way, the Bras d'Or itself is an instrument of unification, uniting the people who live on its shores just as it also separates them geographically.

That instrument of unification needs strengthening. The proposed biosphere reserve promises to unite persons residing in the watershed into a coherent Bras d'Or Lake community. It will be an effect of research projects whose results increase public understanding of the area's social, cultural, economic and environmental circumstances. At times, some of the citizens might be the action-researchers. It will be the effect of education activities prompted by biosphere reserve programs that enable residents of the watershed to work together to achieve more sustainable ways of living. New relationships emerge when formal and informal barriers are transcended. Awakened concern about the sustainability of various aspects of the Lake and its watershed will form a new, common bond that currently does not exist. Shared goals will remove dividing lines; for example, between those who live in its east, its west, its north and south; between those separated by county lines, or by First Nations Reserves; between those who are year-round and those who are summer residents; between those who favour their particular music and dance. Already, membership on the BLBRA Board, and the practice of holding board meetings in various communities around the lake, are creating ground for developing an amalgam of the area's rich cultural resources into an even-richer Bras d'Or Lake community.

Part of the task of applying to UNESCO to designate the Lake and its watershed as a World Biosphere Reserve was to organize and study and generally to take stock of our incredible natural resource. The process of assembling information about the Lake and its watershed in the Association's Nomination Document for UNESCO has itself been a unifying experience. It involved experts from many disciplines; and it called upon the wisdom of many who have long loved Unamaki.

We have begun to develop a culture that understands the interconnectedness of our eco-system. It is building upon our common cultural values. The fact of having to address the lake and its watershed as a common concern invariably raises questions of differing values. We are beginning to strengthen awareness that what happens in one corner of the lake impacts the health of the entire system. When it comes to experience with the Lake there is a considerable gap between those whose people have known it for thousands of years, those have known it for a few hundred and those who are just getting to know it. What we share is the conviction that it

is up to each and all - to continuously protect and improve its health and beauty. It is a conviction that builds on the base of an acknowledged common cultural heritage.

10.7 Examples of Social Organization

(1) Samsonville is a community of approximately 120 homes with a population of about 400 people. It was settled in the middle of the 19th century by persons from nearby communities situated on the Atlantic Ocean who wanted to gain easier access to the Lake's fishing grounds. The St. Peter's Canal had not yet been constructed. In those early years the Samsonville area was known as "The Lake". The area's first post office was opened in 1905. In addition to fishing, other industries developed there, all connected to the Bras d'Or Lake. These industries included a sawmill and vessel repair facility for the boats that came that way for various shipping purposes. The canal boosted this activity as boats hauled coal and other freight to Prince Edward Island and then returned with vegetables and supplies; frequently stopping for repairs.

Through the years, Samsonville remained an active community. The area's first credit union and the first consumer cooperative were established in Samsonville. The community also formed a mutual telephone company, a community water system and organized garbage pick-up. Its 70-year-old Lakeside 4-H Club is one of the oldest 4-H Clubs in Canada. Today it boasts a very active community association with its community centre, a centennial park and many modern amenities including a state-of-the-art water system, soon to be completed.

(2) Camp Rankin, a summer education and recreation facility for 4-H members, was established on a 50-acre parcel of land at Cape George, on the shore of the Bras d'Or Lake. There rural youth participate in skills development and leadership training relating to rural enterprise. Camp Rankin was built more than twenty-five years ago on the initiative of volunteer 4-H leaders, with some assistance from the Province of Nova Scotia. At first it served the local county 4-H members. Gradually its program expanded to include 4-H members throughout the province and, currently, it also serves as a gathering place for other youth groups, family reunions, meetings, retreats and nature programs for local schools.

Camp Rankin, now thirty-five years old, boasts a large recreation hall, dining room, well-equipped kitchen, cabins for director and councillors, a sick bay, an arts and crafts building, six bunkhouses, a washroom facility and a tool and equipment shed.

The camp has established a fine reputation because of its location, physical attributes and high management and maintenance standards. The Bras d'Or Lake contributes much to the quality of Camp Rankin, providing a place for campers to swim, canoe and learn about the environment along its beaches and shoreline.

(3) Chapel Island, also known as "Potlotek", has been an important gathering place, a location for government and a site of spiritual significance to the Mi'kmaq for many centuries. At one time, this small island situated in the southeastern corner of Bras d'Or Lake on Cape Breton Island was strategically located on an ancient travel corridor used by Aboriginal people. It became a gathering spot for the Mi'kmaq, where elders and leaders met to discuss hunting territories and other matters of governance.

Since the mid-18th century, when the French first erected a Catholic church here, Chapel Island has been an important centre of the Roman Catholic faith for the Mi'kmaq, and the location of an annual pilgrimage celebrating the Feast of St. Anne in late July. During the 19th century, Mi'kmaq travelled to Chapel Island by canoe from throughout the Atlantic region, including Newfoundland, to fulfill their religious duties. They sometimes brought the bodies of their deceased for burial at this sacred site. Countless graves scattered across the island offer silent testimony to its spiritual importance to the Mi'kmaq.

Today, Chapel Island is a living Mi'kmaq spiritual site and a summer gathering place. The entire island is important, though it is the area facing the mainland – in the vicinity where the current church stands and where its predecessor's stood – that is the major focus of attention. It is the location of the boulder from which Abbé Maillard, pioneer missionary to the Mi'kmaq, once preached, a depression ring formed by centuries of dancing, a second ring where the large wigwam of the Grand Council once stood, and cabins associated with the summer pilgrimage. In addition to its spiritual and social associations, Chapel Island continues to serve its ancient role as a political meeting place. The Grand Council of the Mi'kmaq continues to meet, twice a year, on the island to hold discussions and make decisions. (Parks Canada, 2008).

The annual mission to the island of hundreds of people every summer places substantial pressure on the terrestrial and estuarine communities and their habitats. Recent initiatives by the Potlotek community and the UINR are aimed at controlling the waste streams and improving the infrastructure through education and investment.

11. PHYSICAL CHARACTERISTICS

11.1. Description of Site Characteristics and Topography of Area

DESCRIPTION OF THE MAJOR TOPOGRAPHIC FEATURES - WETLANDS, MARSHES, MOUNTAIN RANGES, DUNES ETC.--WHICH MOST TYPICALLY CHARACTERIZE THE LANDSCAPE OF THE AREA.

11.1.1 Overview

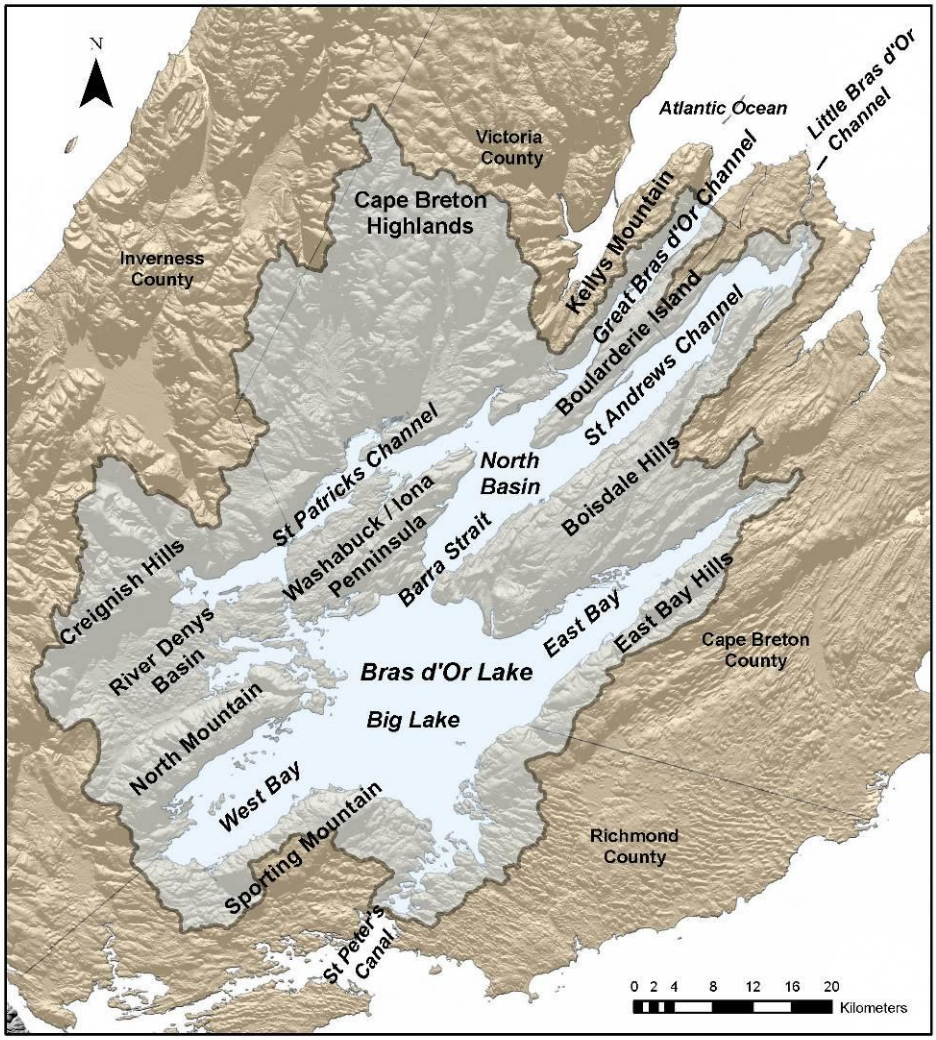
The Bras d'Or Lake is an estuarine system in the middle of Cape Breton Island. Cape Breton Island, is a rugged and irregularly shaped island, about 10 280 km^2. It lies northeast of mainland Nova Scotia, and is joined to the mainland by a 1.4 km causeway built in 1955. The topographic fabric of the Island is controlled by northeast-southwest structural trends. Differential erosion has resulted in steep hills around the Lake, and peninsulas within the Lake, which divide the estuarine ecosystem into five, long, deep channels in the north half, and a number of bays in the south half of the Lake. Along the west side of the watershed steep hills rise abruptly to highland plateaus (the Cape Breton Highlands) at elevations of 250-300 metres. **Figure 11-1** is a shaded relief map showing the general location of physical features in, and around the watershed which are referenced in this submission.

The entire Bras d'Or Lake watershed is 3 565 km^2, including 1 082 km^2 (30 percent) of the Lake itself and 2 479 km^2 being the terrestrial and freshwater component (UMA, 1989 and Parker *et al.*, 2007). The total coastline, including island perimeters, is 1 272 km (Shaw *et al.* 2006)

Four main rivers comprising watershed areas between 100-350 km^2, (Middle River, Baddeck River, River Denys and Skye River) account for most of the drainage into the Lake. **Figure 11-2** shows the location of the four main subwatersheds within the larger Bras d'Or Lake watershed.

Together, these sub-watersheds cover approximately 38 percent of the terrestrial Bras d'Or Lake watershed. Ten additional subwatersheds, ranging in size from 20-50 km^2, account for another 14 percent of the watershed, for a total of 52 percent of the watershed. The remaining terrestrial land mass contributes fresh water to the Bras d'Or Lake by small brooks, streams, overland runoff and groundwater inflow.

PHYSICAL FEATURES
Bras d'Or Lake Watershed



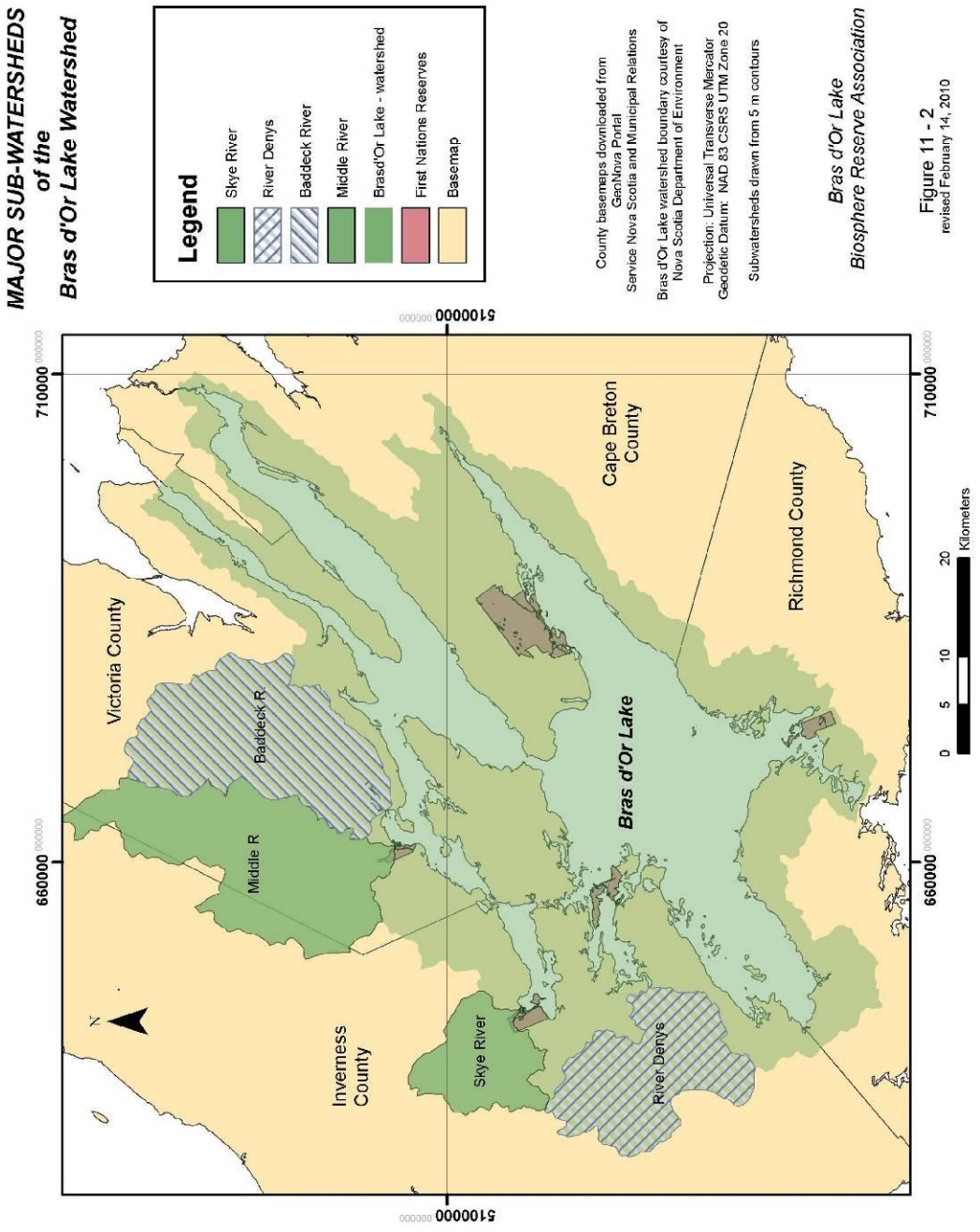
Legend
Bras d'Or Lake Watershed Boundary
County Lines

Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department of Environment

Bras d'Or Lake Biosphere Reserve Association

Shaded Relief Mapping courtesy of: NS Department of Natural Resources (http://www.gov.ns.ca/nat/meb/download)

Figure 11 - 1
revised February 14, 2010


MAJOR SUB-WATERSHEDS
of the
Bras d'Or Lake Watershed
Legend
Skye River
River Denys
Baddeck River
Middle River
Brasd'Or Lake - watershed
First Nations Reserves
Basemap
County basemaps downloaded from GeoNova Portal
Service Nova Scotia and Municipal Relations
Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department of Environment
Projection: Universal Transverse Mercator
Geodetic Datum: NAD 83 CSRS UTM Zone 20
Subwatersheds drawn from 5 m contours
Bras d'Or Lake
Biosphere Reserve Association
Figure 11 - 2
revised February 14, 2010
710000
660000
5100000
Victoria County
Baddeck R.
Middle R
Inverness
County
Skye River
River Denys
Bras d'Or Lake
Cape Breton
County
Richmond County
N
0
5
10
20
Kilometers

Extensive wetland and bog deposits occur in the upper reaches of the watershed, specifically in the Cape Breton Highlands, the Boisdale Hills and the East Bay Hills. The large wetlands in the highland portions of Middle River and Baddeck River serve to store and release water slowly to these major subwatersheds within the Bras d'Or Lake watershed. Much of the coastline consists of unconsolidated materials, subject to erosion from storm events at exposed locations. Numerous coastal barrier beaches, or sand spits, create and protect fresh or brackish water lagoons (barachois ponds).

The barachois ponds are recognized as nutrient-rich habitat for diverse and productive ecosystems. These coastal features are vulnerable to breakdown or collapse from waves, long shore currents, sea ice and rising sea levels and/or submerging coastlines. **Photo 11-1** shows tree stumps in coastal ponds as evidence of the submerging coastline.

Rocky shores occur mainly along the steep shores of the Great Bras d'Or Channel, the south side of St. Andrews Channel, the south side of North Mountain (locally known as Marble Mountain) and the eastern side of the Lake—in the vicinity of Irish Cove.

Photo 11-1

The bathymetry of the deeper portions of the Bras d'Or Lake, determined from multibeam data (after Shaw 2003 in Parker *et al*. 2007) can be seen in **Figure 11-3**. The Lake has restricted connections to the Gulf of St. Lawrence through the Great Bras d'Or and the Little Bras d'Or Channels and to the Atlantic Ocean directly by the small historic ship canal at St. Peter's.

St. Andrews Channel reaches a depth of 280 metres in a channel with near vertical sidewalls. North Basin has a maximum depth of 229 metres and the south half of the Lake reaches a depth of 119 metres. The average depth of the Lake is about 30 metres; most of the bays and coves are quite shallow. The Nova Scotia Topographic Database Coastal Series maps (for example: 11F/15 Grand Narrows - 50 457500 60500) show both marine and land features with topographic contours and bathymetry.

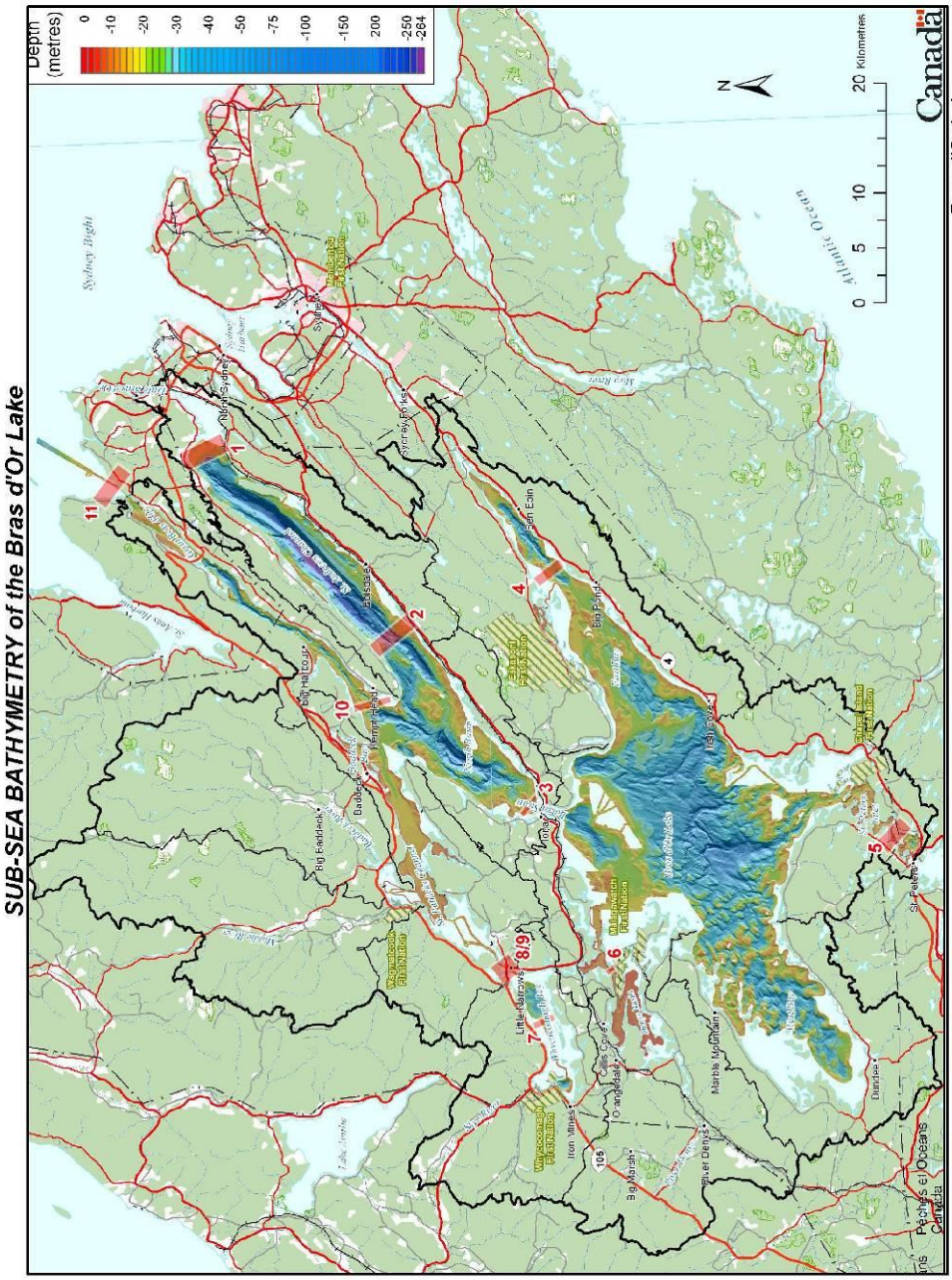


Figure 11-3 revised. February 16, 2010

Underwater sills help control temperatures, salinities, and circulation patterns within the Lake. The bottom morphology is defined by drumlins, moraines and coastal features associated with past glaciations and water levels. Karst-like sinkholes that may have originated from dissolution or collapse of rock salt outcrops were identified on the Lake bottom by multibeam data. Otherwise the Lake bottom consists mainly of mud, sand and gravel, resulting from erosion of glacial tills.

11.1.2 Estuarine Oceanography

The geographic, topographic and bathymetric complexity of the Bras d'Or estuary, linked to the ocean-atmosphere system of the adjacent NW Atlantic ocean, results in complex hydrographic and oceanographic conditions, leading to great variability in the physical and dynamic properties of the water column of the "Lake". Canada's only inland sea: the Bras d'Or is a large (>1200km^2 surface area), nearly land-locked estuarine system in the centre of Cape Breton Island of Nova Scotia (Petrie & Raymond, 2002). The system is connected to the North Atlantic Ocean through three narrow passages: two in the north, and one the south (Figure 11.4). The Great Bras d'Or Channel is approximately 30 km long with an average width of 1.3 km and an average depth of 19 m. It provides a significant interchange between the lake and the North Atlantic Ocean via Sydney Bight and the Cabot Strait. The Little Bras d'Or Channel, to the east on the other side Boularderie Island (Figure 11.4), is much smaller (<0.2km wide), such that the flux of water is insignificant compared with the volume of the estuary or the flux through the Great Bras d'Or Channel. A pair of locks in St. Peter's Canal to the South open sporadically to allow vessels of less than 10 m beam to enter or leave the lake through a narrow, shallow, man-made passage. The Barra Strait (BS) is a narrow, inner passage connecting the northern and southern basins of the lake, with a sill depth of about 20 m and a minimum width of about 500 m (Figure 11.4). Other, even smaller channels (e.g. Little Narrows at the entrance to Whycocomagh Bay, and the Boom Channel at the entrance to Deny's Basin) serve to partially isolate the water circulations in substantial portions of the estuary. Regions of great depth relative to water exchange (e.g. Whycocomagh Basin @ 48m, St. Andrew's Basin @ 280m) create strong vertical stratification in the water column. See Petrie & Bugden (2002) for a review of more than 30 years of oceanographic surveys, measurements and models, and a detailed description of the oceanography of the Bras d'Or estuary. See Yang *et al* (2008) for the most advanced 3-D numerical model of its physical dynamics (Figure 11.5).

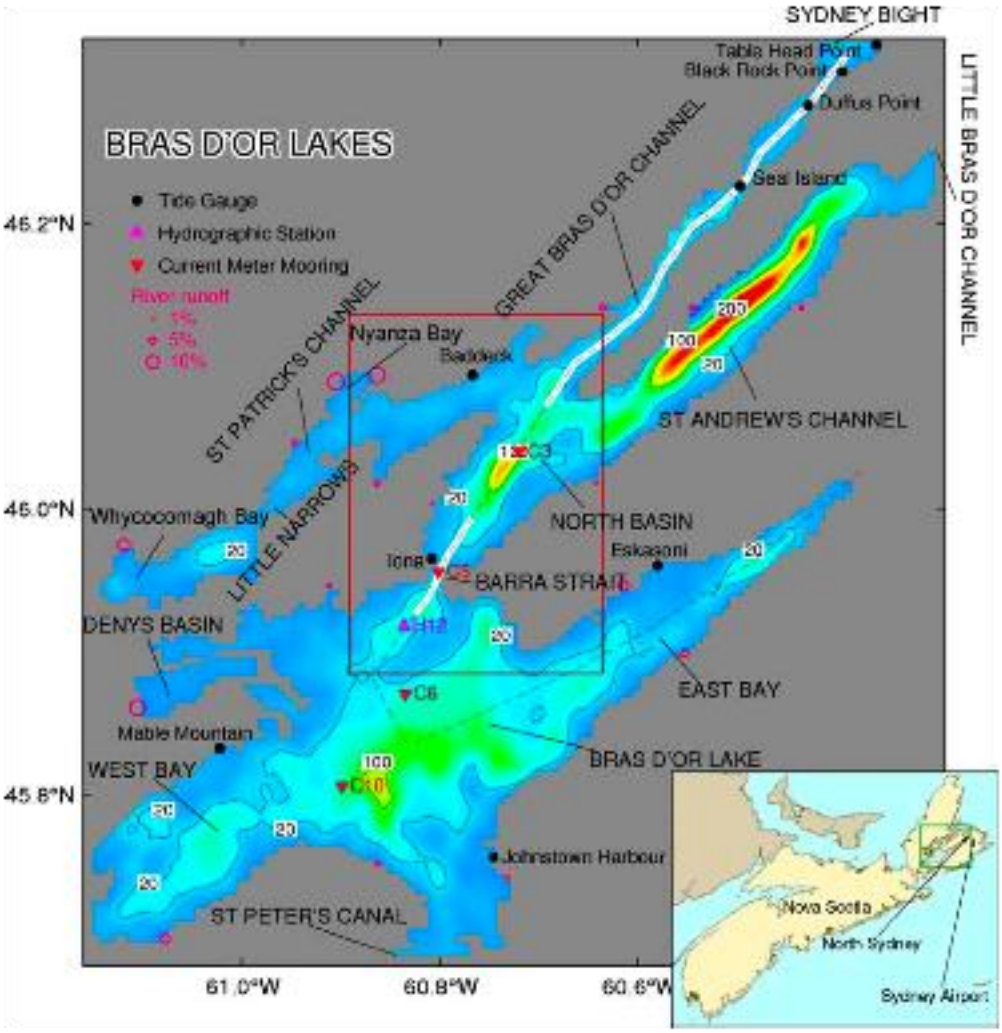


Figure 11.4 Map of the Bras d'Or Lake region of Cape Breton Island, Nova Scotia, Canada, showing selected oceanographic features within the domain of a 3-D semi-prognostic numerical circulation model. Bathymetry (coloured shading and depths in metres), locations of sea level gauges (solid dots), hydrographic stations (pink triangles) and current meter stations (red triangles) are shown. Oceanographic transects through the Great Bras d'Or Channel, North Basin and Barra Strait, where current velocity was measured through the vertical, are marked by thick white lines. Hydrographic transects extending onwards through Bras d'Or Lake and into East Bay, where temperature-salinity data were measured through the vertical, are marked by red dashed lines. The rectangle marked by solid red lines is the area in which residual flows were modeled. Locations where the mouths of 17 rivers join the model boundary are marked with open red circles. The radius of each circle represents the ratio of freshwater discharge of the river to the total freshwater input to the lake system. Inset shows the location of North Sydney where the tide gauge data were collected and the Sydney Airport where meteorological measurements were made. (Figure adapted from Yang *et al* 2007, with permission).

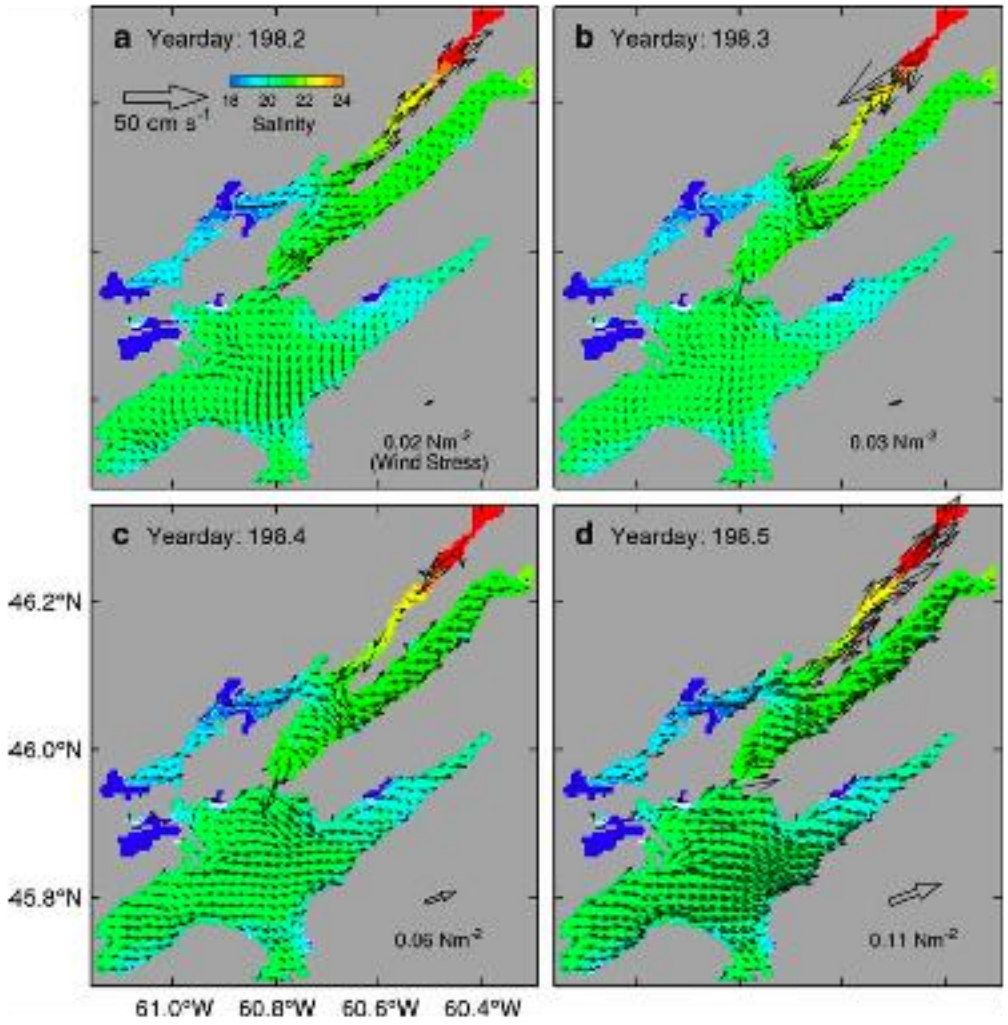


Figure 11.5. Model-calculated near-surface (2 m) currents and salinities in the Bras d'Or estuary at four different times during July, 1974. Velocity vectors are plotted at every third model grid. The three-dimensional numerical model used to generate this plot was driven by all known forcing (i.e. tides, wind, buoyancy, and boundary flows associated with atmospheric pressure perturbations). (Figure adapted from Yang *et al* 2007, with permission).

The asymmetrical hydrodynamic exchange between major sections of the Bras d'Or estuary and between the estuary and the adjacent ocean produce major spatial variations in circulation and hydrology throughout the system. Tidal flows are greatly attenuated and lagged as one moves from the NE entrance to the SW extremities, such that the amplitude of Barometric seiches can exceed the astronomical tidal signal (Krauel, 1975a, b; Petrie, 1999). The nonlinear interaction of the tidal, wind and buoyancy currents with the local bathymetry generates residual flows of high magnitude in restricted channels, and stagnant pools in deep basins (Yang *et al*, 2007). The great diversity of sub-watershed areas (from major river basins to vertical cliffs) and freshwater efflux rates (ADI, 2006) means that buoyancy forcing in some areas of the estuary dominates the circulation patterns (Yang *et al*, 2008). Temporal-spatially averaged salinity in the estuary falls in the range of 20 to 26 psu (practical salinity units), which is lower than the salinity (28-32 psu) in the adjacent waters of the Sydney Bight and Cabot Strait (Krauel, 1975a, Petrie & Bugden, 2002). But the full range of the system is from 0 psu in the mouths of large rivers at flood to 34 psu or higher in evaporative barachois ponds (Taylor & Shaw, 2002; Yang *et al*, 2007). The overarching effect of this diversity and complexity of hydrodynamic forcing is to produce great spatial variability in the residence times of water (ranging from hours to years), and the delivery, distribution and transformations of materials contained, dissolved and carried by that water (i.e. heat, salts, nutrients, viruses, bacteria, plankton, larvae, etc.), with obvious implications for coupled physical and biological processes (Yang *et al*, 2008).

11.2. Elevations

11.2.1. Highest elevation above sea level

Highest elevation is 490 metres (upper reaches of Middle River subwatershed).

11.2.2. Lowest elevation above sea level

Lowest elevation is 0 metres.

11.2.3. Maximum depth below mean sea level

Maximum depth below mean sea level is 280 metres (St. Andrews Channel).

11.3. Climate

DESCRIPTION OF THE CLIMATE OF THE AREA USING ONE OF THE COMMON CLIMATE CLASSIFICATIONS.

According to the *"The Natural History of Nova Scotia"* Nova Scotia has a modified continental climate. Dzikowski, (1985) includes the Bras d'Or Lake watershed in the Eastern Nova Scotia region: A diverse geographical area with high rainfall and generally cool

temperatures, due to the influence of the cool marine currents. Summers are relatively late, warm and sunny with less fog in the watershed than in areas along the Atlantic coast. Winters are often mild and snowy with freeze - thaw cycles. Deep snow accumulates at high elevations, especially in the Cape Breton highland region of the watershed. Total annual precipitation exceeds 1 000 millimetres, with a range of 70 to 120 millimetres per month (Source: Environment Canada. 1989. *Climatic Regions of Canada*. Ecological Land Classification Series. No. 23, Ottawa). Higher values of precipitation typically occur from late October to Late December and from mid-April to late May.

NAME AND LOCATION OF CLIMATE STATION:
Baddeck Station, ID 8200300 Latitude 46°6' N Longitude. 60°45' W

This station meets the World Meteorological Organization (WMO) standards for measuring temperature and precipitation. For the 30-year climate normal period, 1971-2000:

11.3.1. Average temperature of the warmest month

The average temperature of the warmest month: 18.3°C (August)

11.3.2. Average temperature of the coldest month

The average temperature of the coldest month: -6.1°C (February)

11.3.3. Mean annual precipitation

The mean average precipitation is 1 501 millimetres recorded at an elevation of 7.6 metres (Source: www.climate.weatheroffice.ec.gc.ca/climate_normals/results).

Snowfall has a Normal value of 298.6 cm, at the Baddeck Meteorological Station. Approximately 20% of precipitation originates as snow in the Baddeck area, falling between late November and mid April. The percent snow fraction is highest at greater elevations (>30%) (Gates, 1975).

A snowbelt is present over the highlands as a result of orographic precipitation from westerly winds crossing the open Gulf of St. Lawrence. Due to the delay in the onset of spring at higher elevations, the snowpack melt is delayed in the highlands by at least one month. This results in a second peak on stream hydrographs.

In the past, the chemistry of the Island's precipitation was sporadically monitored at three stations by Underwood (1981) and Baechler (1986). No monitoring stations were located in the Bras d'Or Lake watershed. Precipitation chemistry from these stations could be classified as

sodium-chloride type water during the winter, evolving toward a calcium-sulfate: bicarbonate type in the summer. Total dissolved solids (TDS) ranged from 8 to 14 mg/L. Representative chloride concentrations were approximately 2.8 mg/L. The lowest pH's recorded at the rural and urban sites were 4.8 and 4.6, respectively (Baechler, 1986).

Due to the prevailing westerly winds, Nova Scotia lies within the "airshed" of many densely populated, highly industrial areas on the eastern United States Seaboard and the St. Lawrence Valley - Great Lakes region. The province is therefore a recipient of acids and other contaminants from long-range transport of air pollutants. As well, Cape Breton Island lies at the downwind sector of the province and therefore, receives provincial emissions. Fortunately, the bedrock and surficial geology underlying most of the watershed lessens the impact of acidic precipitation.

Climate change scenarios that draw upon various global climate models have been downscaled to the Atlantic Canada region. Groups associated with the Canadian Climate Impacts and Adaptation Research Network (C-CIARN) Atlantic (based at Dalhousie University, Halifax) have used this information to develop adaptive management responses in forestry, biodiversity conservation, protection of coastal lands, protection of freshwater supplies and general emergency preparedness. The climate is expected to become more variable with an increased frequency of more extreme and episodic weather events (compared with earlier decades). It is not possible to identify specific impacts at more local levels, such as within the Bras d'Or Lake watershed. The inland location may buffer the watershed from the more extreme weather events expected along the open Atlantic coast.

Sensitivity of the coasts of the Bras d'Or Lake to accelerated sea-level rise have been addressed by Shaw *et al.*, 2006. They predict the modern rate of sea-level rise (36.7 cm/century) will increase to 60 cm/century by 2030 AD and 115 cm/century by 2100 AD.

Consultations with long-time residents (elders, Aboriginal and non-Aboriginal) about their local ecological knowledge reported noticeable changes in the Bras d'Or over the last few decades. Winters are warmer with more rain and less snow. The Lake rarely freezes over to the extent it once did and summers seem hotter. It has been reported that fifty years ago cars could cross the Lake on the ice. Storms are more frequent and more severe. There seems to be an increase in some insect populations due to the milder winters (Doherty and Naug 2006).

11.4. Geology, Geomorphology, Soils

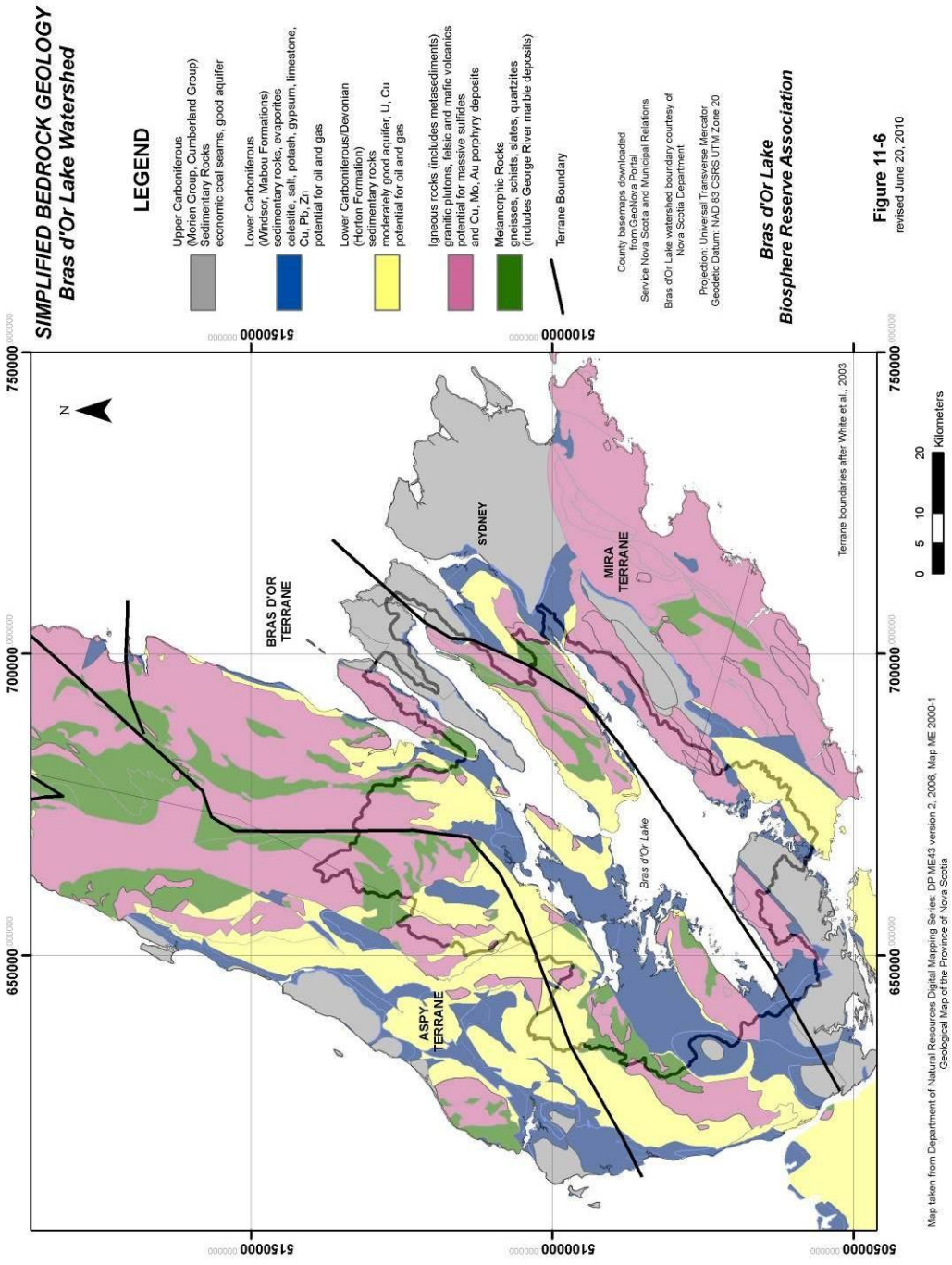
DESCRIPTION OF IMPORTANT FORMATIONS AND CONDITIONS, INCLUDING BEDROCK GEOLOGY, SEDIMENT DEPOSITS AND IMPORTANT SOIL TYPES.

Cape Breton Island has a complex bedrock geology and is reflective of the earth's chaotic history over a long period of geologic time. Because of the variety of rocks and minerals, and the resulting landforms, it is commonly said with pride: "Cape Breton is a geologists paradise!".

Plate tectonics has played a major role in forming Cape Breton Island. Detailed descriptions of the formation, collision and separation of continents, supercontinents and oceans responsible for the diverse bedrock geology of Cape Breton can be found in the literature (Raeside and Barr, 1990; Barr *et al.,* 1996; Barr *et al.,* 1998; White *et al.,* 2003).

From the work of these and many other geologists, it is believed that Cape Breton Island is underlain by five pre-Carboniferous units, the Aspy terrane, the Bras d'Or terrane and the Mira terrane, plus a fragment of Grenvillian (Mesoproterozoic) rocks at the northern tip of Cape Breton Island (outside the Bras d'Or Lake watershed), called the Blair River complex. Recently, White *et al.*, (2003) hypothesized the rocks at the southeastern tip of Cape Breton Island, outside the watershed on Isle Madame, may be related to the Meguma terrane found on mainland Nova Scotia. Good summaries of the geologic background of Cape Breton including the creation, collision and migration of continents and the fossil history of the area can be found in *"The Last Billion Years - A Geologic History of the Maritime Provinces of Canada"* and in *"The Natural History of Nova Scotia"*. Visual diagrams of continents moving through geologic time can be found at www.scotese.com and at http://jan.ucc.nau.edu .

Three of the five geologic terranes underlie the Bras d'Or Lake and watershed. The terranes are shown on **Figure 11-6**, a simplified bedrock geology map of the Bras d'Or Lake watershed. The Mira terrane of southeast Cape Breton Island consists mainly of late Precambrian rocks associated with volcanic arc settings on a continental margin. The Bras d'Or terrane, underlying the north and western portion of the watershed, also includes late Precambrian partially metamorphosed sedimentary rocks that were deposited on a passive continental shelf. Later Precambrian and early Cambrian volcanic arc rocks indicate subsequent development of an active continental margin. Complex Aspy terrane rocks formed by subduction and back-arc basin opening and closure during the Silurian and early Devonian are represented in the highland region of the Baddeck and Middle River subwatersheds.


SIMPLIFIED BEDROCK GEOLOGY
Bras d'Or Lake Watershed
LEGEND
Upper Carboniferous (Morien Group, Cumberland Group) Sedimentary Rocks economic coal seams, good aquifer
Lower Carboniferous (Windsor, Mabou Formations) sedimentary rocks, evaporites celestite, salt, potash, gypsum, limestone, Cu, Pb, Zn potential for oil and gas
Lower Carboniferous/Devonian (Horton Formation) sedimentary rocks moderately good aquifer, U, Cu potential for oil and gas
Igneous rocks (includes metasediments) granitic plutons, felsic and mafic volcanics potential for massive sulfides and Cu, Mo, Au porphyry deposits
Metamorphic Rocks gneisses, schists, slates, quartzites (includes George River marble deposits)
Terrane Boundary
County basemaps downloaded from GeoNova Portal Service Nova Scotia and Municipal Relations
Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department
Projection: Universal Transverse Mercator Geodetic Datum: NAD 83 CSRS UTM Zone 20
Bras d'Or Lake Biosphere Reserve Association
Figure 11-6
revised June 20, 2010
N
BRAS D'OR TERRANE
SYDNEY
MIRA TERRANE
ASPY TERRANE
Bras d'Or Lake
Terrane boundaries after White et al., 2003
0 5 10 20 Kilometers
750000
700000
650000
5150000
5100000
5050000
Map taken from Department of Natural Resources Digital Mapping Series, DP ME43 version 2, 2008, Map ME 2000-1
Geological Map of the Province of Nova Scotia

Around 475 million years ago the Iapetus Ocean began to close and plate collisions resulted in mountain ranges along what is now the east coast of North America. This period of mountain building and emplacement of plutonic rocks, formed the Appalachian mountains of eastern North America (Fensome and Williams, 2001). The roots of these mountains formed the basement rocks of present day Cape Breton Island.

The basement rocks occur in seven belts; the East Bay Hills, Sporting Mountain, Creignish Hills, North Mountain, Boisdale Hills, Kellys Mountain and the Cape Breton Highlands. They are potentially host rocks for massive sulfides and "porphyry type" mineralization of copper, molybdenum and gold (Barr *et al.*, 1996). Where mineralization potential is low, these basement rocks provide a good source of aggregate for the construction industry. North Mountain, Creignish Hills and the Boisdale Hills are known for extensive marble deposits found in the metasediments of the George River Group. These are also host rocks for occurrences of hematite, graphite and wollastonite.

Between these topographic highs are interconnected, northeast trending inter-mountain basins collectively referred to as the Maritimes Basin (Calder, 1998). These interconnected mountains and basins dominated the landscape of the Maritimes from the late Devonian to the Permian. The Maritimes Basin is characterized by thick accumulations of alluvial, fluvial, lacustrine and marine sediments (Pascucci *et al.*, 2000).

The first Carboniferous sediments deposited in these basins, between approximately 365-340 million years ago (Ma), were sandstones and conglomerates of the Horton Group. Within the watershed these coarse rocks form the flanks of the upland regions. Rocks of the Horton Group are often targeted for water supply development in the watershed even though they are potentially a host rock for uranium and copper.

Following the deposition of the Horton sediments, the basins were flooded by the "Windsor Sea" (340 - 325 Ma) which resulted in deposition of extensive evaporite beds and fine-grained sediments of the Windsor Group. The rocks of the Windsor Group underlie most of the Bras d'Or Lake and surrounding low lying areas in the watershed. The Windsor Group contains numerous industrial mineral occurrences including celestite, gypsum, anhydrite, salt potash, dolomite and limestone as well as occurrences of copper, lead and zinc (Boehner, 1986, Shea and Murray,1967, Boehner, R.C. and Giles, P.S., 2003). Fine grained sediments with minor evaporite lenses, referred to as the Mabou Group overlie the Windsor Group.

Overlying the Mabou Group is a thick sequence of mainly braided-fluvial sandstones with minor coal of the South Bar Formation. These Morien Group rocks underlie Boularderie

Island (within the watershed) as well as the near by Sydney area and are economically important as a potable water supply aquifer. During the late Carboniferous extensive rainforests swamps and bogs flourished; the area as we know it today was located near the equator. As the basin subsided and successive sequences of thick sediment and peat were deposited and compressed, economic coal seams were formed (Atlantic Geoscience Society, 2001). The total sequence (~1800 m) of these late Carboniferous sediments were deposited between 325 and 300 Ma. It was the extraction of coal and the manufacturing of steel (outside the watershed) in the late 1800's and during the 1900's that resulted in an out migration of residents from the watershed to the larger industrial centres such as North Sydney, Sydney and Glace Bay.

The Carboniferous rocks of the Maritime Basin, specifically the Sydney Basin are being actively explored on shore and off shore for their oil and gas potential (Government of Newfoundland and Labrador, 2006 and www.gov.ns.ca/energy/oil-gas). Presently there is no active exploration for oil and gas in the Bras d'Or Lake watershed, although on-shore seismic activity has been carried out in the recent past. During exploration for base metals in 1978, in the Malagawatch area light crude oil was encountered. Further drilling encountered a significant section of salt and potash (Boehner, 1986).

Post-Carboniferous strata are not known in the Bras d'Or Lake watershed with the exception of Cretaceous (140 - 65 Ma) clays and sand occurring in isolated deep buried valleys. During the Tertiary (65 - 2 Ma) most of the Maritime Provinces was above sea level and erosion was the dominant geologic process. Through the Tertiary, with the opening of the Atlantic Ocean, there was a slow northward motion of this area on the North American plate and a trend toward a cooler, temperate climate. By 60 Ma, erosional forces had been so effective at wearing down the mountains that the Maritimes was a broad, relatively uniform, lowland plain—almost at sea level. This peneplain gradually uplifted and tilted toward the east as the weight of overlying rock was eroded and deposited off shore. The uplift and erosion resulted in exposure of large plutons that now form the Highland regions. During the later Tertiary glaciation became widespread and its effect on this area was extreme (Atlantic Geoscience Society, 2001).

Drainage systems developed on the tilted plain and downcut deeply into the terrain. The more resistant igneous and metamorphic rocks became the prominent upland areas in the watershed. During the Tertiary, erosion of the softer sedimentary rocks of the Windsor Group, allowed rivers to deepen their courses and the Bras d'Or Lake and Great Bras d'Or Channel were carved out between the uplands of more resistant crystalline rocks. The formation of the

St Andrews Channel, the deepest part of the Lake, is not clearly understood, however it is hypothesized that it is underlain by salt which would have dissolved quickly if folding and faulting allowed groundwater to come in contact with the salt (Shaw *et al.*, 2002).

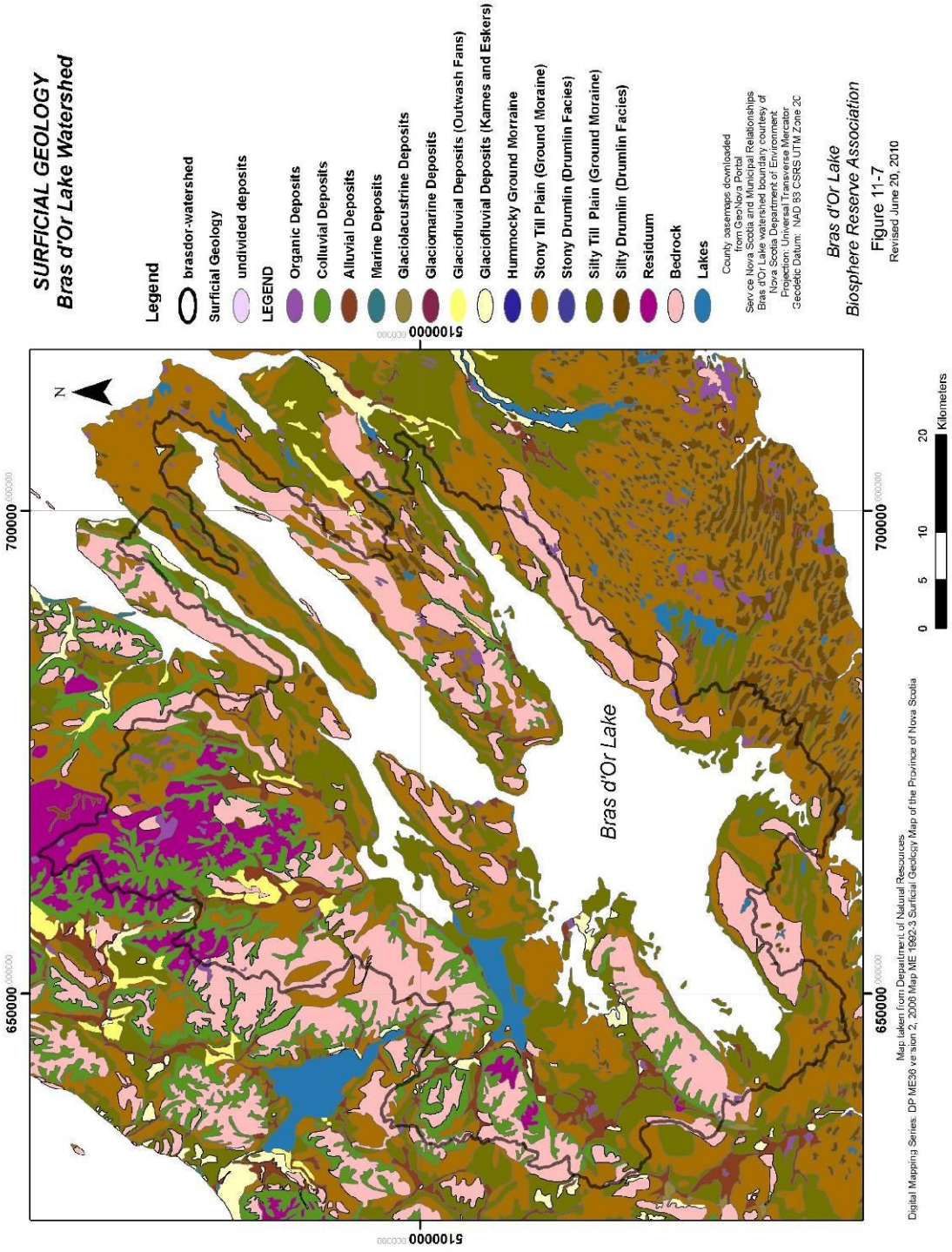
Prior to approximately 55 million years ago, the planet was generally warm and moist. Since then the climate cooled and became drier (Potts, 1996). Cooling culminated with a global ice age during the Quaternary Period. There is evidence of more than sixteen glaciations, each lasting approximately 100 000 years. The watershed's glacial history is a consequence of the interplay of sea level change and ice sheet stability (Stea *et al.*, 1998).

The watershed records evidence of the last two major glaciations, the Illinoian and Wisconsin. The last glaciation started approximately 75 000 years ago, peaked at around 21 000 and finally ended between 12 000 to 10 000 years ago (Nova Scotia Museum, 1996).

Associated with ice movement were large fluctuations in sea level. During the period of maximum glaciation, around 18 000 years ago, sea level was 121 ± 5 metres below the present level. The first rise came 17 000-12 500 years ago, during which time, the sea level increased by 20 metres, followed by an exceedingly rapid rise of 24 metres in less than 1 000 years (Fairbanks, 1989).

Modification of the watershed's topography by glaciation was relatively minor, but with major hydrological implications. It included fluvial incision, glacial scouring of upland areas and voluminous till deposition in lowland areas. The more than 200-metre-deep Bras d'Or Basin was scoured out of weak Windsor Group rocks exhibiting selective and localized erosion on a scale unmatched in the region (Grant, 1994). Extensive sand/gravel "outwash" deposits were formed in the Middle, Skye, Baddeck and Denys Rivers. Several major river valleys were carved into bedrock at a time of low sea level, and then later filled with glacio-fluvial deposits and till. They have been found at Melford (ADI Limited, 2001), Orangedale (Stea, 2003a) and Baddeck (per. comm.) and are inferred in the Skye River Valley and Middle River near Lake O' Law. **Figure 11-7** shows the surficial geology of the Bras d'Or Lake watershed.

With global warming the sea level rose, submerging the landscape approximately 11 600 years ago. The Bras d'Or Lake was created approximately 6 000 years ago, when sea level overtopped a bedrock sill in the Great Bras d'Or Channel at about 25 metres below sea level, changing the Lake from fresh to salt. **Figure 11-8** (Shaw *et al.*, 2006) shows the paleogeography of the region approximately 6 000 years ago with a -25 m water level. Land is shaded in green, water in blue.


SURFICIAL GEOLOGY
Bras d'Or Lake Watershed
Legend
brasdor-watershed
Surficial Geology
undivided deposits
LEGEND
Organic Deposits
Colluvial Deposits
Alluvial Deposits
Marine Deposits
Glaciolacustrine Deposits
Glaciomarine Deposits
Glaciofluvial Deposits (Outwash Fans)
Glaciofluvial Deposits (Kames and Eskers)
Hummocky Ground Morraine
Stony Till Plain (Ground Moraine)
Stony Drumlin (Drumlin Facies)
Silty Till Plain (Ground Moraine)
Silty Drumlin (Drumlin Facies)
Residuum
Bedrock
Lakes
County basemaps downloaded from GeoNova Portal
Service Nova Scotia and Municipal Relationships
Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department of Environment
Projection: Universal Transverse Mercator
Geodetic Datum: NAD 83 CSRS UTM Zone 20
Bras d'Or Lake
Biosphere Reserve Association
Figure 11-7
Revised June 20, 2010
N
Bras d'Or Lake
700000
650000
5100000
0 5 10 20
Kilometers
Map taken from Department of Natural Resources
Digital Mapping Series. DP ME36 version 2, 2006 Map ME 1992-3 Surficial Geology Map of the Province of Nova Scotia

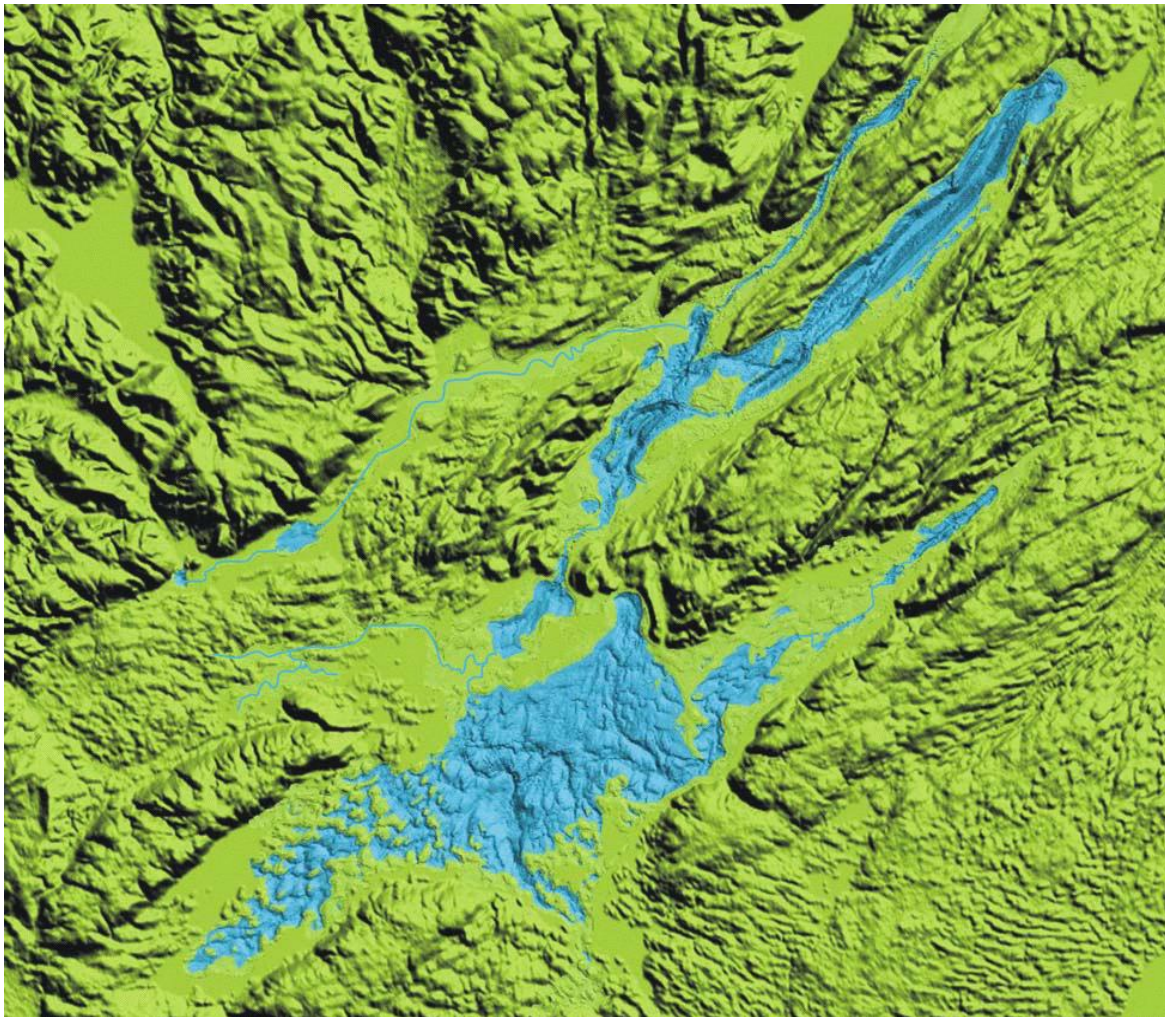


Figure 11-8 Paleogeography of the lake 6000 years ago at -25 m elevation.

It is generally assumed that in Atlantic Canada, a major component of modern sea-level rise is on-going glacio-isostatic crustal subsidence; therefore not the entire submerging coastline in the Bras d'Or Lake is due to climate change. Shaw *et al.*, 2006 derived a crustal subsidence rate of 0.27 m/century. Although there are many uncertainties, they predict a total sea-level rise from 1990 to 2100 AD of 75 cm. including both isostatic (crustal subsidence) and eustatic (world wide changes in sea level) effects. Based on the drowning of paleo-shores roughly 5 000 years ago, they predict that complete destruction or submergence of barrier beaches may become frequent by 2030 AD and typical by 2045 AD. Multibeam bathymetry images of the sea floor suggest entire shorelines were completely submerged within a time period of 300 years given similar rates of sea level rise to what is predicted by 2100.

Soil development over the Bras d'Or Lake watershed is varied and is reflective of the underlying bedrock and surficial geologic units. The sandy loam soils tended to develop over the extensive sandstones of the Morien Group. These soils are the foundation of the agricultural areas (Boularderie Island). Clay soils tended to develop over the shales and siltstones of the Bras d'Or lowlands. Soil development is thin over the upland areas of the watershed.

Cape Breton Island is not tectonically active; therefore the creation of new faults or the rejuvenation of old systems is not expected. Although seismic activity on the eastern North American seaboard is well known, the majority of shocks are very small. With the exception of the Grand Banks earthquake of 1929 (7.2), all instrumentally determined earthquakes in Atlantic Canada have had magnitudes less than 5.2 (Rast *et al.,* 1979).

12. BIOLOGICAL CHARACTERISTICS

FOLLOWING IS A LIST OF THE MAIN HABITAT TYPES (E.G. TROPICAL EVERGREEN FOREST, SAVANNA WOODLAND, ALPINE TUNDRA, CORAL REEF, KELP BEDS) AND LAND COVER TYPES (E.G. RESIDENTIAL AREAS, AGRICULTURAL LAND, PASTORAL LAND). REGIONAL REFERS TO THE HABITAT OR LAND COVER TYPE WIDELY DISTRIBUTED WITHIN THE BIOGEOGRAPHICAL REGION WITHIN WHICH THE PROPOSED BIOSPHERE RESERVE IS LOCATED, TO ASSESS THE HABITATS OR LAND OVER TYPE'S REPRESENTATIVENESS. LOCAL REFERS TO THE HABITAT OF LIMITED DISTRIBUTION WITHIN THE PROPOSED BIOSPHERE RESERVE TO ASSESS THE HABITAT'S, OR LAND COVER TYPE'S, UNIQUENESS. A LIST OF CHARACTERISTIC SPECIES FOR EACH HABITAT OR LAND COVER TYPE IS GIVEN, AND IMPORTANT NATURAL PROCESSES (E.G. TIDES, SEDIMENTATION, GLACIAL RETREAT, NATURAL FIRE) OR HUMAN IMPACTS (E.G. GRAZING, SELECTIVE CUTTING, AGRICULTURAL PRACTICES) AFFECTING THE SYSTEM, ARE DESCRIBED.

Please see **Figures 11-3, 11-4 and 11-5** for representations of the aquatic and marine environments of the Bras d'Or estuary.

12.1. Habitat/Land Cover Bras d'Or Lake estuary Distribution: Local

The physical-chemical complexity of the Bras d'Or estuary (see section 11.1.2) creates a remarkable diversity of habitats within this large but young inland sea. The result is a corresponding diversity of aquatic and marine communities and species, ranging from abyssal-like sedimentary Arctic refuges, to sub-boreal river bed and marine kelp forests, to temperate seagrass meadows. Over the past 50 years several surveys and syntheses of various elements of the marine biota the Bras d'Or estuary, in varying extent and detail, have been undertaken. The results are summarized in ADI (2006), CEPI (2006b, 2009b), DFO (2005), Doherty *et al.* (2006), Kenchington (1998), Lambert (2002), Parker *et al* (2007), Taylor & Shaw (2002), Tremblay (2002), Tremblay *et al* (2005, 2006), UMA Group (1990) and UINR (2007). The following summary is based on these sources.

12.1.1. Characteristic species

The majority of species occurring in the Bras d'Or Lake belong to the boreal biogeographic region and are generally representative of species found along Nova Scotia's Atlantic coast. Two transitional groups, Arcto-boreal, and boreal-temperate species, which can tolerate a greater range in water temperature than the strictly boreal species, are also present. However, due to the singular physical characteristics of the Lake, Arctic and warm water temperate species (Virginian Enclave) are found as well. At the bottom of a 283-metre-deep, canyon-like feature in St. Andrews Channel, environmental conditions are consistently stable with temperature about 0^{o}C (range 2^{o}C) and with salinity about 25 parts per thousand (range 1.5 ppt). Similar conditions exist in deep parts of the North Basin, just north of the Barra Strait, and also to a lesser extent, in some deeper parts of the large Bras d'Or Lake. In these frigid depths relict populations of true Arctic species have apparently survived thousands of years cut off from their far northern relatives. In contrast to these permanently cold areas, many shallow coves and bays throughout the Lake have summer water temperatures that far exceed 20^{o}C. These conditions have allowed the establishment of populations of warm-water species characteristically found off the coastal US states of Virginia and the Carolinas.

St. Andrews Channel, North Basin and the Great Bras d'Or Channel contain the highest diversity of habitats and thus, not surprisingly, have the greatest species richness. This is true across most taxonomic groups.

Fish

Atlantic Cod

The most common fish of the boreal group include cod (*Gadus morhua)*; white hake (*Urophycis tenuis)*; and winter skate (*Raja ocellatus)*. Arctic-boreal representatives include alligatorfish (*Aspidophoroides monopterygius),* and daubed shanny (*Lumpenus maculatus)*. Characteristic of species which can move between warmer temperate waters and cooler Nova Scotia coastal waters are the winter flounder (*Pseudopleuronectes platessa),* and gaspareau (*Alosa pseudoharengus)*. The warm-water temperate group is represented by the windowpane flounder (*Scophthalmus aquosus).*

Forty-six species of fish have been reported for the Lake. Most are demersal and and these are dominated by winter flounder and cod. Pelagic species found in the Lake tend to be migratory and non-resident. Herring (*Clupea harengus),* and mackerel (*Scomber scombrus),* dominate this category. Until recently it was thought that all herring in the Lake were spring spawners and vacated the Lake during the winter. However, capture of herring late in the year, and discovery of herring eggs on seaweed in October, suggest the presence of autumn-spawning herring (possibly resident) in the Lake.

Winter flounder and cod have been prominent in survey catches since the early 1950s. American plaice (*Hippoglossoides platessoides),* also formed a dominant portion of the catch in a 1967 survey. However, in a recent five-year groundfish survey, plaice were scarce and found only in St. Andrews Channel. The relative abundance of other species appears to have changed little. There are currently no commercial finfish fisheries in the Bras d'Or Lake. A ban on bottom trawling was imposed in 1992, and a moratorium was declared on the herring fishery in 1999 due to a serious depletion of the stocks. Farming of salmon and rainbow trout took place at a number of locations on the Lake from the 1970s to about the end of the millennium. However, these activities have now been abandoned, largely due to difficulties in overwintering stocks and low profit margins.

Epibenthic Invertebrates

The most important species from a commercial standpoint are lobster (*Homarus americanus),* and oyster (*Crassostrea virginica) (*a temperate mollusc which is able to spawn and flourish in the Lake thanks to elevated summer water temperatures). Of commercial value, but little-fished due to low abundance, are mussels (*Mytilus edulis*; rock crabs, *Cancer irroratus);* and scallops (*Placopecten magellanicus).*

American Lobster

Overall, echinoderms were dominant, both in number and weight, in trawl catches between 1999 and 2003. Over 80 percent of these were the urchin (*Strongylocentrotus drobachiensis),* and most of the remainder were starfish (*Asteria vulgaris).* Ranked a distant second and third, behind the echinoderms, were the crustaceans and molluscs, respectively. Rock crabs, shrimp, mostly *Pandulus montagui*, and hermit crabs (*Pagurus sp*.), were the dominant crustaceans while quahogs (*Mercenaria mercenaria),* and mussels (*Mytilus edulis)* were the most common molluscs.

Seventy species of polychaete worms were identified from samples collected from a benthic survey conducted in 1981. The dominant species were *Euchone elegans, Polydora quadrilobata, Myriochele heeri, Ninoe nigripes, Nephtys incisa, Sabellides borealis, Lysippe labiata, Melinna elisabethae, Axionice maculata, Terebellides stroemio, Euchone papillosa,* and *Laonome kroyeri.* Significant numbers of Virginian enclave species were present, dominated by the first three polychaetes named above. In addition, four Arctic relict species were identified; *Clymenura polaris, L. Labiata, S. Borealis and Lanassa venusta.*

Five species of mysid shrimp have been identified in the Lake. Two dominant species, *Neomysis americana* and *Mysis stenolepis,* are boreal and found throughout the Lake. Two others, *Mysis mixta* and *Erythrops erythrophthalma,* are Arctic-boreal. The fifth species, *Mysis oculata*, is a true Arctic animal.

Thirty-nine species of foraminifera have been collected in the Lake. Dominating, is *Eggerella advena,* which is common in Arctic inshore waters. Other frequently found types are *Trochammina squamata and Milliamina fusca*.

Plankton

During colder months, the phytoplanton community is mainly made up of diatoms and dinoflagellates. With the advent of warmer temperatures, these forms give way to flagellates and nanoflagellates. Common diatoms are *Nitzchia, Pseudonitzchia, Fragilariopsis* and *Gyrosigma*; while *Dynophysis*, *Prorocentrum, Alexandrium* and *Gymnodinium* make up the bulk of the dinoflagellates. Eight species of potentially toxic phytoplankton were identified, the most common being *Dynophysis* and *Nitzchia*.

The dominant species of zooplankton in the Lake are *Pseudocalanus minutus, Oithona similis, Temora longiremis* and *Tortanus discaudatus.* In all, fifteen species of copepods were identified. Most, like the four dominant forms, are common throughout the region, especially in the Gulf of St. Lawrence. One exception is *Microcalanus pusillus*, an Arctic species which was collected at depth in St. Andrews Channel, and the adjacent North Basin.

Marine Plants

A total of ninety-two species and varieties of marine plants have been identified in the Lake: thirty-one red algae, thirty-one brown algae, twenty-three green algae and seven microscopic blue-green algae. The most common is eel-grass (*Zostera marina)*. Two seaweed associations have been recognized in the Lake; in one, the species are the same as those of the open Atlantic coast of Cape Breton, and in the other, the species are shallow, warm-water plants characteristic of protected bays along the Northumberland Strait. The first group, mostly common brown seaweeds, include the common rockweed or bladder wrack (*Fucus vesiculosus)*, knotweed (*Ascophyllum nodusum)*, kelp (*Laminaria agardii)*, Irish moss (*Chondrus crispus)*, and similar to Irish moss, the leaf weed (*Phyllophora membranifolia).* The warm-water group of seaweeds includes sea lettuce (*Ulva lactuca)*, the fern-like *Bryopsis hypnoides*, twig weed (*Ahnfeltia plicata)*, the coarsely bushy red seaweeds, chenille weed (*Dasya pedicellata)*, the graceful red weed (*Gracillaria foliifera)*, and the finely bushy red seaweeds, banded weed (*Ceramium fastigiatum)*, rough tangle weed (*Stilophera rhizodes)*, and slippery tangle weed (*Sphaerotrichia divaricata).*

Uncommon morphological forms of some common seaweed species were found in the Lake. Unusual bushiness, reduction (or absence) of flotation vesicles and colour variation were some of the anomalies recorded. The wide range of environmental conditions (temperature, salinity, lack of tides and perhaps low nutrients) experienced by plants in the Lake might be responsible for these aberrant forms.

12.1.2. Important natural processes

The topographic and bathymetric configurations of the Bras d'Or, along with the mix of ocean and freshwater inflows, gives rise to the different biotic associations found in the brackish estuarine system of the Bras d'Or Lake. These associations are matched to the diversity of habitats, pelagic and benthic communities (e.g. warm, shallow embayments with temperatures reaching 25°C versus depths > 250 metres with year-round temperatures near 0°C). Restricted hydrodynamic exchange with the Atlantic Ocean limits the inputs of dissolved inorganic nutrients, ocean plankton and hence potential marine recruits to estuarine populations. Terrrestrial inputs from riverine, surface and ground water flows contribute little inorganic nutrient, but are major sources of particulate organic material and inorganic sediment from the erosion of glacial till deposits (Strain & Yeats, 2002). Wind and buoyancy-driven circulations then redistribute and deposit sediments in the deep, low-energy estuarine depocentres (Shaw *et al*, 2002). Rising sea levels through this century will affect this situation through the flooding of low-lying beaches, exposure of erodible shorelines to wave energy, and increased influence from the Atlantic Ocean through the Great Bars d'Or Channel (Shaw *et al*, 2006; Taylor & Shaw, 2002; IISD, 2010).

The estuarine food webs in this semi-closed, mesotrophic system are primarily dependent on autochthonous primary production. Planktonic productivity is relatively low due to the limited nutrient inputs, but most of the area of the estuary is too deep to support high rates of benthic primary production. Hence, macrophyte production by seaweeds and seagrasses in the littoral and shallow sub-tidal fringes are assumed to support detritus-based food webs, although no trophodynamic studies have been undertaken to date. Similarly, the significance of benthic-pelagic coupling processes can be assumed to be significant, given high sedimentation rates, but no data are available. Fisheries production in the form of finfish species (e.g. herring, cod, Salmon) and shellfish (e.g. oyster) has declined exponentially over the past two decades. The relative roles of distal and proximal, anthropogenic and "natural" factors in altering these biogenic processes have not been ascertained.

12.1.3. Main human impacts

The main anthropogenic impacts on the structures, functions, health and resilience of the Bras d'Or estuary appear to have come from fishing, suspected introductions of invasive species and land use in the watershed (e.g. land clearing, road building, forestry, mining, agriculture,

industrial and residential development) that results in sedimentation, pollution and contamination (UMA 1990, CEPI 2006b, Hipwell 2004, Schneider *et al* 2004, Parker *et al* 2007, UINR 2007). There is virtually no sustained monitoring of any of these putative impacts with the exception of generic mammalian faecal coliform bacteria counts during the summer months every third year in the context of the Canadian Shellfish Sanitation Program (CSSP 2009). An effort is now underway to indentify robust indicators of estuarine ecosystem health, monitor them regularly and report annually on the state of the Bras d'Or ecosystem (Hatcher *et al* 2008, CEPI 2009b).

Statistics on fishery yields, catch rates and landings from the Bras d'Or ecosystem are generally not available (an exception being American Oyster, *Crassostrea virginicus*, with reported landings declining from 773 Metric tonnes in 1999 to less than 2 Mt in 2009; Beresford & Hatcher 2007). But all of the major commercial fisheries, and even some of the Aboriginal food and ceremonial fisheries are closed, and Local Ecological Knowledge paints a clear picture of decline in virtually all fish yields (Doherty & Naug 2006, CSI 2009), As fishing declined, a number of fishermen left the industry or continued fishing on a part-time basis. The relative significance of overfishing, damaging fishing practices, anthropogenic degradation of fish habitat and "natural" changes in recruitment and habitat quality are unknown.

Two invasive species are thought by some to have entered the Bras d'Or through ballast water discharges from ships serving the east coast of North America. Green crabs (*Carcinus maenas*) arrived between 1992 and 1995; they prey on native bivalves (including oysters: Tremblay *et al* 2006, Ellerbrook 2008), and also damage eelgrass beds that are important recruitment sites for oyster, spawning areas for herring and nursery habitat for many estuarine and marine fish and crustacean species. Oysters where first discovered to have been parasitized by *Haplosporidium nelsoni* in 2002 (Stephensen *et al* 2003). The protozoan MSX (multinucleated spherical X) infection has resulted in epidemic morbidity and mortality in the oyster beds of the Bras d'Or estuary, essentially destroying the capture fishery and aquaculture industry (Stephensen & Petrie 2005, Beresford & Hatcher 2007). In 2008 another disease of unknown origin (the Malpeque disease) was discovered in a few oyster populations in a small region of the estuary. The mechanisms of arrival of any of these species are unknown, and can only be the subject of forensic analyses at this stage.

The most obvious pollution comes from human sewage: faulty residential and light industrial septic tank systems, inadequate municipal waste treatment facilities and direct discharges into the estuary by straight pipes, commercial ships and recreational boats. The

main impact is bacterial contamination of shellfish and aquaculture sites, with some 3.5% of the tested area of the estuary (approx. half) closed to shellfish harvesting at present (up from <0.01% in 1974) UINR 2007). Direct impacts on human health from these sources have yet to be reported, and in general, the water quality in the Bras d'Or estuary is very good by national and international standards (Parker *et al* 2007, UINR 2007).

Other land-based human activities are reported have also impacted the estuary and its endemic species (Doherty & Naug 2006, Naug 2007a). Land clearing associated with mining, forestry and agriculture practices that clear the streamside (riparian zone) and allow cattle to access streams,is assumed to have increased the discharge rate of runoff waters into rivers, leading to increased sedimentation, decreased salinities and excess nutrient flows at the mouth of rivers (e.g. River Denys: Barrington 2005).

Attempts to raise Atlantic salmon (*Salmo salar)*, Arctic char (*Salvelinus alpinus)*, and rainbow trout (steelhead) (*Onchorhynchus mykiss)*, through finfish aquaculture in the Bras d'Or, had been virtually abandoned by 2004, largely due to sporadic, extreme cold water events. A steelhead population still exists, however, derived from fish that escaped from the pens over a 10-year period (CSI 2009).

12.1.4. Relevant management practices

Management of human activities for the conservation and preservation of the estuarine ecosystem in the Bras d'Or watershed is complicated by overlapping jurisdictions resulting from land-ocean interactions in the coastal zone. Much of what affects marine environmental quality and organic productivity is derived from the land in the adjacent watershed. So management practice needs first to recognize geographic causal relationships, and then coordinate management actions among relevant empowered agencies and authorities. This is not easy in the Bras d'Or, where 18 legally empowered agencies spanning four levels of government share authority and responsibility (yet, there are still gaps in policy and regulation!). The CEPI is intended to produce the necessary collaboration of planning and management activities for the greater good of the entire ecosystem and its people.

Concerted efforts have been underway, beginning in 1997 with the Bras d'Or Stewardship Society, and strengthened with the formation of the Pitu'paq Partnership in 2001, to implement pollution control, remediation and prevention for the Bras d'Or Lake. The prime focus for this work has been human sewage management. A number of projects to upgrade sewage treatment facilities, or to install new ones, have been undertaken under the authority of the

Provincial Department of Environment, Municipal Councils and First Nation's Band Councils (these entities make up the Pitu'paq Partnership).

Fishing of some stocks has been restricted, or stopped altogether under the authority of Fisheries and Oceans Canada and, in the case of Food and Ceremonial fisheries: the First Nation's governments. Some oyster beds remain closed due to bacterial contamination under the authority of the Canadian Shellfish Sanitation Program (CSSP, 2009). Under this comprehensive federal, multi-agency and international program, quality assurance is implemented for shellfish grown for human consumption. There is an intensive water quality monitoring program around the oyster beds and aquaculture sites to help determine those that can still be harvested safely. Six levels of classification are imposed according to the CSSP Manual of Operations based on this sampling: Approved, Conditionally Approved, Closed, Restricted for Controlled Purification, Restricted for Relaying and Prohibited. The monitoring for mammalian faecal coliform bacteria and point source sewage inputs takes place at hundreds of sites throughout the estuary during the summer every third year. Conservative rules limit transitions among classifications according to stringent burdens of proof.

In 2006 the Bras d'Or Lake and all connected waters inside a line joining Carey Point to Noir Point in Great Bras d'Or, southwards of Alder Point in Little Bras d'Or, and northwards of the seaward end of the St. Peter's Canal, was designated as a "No Discharge Zone" for all boating traffic under Transport Canada regulations. This designation comes into force in June of 2010.

The Nova Scotia Department of Natural Resources requires a 20-metre-wide special management zone or buffer bordering both sides of streams with widths greater than, or equal to 0.5 metres. Planting and tree harvesting can still occur in the buffer, but there are restrictions. Current agriculture practices encourage farmers to fence cattle away from stream banks.

Of great significance for sustainable management is the CEPI initiative (Part I -pg. 18), aimed at developing a master management plan for the entire watershed (CEPI, 2006a). This will provide leadership for each subwatershed, with the intention to establish sustainable practices for the future. See more about this work in the Cooperation Plan, **Appendix 1**.

12.2. Habitat/Land Cover Bras d'Or forests Distribution: Regional

The Bras d'Or watershed includes several ecoregional classifications. It falls entirely within the Atlantic Maritime Ecozone. Within that are three ecoregions: the Cape Breton Highlands, the Nova Scotia Uplands and the Northumberland Bras d'Or Lowlands. Within these,

there are five ecodistricts as mentioned earlier in Section 8 (see **Figure 8-1**). All of the areas are dominated by forest cover.

The main forest types are described well by Loucks (1961) and Davis & Browne (1997). Most of the forests covering slopes around the Bras d'Or are deciduous (sugar maple, American beech, yellow birch and hemlock). There would have been more forests before the clearing of land for agriculture. Balsam fir is a climax tree, but the number of balsam fir within the Bras d'Or watershed is limited. Most are found on the Highlands Plateau.

Much of the land surrounding the Bras d'Or estuary is covered with forests (**Map 2**). The name of the watershed itself is indicative of the natural abundance of mixed hardwoods whose colourful fall foliage magnificently reflects off calm water surfaces. Aerial surveys of Cape Breton forests have been conducted in decennial intervals since the late 1930s. The aerial photography has been interpreted by government agencies to produce maps of the forest cover at a large cartographic scale of 1:10 000 and to provide estimates of merchantable wood stocks for the commercial exploitation (harvesting) of the forests. Although the film quality and interpretative standards of aerial photography have changed in the course of time, the forest inventories do provide a sound basis for determining the following: area covered with forests, the contiguity and size of forest cover types, the approximate height of the forest cover, as well as any forest cover changes such as transfers from tall to short, and from deciduous forests dominated by broadleaved trees to evergreen forests dominated needle trees and *vice versa*.

Floristic surveys of the forest understory and the ground vegetation do not exist for the Bras d'Or watershed. As for many other regions of North America, there are no maps available for the watershed region that would depict any floristic classification of the forest vegetation at the level of species alliances, let alone species associations. Any large scale cartographical representation of the natural vegetation diversity would have been further complicated by anthropogenic transformations of most of the natural forest vegetation in the course of the last two centuries, due to agricultural settlement, logging and disease infestation. Moreover, the presence of forest fragments dominated by old large-diameter trees, is an obvious indicator of the degradation of the original forest cover. Remnants of old forests hold promise, however, for eventual vegetation restoration of the Bras d'Or watershed.

12.2.1. Characteristic tree species

White spruce (*Picea glauca*) and balsam fir (*Abies balsamea*) occur in heavier soils associated with red maple (*Acer rubrum*) and white birch (*Beula papyrifera*). Balsam fir dominates some sites on the plateaus. Better-drained slopes support stands of sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), and yellow birch (*Betula alleghaniensis*). Black spruce (*Picea mariana*) and larch (*Larix laricima*) are common in wetter bog areas). Eastern hemlock (*Tsuga canadensis*), red spruce (*Picea rubens*)—restricted to older forests, generally steep sided ravines and pine (*Pinus spp*.). All the native pine is White Pine, (*Pinus strobus*), scattered throughout the area. Uncommon species include red oak (*Quercus rubra*), American elm (*Ulmus americana*.), white ash (*Fraxinus americana*), and three species of poplars, *Populus balsamifera, P. tremuloides,* and *P. grandidentata*. *Populus tremuloides* and white ash are much more common than red spruce, which is an uncommon species. The ratio of coniferous to deciduous trees is approximately 1.7 to 1.

The prevailing temperature and precipitation provide for a humid, cool-temperate climate in the region. Poor soil drainage is, however, not uncommon on Cape Breton, and this likely shortens the effective growing season considerably in some areas. This hydro-edaphic anomaly may well explain why the zonal cool-temperate forests are interspersed with forest patches dominated by tree species of the cold-temperate zone, thus creating an ecological transition zone at the landscape level (i.e. ecotone). The cool-temperate vegetation component of the ecotonal landscape is presently dominated by broadleaved deciduous tree species of the genus *Acer* (maples) and the species yellow birch (*Betula alleghaniensis*). These two species naturally occur in equitable mixtures, with the coniferous eastern hemlock (*Tsuga canadensis*) and white spruce (*Picea glauca)*, while red oak (*Quercus rubra*), white ash (*Fraxinus americana*), and white pine (*Pinus strobus*) remain infrequent companion species. Moreover, elm trees (*Ulmus americana*), species of the genus *Populus*—and according to traditional ecological knowledge possibly black ash (*Fraxinus nigra*), occur in riparian zones.

Tree species with a wide continental range represent the cold-temperate flora of the boreal forest component and include species of the coniferous genera *Abies, Picea, Pinus,* and *Larix,* but also the broadleaved paper birch (*Betula papyrifera)* and trembling aspen (*P. tremuloides*). Large stands of black spruce, balsam fir and larch, dominate the natural forest cover of the extra zonal vegetation within the ecotone, while white spruce and paper birch respectively represent the secondary forest cover of old fields and clear cuts on upland sites.

12.2.2. Important natural processes

Natural disturbances include small fires in softwood (conifer) stands and individual tree mortality (most common in hardwood (deciduous) stands). Extensive winter deer yards have developed in the softwood cover of sheltered lowland areas; one of the largest is a 2 400-hectare site in the River Denys watershed. “High concentrations of deer can have a negative impact on the regeneration of many coniferous and hardwood species (Frelich, 2002).” If whitetail deer populations exceed the natural carrying capacity of the habitat, then over-browsing may indeed negatively impact immature softwood and hardwood regeneration. However, deer populations have been low in the watershed for some years and so this effect has not been significant.

Insect disturbances come from spruce budworm (*Charistoneura fumiferana*), restricted to Balsam Fir stands; tussock moth (*Oxygia leucostigma*); hemlock looper (*Lambdia fiscellaria*), which also eat spruce; spruce bark beetle (*Dendroctonus rufipennis*), and balsam fir sawfly (*Neodiprion abietis*). Eastern Spruce bark beetle infests mainly white spruce, which has regenerated on abandoned farmland. Although it may infect white spruce growing in association with hardwood stands, it causes most damage in mature to overmature white spruce stands that have resulted from this tree species ability to regenerate abandoned farm fields. The current infestation has devastated many old field white spruce stands in the watershed and has resulted in increased efforts by landowners to salvage infected trees.

Beech scale insects (*Crytococcus fagisuga*) help spread an introduced fungus (*Nectria coccinea*) to beech trees; this fungus deforms bark and limbs, and leads to reduced seed set and early mortality. Cape Breton Island has also had a history of large-area insect infestations in recent decades.

The dominant tree species of the zonal cool-temperate forests are tolerant of shade. Even at low light levels, the evergreen, eastern hemlock and red spruce enjoy a phenological advantage when regenerating under mixed canopies of deciduous and evergreen trees. Morphological plasticity and superior physiological capacity enable the deciduous beech, maples and yellow birch to regenerate within small canopy gaps created by natural tree mortality. Thus, the intriguing aspect of the zonal forest is the dominance of self-replacing and long-living tree species capable of both occupying sites for long time periods, and creating high structural diversity within small areas due to an uneven age structure.

Tree species dominating the extra-zonal forest cover tend to form dense, uniform stands of a single species (e.g. black spruce or balsam fir) that eventually break open following periods

of severe frost heave or at time of age maturity. Gaps in monospecific stands of shade-intolerant species render the forest increasingly vulnerable to large-area disturbances due to wind throw.

12.2.3. Main human impacts

Farming and forestry are the most significant current (and historical—for more than 200 years) disturbances in the region. Abandoned farmland on poorer sites leads to natural regeneration, especially by white spruce, white birch and red maple. Indeed, much of the forest visible from the road is early successional, consisting of these three species invading abandoned farmland. The spruces ultimately provide a reliable source of fibre for the pulp and paper industry in Cape Breton. This decrease in farming, and the resultant succession, has increased the amount of forest cover over the past 40 years.

An ecohistorical case study to the east of the Bras d'Or concluded that most of the land with significant natural deciduous forest cover had been claimed by settlers (Bouman *et al*. 2004). Mostly immigrants from Scotland attempted to improve their settlements for agriculture by clearing approximately 40 percent of the natural forest cover in the 19th century. Although agriculture ceased in most areas, the forest clearings and ensuing agricultural activities (including crop production and livestock keeping) constituted an unnaturally large and contiguous vegetation disturbance throughout the region for an extended period of time. This historic disturbance and the continued forestry practice of clearcutting have opened an increasingly large area of natural forest territory for the invasion by herbaceous plant species and tree species that are rapid colonizers, well adapted to grow in open areas. Historical records also indicate commercial logging for the production of hemlock and spruce lumber as well as pine logs. Moreover, early naval explorers apparently noted the pine trees along the shores of the Bras d'Or and exportation of "fir" from Cape Breton to England was recorded during the time of the Napoleonic Wars in the early 19th century.

Agricultural land use continued in riparian zones which supported tree species like the American elm (*Ulmus americana*), rare on upland, as well as waterlogged sites. Similarly, a number of herbaceous plant species characteristic of riparian zones have likely been exposed to a greater risk of extirpation than species associated with the ground vegetation of common forest sites. In addition to active vegetation disturbances, the introduction of a disease at the turn of the 20th century resulted in a passive human disturbance of the forest cover, eliminating the extremely shade-tolerant beech tree (*Fagus americana*) from the forest canopy. The long-

term effects of this species decline on the floristic composition and ecosystem functions of the Bras d'Or watershed have not been assessed. Place names like 'Beechhill' and 'Beechmont' corroborate however, the autecological notion that beech species would have held, prior to decline, a competitive advantage over other cool-temperate tree species within a distinct niche of the physio-edaphic gradient in the uplands of the watershed region.

12.2.4. Relevant management practices

Most of the forest management in the watershed area is for the production of wood, although, there are large differences in the levels of intensity at which the harvesting is done. Forestry is carried out by small landowners (individually), group ventures, and cooperatives. NewPage manages nearly all Crown land in the watershed of which there is 845 km^2 (34% of land area). The remaining 66% is private land owned by small private landowners. Most of the wood is processed for the manufacturing of pulp and paper or for construction lumber.

Most harvesting that does occur within the watershed is the result of clearcutting, however, the recent adoption of FSC certification by NewPage will lead to restoration-based objectives for most of the Crown land in the watershed, which, over time will reduce the use of clearcut harvesting. Planting follows harvesting on roughly 50 percent of sites on Crown land—the remainder regenerate naturally. Silviculture is also common on private woodlots in the area. Treatments are dominated by planting, weeding and pre-commercial thinning. Hardwood harvesting is mainly limited to fuel wood production as there are limited market opportunities for hardwood material. As a result, there is little hardwood-based silviculture occurring.

NewPage sustainable forestry practices
(A. Doucette)

The Woodlands Unit of NewPage has a long-term sustainable forest management plan with a 80-year strategic planning horizon that is updated every five years. The plan conforms to two forest management standards to which NewPage is certified: the Canadian Standards Association (CSA Z809-02; www.csa-international.org/product_areas/forest_products_marking)

and the Forest Stewardship Council Maritime Standard (http://www.fsccanada.org/maritimes.htm).

The forest management plan covers the woodlands' operating region of 650 000 hectares of licensed Crown lands and 24 000 hectares of owned land in northeastern Nova Scotia and Cape Breton. NPPH's operating area includes 823 km^2 (~33 percent) of the Bras d'Or Lake watershed, mainly in the Baddeck and Middle River subwatersheds, but also in parts of eight of the other subwatersheds, including that of the River Denys. These main watersheds have specific objectives in place to keep the amount of area in recent-cut condition to less than 20 percent. The plan also includes special management areas restricting logging on steep slopes, protecting riparian zones of rivers and streams, considering aesthetics for viewsheds (cutting patterns visible to tourists), keeping at least 8 percent of the plan area as old forest, protecting habitats for species-at-risk and for maintaining forest corridors between ecologically important areas. The Biosphere Reserve will be able to facilitate actions in concert with this plan.

12.3. Habitat/Land Cover Freshwater subwatersheds Distribution: Regional

12.3.1. Characteristic species

The freshwater ecosystems of the Bras d'Or Lake watershed contain a wide diversity of aquatic organisms. Streams and rivers are characterized by their particular members of the Salmonidae: highly valued cold water species such as brook trout (*Salvelinus fontinalis*) and Atlantic salmon (*Salmo salar*). Other salmonids include rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*)—both introduced. Other fish common throughout include rainbow smelt (*Osmerus mordax*), American eel (*Anguilla rostrata*), white sucker (*Catostomus commersoni*), and American shad (*Alosa sapidissima*). Some populations are resident; others migrate into the Bras d'Or Lake and/or into the streams that feed into the Lake.

Other characteristic species in this habitat include mammals, amphibians, reptiles, birds and insects. For example, beaver (*Castor canadensis*) are significant with respect to the freshwater environment because of their ability to greatly alter the hydrological characteristics of large section of streams through the construction of dams. Dams impound water behind them and may become barriers to fish passage, especially under low flow conditions. Among reptiles, the wood turtle (*Glyptemys insculpta*) is found in the River Denys subwatershed. The wood turtle is listed as of special concern (SC) by the **C**anadian **S**pecies at **R**isk **A**ct Registry and as vulnerable (VUL) under the **N**ova **S**cotia **E**ndangered **S**pecies **A**ct. The wood turtle prefers slow

moving, meandering, low-gradient sections of streams with well-established gravel deposits on the inside of river bends. Common bird fauna that are associated with freshwater environments include kingfishers (*Ceryle alcyon*), waxwings (*Bombycilla garrulus*), mergansers (*Mergus merganser*), and bank swallows (*Riparia riparia*).

The streamside habitats are highly varied. They range from forested to clearcut; farmed land to urban use. The riparian habitats are less impacted by human activities in their headwaters but as they decrease in gradient, they afford highly valued flood plains where humans have settled and succeeded at pastureland development.

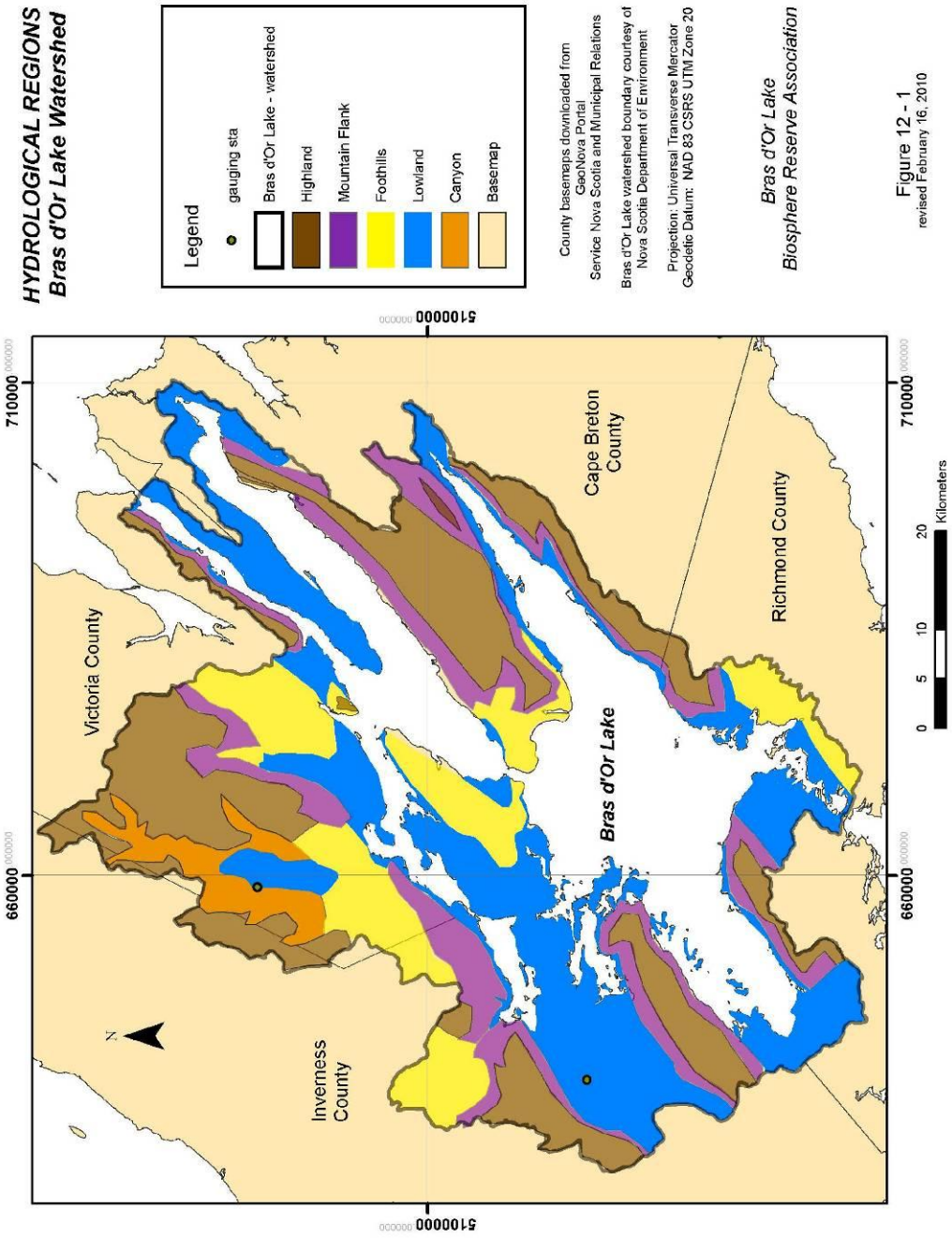
12.3.2. Important natural processes

The key to describing the natural processes of the Bras d'Or Lake watershed's fresh, groundwater, stream and lake habitat is to be able to map the occurrence, quantity, quality and transport of water as it moves through the waterscape.

The effects of climate, geology and topography have been synthesized to develop a preliminary conceptual model of freshwater resources in the Bras d'Or Lake watershed. The model identifies six Hydrological Regions; these are the Highland, Mountain Flank, Foothills, Lowlands, Canyon and Bras d'Or Marine Hydrological Regions (summarized and adapted from ADI Ltd., 2006). Within each region, common characteristics govern the Hydrological Cycle (movement of water) and the Geochemical Cycle (movement of chemicals). **Figure 12-1** shows the Hydrological Regions discussed below (adapted from ADI Ltd., 2006).

Highland Hydrological Region

This region encompasses approximately 30 percent of the watershed. It includes the Cape Breton Highlands as well as isolated remnants protruding above the lowlands. Distinctive elements incorporate resistant igneous and metamorphic bedrock, draped with thin discontinuous weathered rock at high elevations, under a harsh climate and with a high water surplus. These rock types represent the core of the former Appalachian mountain chain and form the "basement" rocks of the Island.


HYDROLOGICAL REGIONS
Bras d'Or Lake Watershed
Legend
gauging sta
Bras d'Or Lake - watershed
Highland
Mountain Flank
Foothills
Lowland
Canyon
Basemap
County basemaps downloaded from GeoNova Portal
Service Nova Scotia and Municipal Relations
Bras d'Or Lake watershed boundary courtesy of Nova Scotia Department of Environment
Projection: Universal Transverse Mercator
Geodetic Datum: NAD 83 CSRS UTM Zone 20
Bras d'Or Lake
Biosphere Reserve Association
Figure 12 - 1
revised February 16, 2010
710000
660000
5100000
Victoria County
Cape Breton County
Richmond County
Inverness County
Bras d'Or Lake
N
0
5
10
20
Kilometers

This region in the headwaters of the Baddeck and Middle River watersheds comprises an expansive bedrock controlled low relief peneplain, at high elevation (300-450 metres) under the influence of a snowbelt. The thin overburden contains numerous wetlands in local depressions and widespread barrens. It also includes six, long, linear ridges at lower elevations (100-300 metres). These ridges are the Creignish Hills, North Mountain, Sporting Mountain, East Bay Hills, Boisdale Hills and Kellys Mountain.

A shallow water table has developed over these resistant igneous and metamorphic rocks. There is little or no overburden to act as a recharge source for the bedrock during dry periods. Local facture-controlled groundwater flow systems dominate the waterscape, governed by discrete subvertical fractures to depth and a horizontal higher permeable zone near the bedrock surface. Streams exhibit low gradients, with little erosive power. Minor glacial lakes are present, formed primarily as basins scoured by ice movement.

Water chemistry is controlled by the crystalline, relatively insoluble bedrock except in localized regions where marbles exist. Stream and groundwater chemistry generally exhibit dilute sodium chloride water, gradually transitioning to calcium bicarbonate water, where carbonates are present. The wetlands create highly coloured, usually low pH water systems due to elevated organic carbon.

Streambed sediment chemistry indicates localized elevated concentrations of specific metals including copper, lead zinc, silver, mercury and nickel, due to natural mineralization.

Mountain Flank Hydrological Region

This region forms the transition between highland and lowland regions. It occurs as narrow linear features, generally paralleling the northeast-southwest oriented highland regions, encompassing some 20 percent of the watershed. This region is the most complex and forms the more spectacular scenic vistas on the Island.

Distinctive features include a steeply dipping contact between the basement rocks and a variety of sedimentary rock, usually separated by a major fault. In most areas, the region is marked by a steep transition slope with conspicuous bare rock or covered by rock talus; locally, this is deeply dissected by mountain valleys. Climatic conditions reflect attributes of both the highland and lowland regimes.

The configuration of low permeable basement bedrock, overlaid at steep angles by permeable overburden along a faulted transition slope, then covered at the base by a variety of sedimentary rock, results in high diversity hydrological conditions within a narrow zone.

Intermediate and regional fracture-controlled groundwater flow systems dominate the waterscape. Hydraulically active fault zones, dissected by deeply incised mountain valleys, usually act as groundwater discharge zones. These fault zones provide conduits for deep basement flow, including evaporite brines to discharge at surface, as is found at Bucklaw.

Streams are mainly perennial, and are often spring fed. Gradient and erosive power is high over the steep slopes, including waterfalls; both reduce dramatically at the base.

Initially stream and groundwater chemistry exhibits dilute sodium chloride water, gradually transitioning to calcium bicarbonate water, especially in areas underlain by carbonates. Depending upon the type of rock at the base of slope, the water chemistry can be quite different from the source water, due to inflowing groundwaters.

Foothills Hydrological Region

This region is characterized by intermediate uplands, generally adjacent to highland areas. It covers some 17 percent of the watershed.

Distinctive features include a heavily dissected landscape with well-rounded slopes, at moderate elevations (300-350 metres). Bedrock consists of moderately permeable sandstones and conglomerates overlain by a continuous blanket of sandy glacial till. It is outside the major snow belt.

The moderately permeable sandstones and conglomerates within a region of high water surplus, results in high water table conditions. The sandy till acts as a recharge source for the bedrock during dry periods. Local, fracture-controlled groundwater flow systems are governed by an interconnected fracture network at depth, and by a horizontal, higher permeable zone near the bedrock surface.

Streams exhibit a dominant trellised pattern due to rock structure, with a secondary dendritic pattern. Over well developed valley floors they are underfit and exhibit a straight to slightly meandering pattern.

Water chemistry is controlled by the rock matrix and cementation of the sandstones and conglomerates. Stream chemistry generally exhibits dilute calcium bicarbonate water with near neutral pH.

Lowland Hydrological Region

This region covers the largest area of the watershed (33 percent). It is positioned primarily within the central core, nestled between the highlands and the Bras d'Or Lake .

Distinctive features include a low lying, gently undulating plain underlain by a variety of sedimentary bedrock and overlaid by either a sandy or silty glacial till with localized sand/gravel. It is influenced by a coastline of submergence which has dissected the region with deeply indented saltwater embayments. The climate is consistent with the Eastern Nova Scotia Climatic Region; the snow belt is absent.

Close to 15 percent of the Lowland Region is characterized by underlying sandstones overlaid by a thin, continuous blanket of sandy till and localized wetlands. The competent bedrock is well fractured by extensive folding. Hills are smooth, rounded, and bedrock controlled with minor dissection by low order streams. Local fracture-controlled groundwater flow systems are governed by discrete subvertical fractures to depth with higher horizontal permeable zone near the bedrock surface. The overburden acts as a reservoir recharge source for the bedrock during dry periods. Numerous lakes are present, formed either as basins scoured out by glacial ice movement or dammed by glacial till.

A further 18 percent of the Lowland Region exhibits similar topography but is distinctive by its lower elevation, underlying argillaceous sedimentary rock (siltstones, shale) and evaporites (salt, gypsum, potash). Salt diapirs occur at depth, warping the sedimentary beds. Bedrock is covered with a thick blanket of silty till and localized glacial lake clays. The area exhibits karst sinkholes. Karst features are usually inactive, having been infilled with glacial debris. However, local areas of active karst occur near Melford and over the Iona / Washabuck Peninsula. The low permeability of bedrock and overburden, coupled with low relief, minimize recharge and maximize runoff. Streams are, for the most part, ephemeral, which within karst systems disappear underground then reappear some distance away. Lakes are primarily of solution origin. Stream and groundwater chemistries are strongly controlled by the rock matrix of the dominant evaporates containing a wide variety of soluble salts.

Four notable stream valleys; Skye River, River Denys, Baddeck and Middle Rivers, comprise approximately 38 percent of the Bras d'Or Lake watershed. The rivers flow across the Lowland Regions to discharge into the Bras d'Or Lake. Here they exhibit gently sloped, smooth valley flanks, bounding wide valley floors which are underlain by large glacial-fluvial outwash deposits. In some, pre-glacial bedrock channels have been infilled by either Cretaceous or Quaternary sediments. Large meandering rivers within broad, and at times, terraced floodplains flow across the valley floors.

Water chemistry from a tributary of River Denys for example, is characterized by a low to moderate total dissolved solids (50-450 mg/L). Dissolved solids increase as the water flows

through the lowland areas because of the groundwater contribution to stream flow. Total dissolved solids show an inverse relationship with stream flow, due to baseflow provided by the adjacent sand and gravel aquifer. The water is generally a non-coloured, corrosive, soft to hard, mixed calcium / sodium sulfate / bicarbonate water with an alkaline pH (6.7-8.0).

Estuarine areas comprise about 1 percent of the watershed and represent a dynamic setting where brackish barachois ponds are formed along the coast of the Bras d'Or Lake. The position of the salt water and fresh water interface is governed by seasonal fluctuations and rainstorms. The seaward boundary is constantly changing due to sea level rise and long shore drift from wave and current action. Deltaic environments at the mouths of the Middle and Baddeck Rivers, as well as large irregular shaped embayments such as the River Denys Basin are included in this description.

Canyon Hydrological Region

The Middle River is defined as a Canyon Region, and comprises 4 percent of the watershed. Canyons predate the last glaciation and have been carved into the waterscape over approximately the last 65 million years.

The key distinctive feature is large river systems, deeply incised into and bounded by the Highland Hydrological Region with its associated snowbelt. The Mountain Flank Region forms the canyon walls, dropping the waterscape down to a broad lowland region, with large-order rivers meandering across a wide "U" shaped valley floor.

Recently, a stream gauge was installed in the Middle River watershed. It records stream discharge, over 116.8 km^2, or 36 percent of the Middle River watershed. The hydrograph is characterized by dual peak flows in spring, from March through May. The early peak represents snowmelt in the lowlands; the latter the later highland melt peak. The river is perennial with baseflow in summer and midwinter provided by inflow from bedrock and sand/gravel aquifers. Fall rains produce numerous storm peaks superimposed on rising baseflows. The annual mean daily flow in 2004 was 4.9 m^3 per second (cms), creating a runoff coefficient of 0.04 cms/km^2. The water chemistry at this station is characterized as fresh, soft, corrosive, non-coloured and slightly alkaline. The total dissolved solids show an inverse relationship to discharge, reflecting a strong groundwater baseflow component. Low flows exhibit a calcium bicarbonate water, high flows, a mixed sodium / calcium-chloride / bicarbonate water (ADI Ltd., 2006).

Bras d'Or Marine Hydrological Region

The sea floor of the Bras d'Or Lake forms its own hydrologic region. While seemingly unorthodox to describe this setting as part of any "watershed", it is important to recognize that from approximately 10 000-6 000 years ago, prior to inundation by the sea, what is now sea floor, was forested land exposed to precipitation events (Shaw and Taylor, 2008; Mott *et al*., 2009). During that time, precipitation recharged lowland aquifers and fresh water drained through streams to freshwater lakes.

Inundation by sea level rise has presently created approximately 1 230 km of shoreline where fresh water meets salt water. This region comprises some 1 092 km^2, or 30.6 percent of the total watershed (3 566 km^2).

While streamflow enters the Bras d'Or Lake at sea level, deep and intermediate groundwater flow systems discharge water up through the sea floor. Although groundwater inflow has not been documented, it contributes to the water balance of the Lake. The impact of historical karst formation may be seen in the linear deep-water trough of St. Andrews Channel and depressions in the Great Bras d'Or Channel, southwest and west of Kempt Head. While humans do not directly utilize this water resource, the impact of groundwaters discharging through the sea floor could have an affect on benthic aquatic life ecosystems and must be accounted for in Lake hydrological budgets. Fresh water inflow, both from ground and surface water, accounts for the approximate 2/3 salinity of the Bras d'Or Lake.

12.3.3. Main human impacts

The main human impacts come from settlements and land use within the watershed. Activities related to forestry, farming, residential development and mining represent the most significant impacts on the freshwater environments. Forest management practices and land clearing for agriculture, mining and urban growth have accelerated erosion along stream banks.

Riparian zones are presently less effective at buffering the effects of high intensity precipitation events. With impacted riparian zones, water falling in the watershed moves through disturbed soil and/or overland rills and enters the active stream channel at high discharge rates, very soon after rain begins. This produces high velocity streams that are termed flashy, resulting in increased streambank erosion and excessive bedload transport of bottom substrates. Sedimentation has a major impact on fish survival because it can fill in the spaces between gravels and thereby limit the supply of oxygen for developing eggs.

Recreational fishers and a First Nations' fishery produce other impacts on the populations of finfish within streams and rivers. First Nations place a high value on the ability to procure this resource for food and ceremonial purposes and are self-regulatory under the Mi'kmaq philosophy known as Netukulimk. Netukulimk is the Mi'kmawey concept of harvesting resources without jeopardizing the integrity, diversity, or the productivity of the environment. The non-aboriginal recreational fishery is highly regulated, for sustainability, by the provincial government. There is the requirement of purchasing a fishing licence, and there are regulations for particular species, special management areas, time of year, number of fish that may be retained, and/or through a "catch and release" fishery.

12.3.4. Relevant management practices

The CEPI has adopted subwatersheds as the relevant topographical and ecological units for developing ecosystem-based approaches to management. There are twelve management areas/subwatersheds, each of which has been extended into nearshore bays of the Lake, as the receiving waters. For planning purposes, the entire Lake has been allocated to various subwatersheds (CEPI, 2006a). The CEPI has also initiated the Collaborative Salmon Initiative (CSI) with the main goal, to sustain and improve salmon populations throughout Cape Breton (CSI, 2009).

The River Denys subwatershed serves as a pilot project because of several local initiatives taken by local residents. One local residents' group, the Stewards of the River Denys Watershed Association (SRDWA) was formed in 1999, by volunteers representing watershed communities and stakeholders. This association has formed partnerships with government agencies and private organizations to undertake fish habitat restoration projects and to investigate sources of water pollution, siltation and contamination. The association has developed a three-year subwatershed management plan.

The River Denys watershed is about 300 km^2. It has mixed hardwood forests, a major wetland complex, and a historically significant oyster fishery in the Lake (compromised by bacterial contamination and the MSX parasite). Salmon and trout spawn upstream and herring spawn in the shallow eelgrass beds of the Lake. Consultations with community members in 2005/2006 identified priority issues: assessing, and where necessary, applying remediation of areas impacted by pollution associated with sewage, garbage disposal and a landfill site; restoring fish habitat and the oyster beds / aquaculture sites; and providing public education to

help support these initiatives. The SRDWA are actively procuring funds in collaboration with local industry and government to address priority issues. They have carried out an evaluation of the landfill site with the assistance of local scientists who have volunteered their time. The evaluation of streams within the watershed is on-going with a major analysis of fish habitat within Glen Brook done in 2008.

The Middle River watershed is a 319 km^2 area on the west side of the Bras d'Or Lake. A Middle River Watershed Society was formed by representatives of the Middle River Watershed Association and the Middle River Development Association. The society conducts studies that allow a comprehensive approach toward enhancing the sea trout (brook trout) population in the river system.

12.4. Habitat/Land Cover Developed Land Distribution: Regional

There are two main activities that occur on developed land within the watershed: agriculture and recreation.

12.4.1 Agriculture in the Bras d'Or Watershed

12.4.1.1. Cape Breton Island's agricultural history

The primary characteristic of Cape Breton Island's agricultural sector was its geophysical and productive diversity. Fertile hillsides, valley micro-regions and bountiful estuary regions provided a propitious situation for an abundance of farm produce, and a social milieu for a vibrant rural culture. Further, the history of agriculture on Cape Breton Island has been one of occupational diversity—pluriactivity, in which farmers' incomes depended on a variety of sources. It is this diversity that has sustained the Island's agriculture over time.

The earliest written records of Cape Breton Island's geography recognized the strong agricultural potential of the region. Samuel Holland's [8] description of Cape Breton, along with his 1811 and 1818 censuses (edited by D.C. Harvey, 1935) repeatedly refer to deep, rich, clay soil, especially in the Bras d¹Or watershed. Although Holland¹s survey appeared to be more concerned with fishing and mining, his census data shows a predominance of farming as the

[8] [8] **Holland's Description of Cape Breton Island and Other Documents**, compiled with an Introduction by D.C. Harvey, Archivist, Public Archives of Nova Scotia, Halifax, (N.S.), 1935, (Public Archives of Nova Scotia, Publication no. 2).

occupation of the Island's considerable population. Other listed occupations were primarily related to farming, such as those of blacksmith, butcher, miller and cooper. Even in the early 19th century, pluriactivity was prevalent with many farmers who were also listed as fisherman.

Much of the historic agriculture on Cape Breton Island was for domestic use: cattle for beef and milk, sheep for mutton and wool, hogs for meat, poultry for meat and eggs, a wide variety of fruits and in-season vegetables for consumption and preserving. The Cape Breton soils were well suited to a variety of grasses and grains for forage and for milling. The thriving local market for Cape Breton farm products included both sale for cash or barter. There was also significant "export" of farm products, especially from ports in the Bras d'Or Lake, such as Baddeck, from whence products were shipped to the Sydney area, Newfoundland and the Eastern Seaboard of the United States. These forms of marketing peaked for various products between 1880 and 1930. After WWII, marketing regulations and changing consumer patterns resulted in importation of many processed and primary foods, with a corresponding decline in Cape Breton farm production for both local and outside markets.

The major farming immigration to Cape Breton Island was the Celtic influx beginning in the late 18th century and continuing through to the mid-19th century. The Louisbourg French, and the subsequent settlement by Acadian French, the pre-Loyalists and the Loyalists, and the Mi'kmaq—all contributed to agricultural development on Cape Breton Island. But it was the Scottish and Irish immigrants who most influenced the evolution of the agricultural sector until the mid-20th century. Then a significant immigration of families from the Netherlands to Cape Breton built upon the early foundations of the industry to become a driving force in the economic sustainability of modern farming on the Island. The solid continuity of the Scottish-Irish and Dutch farming sector provided a basis for a new wave of non-traditional farmers. From the 1970s to the present, people from a variety of national and ethnic backgrounds initiated small farm operations on the Island. They combined an interest in lifestyle and the environment, with food production and a wide range of other occupations—artistic, professional and tourism-related.

12.4.1.2. Current agricultural activity

Agricultural activity across Cape Breton is diverse and varies from county to county across the Island. In the Bras d'Or Watershed no one agricultural activity is wholly dominant

over another, though on a county-by-county basis there are trends that are specific to each county.

Cape Breton County Area Watershed (>500acres)

The biggest contributor to the industry in this area is the horticulture sector, in small fruit and vegetable production. The Bras d'Or Producers Cooperative is one of the largest vegetable producing groups in NS with several hundred acres devoted to lettuce, cabbage, rutabaga, broccoli, cauliflower, cucumbers, beans, pumpkins, hothouse tomatoes and cucumbers— and operating almost entirely on Boularderie Island, a portion of which lies within the watershed.

There are several small fruit operations including U-picks that produce strawberries and raspberries; there is effectively no commercial tree fruit production.

Wild blueberry production is increasing and there is a small, but growing organic sector in this area (fruit and vegetables). There is a limited amount of livestock production, mainly beef. Only one dairy producer remains in this area of the watershed. There is effectively no commercial mink, hog, sheep, or poultry operation. However, one large egg producer located outside of the watershed uses some production areas within the watershed.

Typically, there are more than 200 acres producing feed grain each year (wheat, barley, oats and corn) and several hundred acres producing hay.

Victoria County Area Watershed (<400acres)

There is a limited amount of agricultural activity within the watershed of Victoria County consisting primarily beef production, forages and one dairy farm. These activities are mainly on the Boularderie Island area of the watershed. There are small, but growing acreages of blueberry production, some mixed organic farms in the Middle River area, and two small fur producers in the Little Narrows area.

Richmond County Area Watershed (<200acres)

A limited amount of agricultural activity takes place in this area, primarily livestock production—including several beef producers and a few fur farms in this part of the watershed. There is limited or no commercial horticultural production.

Inverness County Area Watershed (>500acres)

Within this watershed area there is significant livestock (beef and dairy) production, especially in the Skye Glen, Nevada Valley, River Denys and Orangedale areas; several hundred acres are devoted to forage and pasture. There are small numbers of sheep and some hog and poultry production in the West Bay area of the watershed.

Blueberry production is well established and increasing with 100+ acres in production, especially around Whycocomagh and North Mountain (locally known as Marble Mountain). There are several organic vegetable producers and a couple of active maple syrup operations.

12.4.2. Recreational activity

The Bras d'Or Lake and its watershed provide ample opportunity for recreational activities.

Boating (including sailing, kayaking and power boating) is a prime recreational activity on the lake. Boating is facilitated by the presence of two yacht clubs, one in Baddeck, one in St Peters. Several annual boating events are also initiated from other communities around the shores of the Bras d'Or Lake.

Swimming takes place from private beaches and docks, and also at several public and protected beaches located around the Lake. With the Lake approximately 66 percent salt water, and warming up earlier than the Atlantic Ocean, swimming in the Bras d'Or Lake is a popular summer recreational activity. It offers excellent scuba diving opportunities as well.

There are two world-class golf courses in the watershed, one at Baddeck, the other in Dundee. The Bell Bay Golf course in Baddeck recently achieved designation as a "Certified Audubon Cooperative Sanctuary" through an Audubon International program. To achieve this, an organization must develop and implement an environmental management plan and document its results. Environmental management practices in five key areas include:

- Site Assessment and Environmental Planning
- Wildlife and Habitat Management
- Water
- Resource Management
- Outreach and Education

A third golf course is under construction in Ben Eoin. It is associated with the present infrastructure of Ski Ben Eoin. The completion of the golf course will provide year round employment at this site, rather than the seasonal employment offered by the ski hill.

Besides the "downhill" ski facilities at Ski Ben Eoin, multiple trails have been constructed

for cross country skiing and snowshoeing. Cross country skiing and snowshoeing, however, are not restricted to the groomed facilities. These winter activities are enjoyed throughout the watershed on old trails, fields and rural roads.

Designated wilderness areas and provincial park lands within the Bras d'Or Lake watershed provide excellent hiking opportunities during the spring, summer and fall. There are several public and private camp grounds in the watershed providing facilities for tenting and recreational vehicles.

Provincial Crown land in the highlands areas of the watershed, pioneer trails and private lands (with permission), are well used by snowmobilers during the winter months.

Anglers enjoy world-class sport fishing (salmon and trout), especially in the Baddeck and Middle Rivers.

Local residents and visitors to the area enjoy dining in any of the many eating establishments offering view planes of the Lake.

Ecotourism is flourishing because of the beautiful scenery, wilderness areas, and the slower paced rural experience the watershed offers. Historical and cultural experiences are bountiful and the people are welcoming. Among the many community festivals and events, Celtic Colours is an award winning cultural event celebrating celtic music around the world.

13. CONSERVATION FUNCTION

13.1. Contribution to the Conservation of Landscape and Ecosystem Biodiversity

(DESCRIBE AND GIVE LOCATION OF LANDSCAPES, ECOSYSTEMS, HABITATS AND/OR LAND COVER TYPES OF PARTICULAR SIGNIFICANCE FOR THE CONSERVATION OF BIOLOGICAL DIVERSITY.)

Conservation of biodiversity in the proposed biosphere reserve has been secured largely by provincial programs administered by Nova Scotia Environment, the Nova Scotia Department of Natural Resources, Canada's Department of Fisheries and Oceans, industry efforts (forestry, fishery and mining) and activities of environmental and non-government organizations. The proposed biosphere reserve will actively strengthen the work of each of these entities by bringing forward national and international examples, and at times, resources found through the World Network of Biosphere Reserves.

13.1.1. Marine, estuarine and aquatic biodiversity

The water exchange of the Bras D'Or is slow, due to the restricted seawater inflow through only two channels—the Great Bras D'Or Channel with average width 1.3 kilometres and depth 19.5 metres and the Little Bras D'Or Channel with average width less than 100 metres and depth 5 metres (Petrie and Bugden, 2002), the paucity of riverine inputs, and the large surface area of the Lake compared to total drainage basin. As a function of the slow exchange rates, the ecosystem is relatively protected and has evolved as a unique estuarine community. Composition of this community is partly a function of the latitudinal position of the Bras D'Or on the Atlantic coast and the fluctuations of two major currents in close proximity to the coast. This community has elements of the typical fauna of the Atlantic coastal areas; however, there are also tropical and Arctic species which are rare at this latitude. Many of these species travel with the Gulf Stream from the South and with the Labrador Current from the North and become trapped in the Bras D'Or (Lambert, 2002). Many of the Arctic species, however, invaded the Bras D'Or about 10 000 years ago after the last ice age. During the climatic optimum, about 4 000-7 000 years ago, many tropical species (including the oyster) invaded the Bras D'Or from the surrounding Atlantic Ocean which, at that time, was about 2C^{o} warmer than it is today (Lambert, 2002). This community composition, forced by the physiography of the system, and fed by the North and the South, in the past and in the present, makes the Bras D'Or system globally unique and a clear candidate for the highest level of protection.

Slow rates of flushing, and imbalances in nutrient inputs can have significant effects on changing rates of primary production in the waters of the Bras D'Or (Strain and Yeats, 2002). Because of slow rates of inputs from land and sea, the bases of food webs accumulate carbon over long time periods. Thus, higher trophic levels (such as the oysters and the resident cod) are highly susceptible to short-term overfishing. Sustaining the unique character of the Bras D'Or aquatic communities is dependent on a high degree of protection and management of watershed activities.

The rich geological history and associated topographical variety of the terrestrial and aquatic ecosystems constitute a remarkable natural diversity, set within scenic surroundings in this inland one third of Cape Breton Island. The Bedford Institute of Oceanography and others have documented many of the features and processes of the Bras d'Or marine/freshwater ecosystem. In an overview of the ecology of the Brad d'Or, with emphasis on the fish, Lambert (2002) noted "…the Bras d'Or Lake may be the only truly marine body of water that is home to

so many glacial relicts…but paradoxically also to warm water enclave relicts. This must make the Lake(s) unique." It follows that managing and monitoring human activities, and their outcomes within the context of the estuarine ecosystem, is a key function of ecosystem-based management within the proposed Bras d'Or Lake Man and the Biosphere Reserve.

Figure 8-1, and **Map 2** depict much of what is known about habitat diversity and human activities in the estuary and adjacent watershed. There are still important information gaps related to either the scale of coverage (detailed for small areas or quite general at watershed scales) or the taxa that have been studied (mainly plants and animals of commercial or recreational interest).

13.2. Conservation of Species Biodiversity

IDENTIFIES THE MAIN SPECIES (WITH SCIENTIFIC NAMES) OR GROUPS OF SPECIES OF PARTICULAR INTEREST FOR THE CONSERVATION OF BIOLOGICAL DIVERSITY, IN PARTICULAR IF THEY ARE RARE OR THREATENED WITH EXTINCTION.

Assessments of species-at-risk are used to guide priorities for conservation actions. The two systems noted below use the collective best judgments of scientists who study the different groups of species; these assessments are subject to change over time as more information becomes available.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) judges the conservation status of species on a Canada-wide (or occasionally on a regional) basis, as follows: EXP = extirpated; END = endangered (of being extirpated); THR = threatened, could become endangered; VUL = vulnerable; and SC = species is of special concern (for some given reasons). Nova Scotia follows a similar system through the Nova Scotia Species@Risk Working Group. Applied to species that are known or expected still to be present in the Bras d'Or Lake watershed (and excluding extirpated species) the status of the following is indicated opposite the species in the following table.

Table 13-1: Species at risk in the Bras d'Or ecosystem listed by Nova Scotia Species at Risk Working Group and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Where the rankings by the two groups are different, the COSEWIC rank is in [ ].

ENDANGERED	
American marten (*Martes americanus*)	Field studies and re-introductions underway
Canada lynx (*Lynx canadensis*)	Field studies including TEK to confirm this

boreal felt lichen (*Erioderma pedicullatum*)	Cool, moist, old growth balsam fir forests
[THREATENED]	
olive-sided flycatcher (*Contopus cooperi*)	Open bogs
common nighthawk (*Chordeiles minor*)	Nests in clearcuts, migration along Bras d'Or shoreline in August
chimney swift (*Chaetura pelagic*)	Formerly nested in hollow trees and buildings throughout
Canada warbler (*Wilsonia canadensis*)	Nests in dense shrubbery along streams
rusty blackbird (*Euphagus carolinus*)	Treed bogs
VULNERABLE	
Bicknell's thrush (*Catharus bicknelli*) [Special Concern]	Cape Breton Highlands
wood turtle (*Glyptemys insculpta*) [Special Concern]	River Denys Basin
	Not listed Provincially
Gaspe shrew [Special Concern]	Steep slopes of Cape Breton plateau (Delisted in NS partly because it is now thought that it is the same species as a more widely distributed shrew that also occurs in the Cobequids, NB and Maine)

The Atlantic Canada Conservation Date Centre (ACCDC) ranks the conservation status of species throughout their known range as indicated by G = global, and within a given jurisdiction by S = State/Province, or other sub-jurisdictional area. The ranking system one to five was developed by The (US) Nature Conservancy and the system has been adopted by the Conservation Data Centres in Canada (the ACCDC is the CDC for Nova Scotia and the other Atlantic provinces). On this scale, the number one is extremely rare, meaning the type is known from only five or fewer locations, while five means that the type is common and demonstrably secure, based on the number of known occurrences recorded in the conservation databases. Candidates for G3 and/or S3 = rare, meaning the type is known from only 21-100 locations, globally or in the province. The list in the table below has been adapted, in part, from Appendix B in Parker *et al.* (2007). It groups species by major taxonomic categories (birds, mammals and

plants) and notes their status for the watershed generally (*vs* for each subwatershed as in Appendix B in Parker *et al*. 2007).

The Second Maritime Breeding Bird Atlas is under development and continues until 2010. It will provide much better information on a good number of the species below. Most are extremely rare as nesting birds in the Bras d'Or watershed. A few consistently nest here (e.g. common goldeneye); others may do so occasionally (e.g. northern mockingbird) and for others we just do not know (e.g. Philadelphia vireo). Others are returning to pre-European settlement populations as former agricultural land returns to forest (e.g. bobolink). It is not clear whether the evidence is sufficient to include the Warbling vireo, or even the Philadelphia vireo.

Table 13-2. Status of species ranked as rare provincially (S1, S2 and S3) that occur in the Bras d'Or ecosystem. A question mark (?) indicates that status is uncertain.

Common Name	Scientific Name	G & S Rank
Birds (B = breeding species)		
Bicknell's thrush	*Catharus bicknelli*	G4 S1 S2B
long-eared owl	*Asio otis*	G5 S1 S2B
common goldeneye	*Bucephala clangula*	G5 S2B
warbling vireo	*Vireo gilvus*	G5 S2B
Philadelphia vireo	*Vireo philadelphicus*	G5 S2B
Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*	G5 S2 S3B
red-breasted merganser	*Mergus serrator*	G5 S2 S3B
eastern phoebe	*Sayornis phoebe*	G5 S2 S3B
northern goshawk	*Accipiter gentilis*	G5 S3B
common tern	*Sterna hirundo*	G5 S3B
Arctic tern*	*Sterna paradisaea*	G5 S3B
black-billed cuckoo	*Coccyzus erthropthalmus*	G5 S3B
northern mockingbird	*Mimus polyglottos*	G5 S3B
bobolink	*Dolichronyx oryzivorus*	G5 S3B
red crossbill	*Loxia curvirostra*	G5 S3 S4B

*N.B. Very rare, perhaps only accidental around Bras d'Or. Virtually all of the nesting terns are common terns.

Mammals

rock vole	*Microtus chrotorrhinus*	G4 S2
American marten	*Martes americana*	G5 S1
southern bog lemming	*Synaptomys cooperi*	G5 S3 S4

Herpetofauna

wood turtle	*Glyptemys insculpta*	G4 S3
four-toed salamander	*Hemydactylium scutatum*	G5 S3

Fish

Atlantic salmon	*Salmo salar*	G5 S2

Insects

Odonata (Dragonflies and damselflies)

harlequin darner	*Gomphaeschna furcillata*	*G5 S1*
lake darner	*Aeshna eremita*	*G5 S3*
black-tipped darner	*Aeshna tuberculifera*	*G4 S3*
Canada darner	*Aeshna canadensis*	*G5 S3*
subarctic darner	*Aeshna subarctica*	*G5 S3*
eastern red damsel	*Amphiagrion saucium*	*G5 S2*
common green darner	*Anax junius*	*G5 S3*
variable dancer	*Argia fumipennis violacea*	*G5 S3*
powdered dancer	*Argia moesta*	*G5 S3*
springtime darner	*Basiaeschna janata*	*G5 S3*
fawn darner	*Boyeria vinosa*	*G5 S3*
aurora damsel	*Chromagrion conditum*	*G5 S3*
superb jewelwing	*Calopteryx amata*	*G4 S3*
subarctic bluet	*Coenagrion interrogatum*	*G5 S1*
delta-spotted spiketail	*Cordulegaster diastatops*	*G5 S3*
twin-spotted spiketail	*Cordulegaster maculata*	*G5 S3*
American emerald	*Cordulia shurtleffii*	*G5 S3*
racket-tailed emerald	*Dorocordulia libera*	*G5 S2*

azure bluet	*Enallagma aspersum*	*G5 S2*
boreal bluet	*Enallagma boreale*	*G5 S3*
tule bluet	*Enallagma carunculatum*	*G5 S1*
familiar bluet	*Enallagma civile*	*G5 S3*
springtime bluet	*Enallagma cyathigerum vernale*	*G4 S2*
marsh bluet	*Enallagma ebrium*	*G5 S3*
Hagen's bluet	*Enallagma hageni*	*G5 S3*
Beaverpond baskettail	*Epitheca canis*	*G5 S3*
spiny baskettail	*Epitheca spinigera*	*G5 S3*
lancet clubtail	*Gomphus exilis*	*G5 S3*
dusky clubtail	*Gomphus spicatus*	*G5 S2*
mustached clubtail	*Gomphus adelphus*	*G4 S2*
harpoon clubtail	*Gomphus descriptus*	*G4 S2*
Uhler’s sundragon	*Helocordulia uhleri*	*G5 S3*
Beaverpond clubtail	*Gomphus borealis*	*G4 S2*
fragile forktail	*Ischnura posita*	*G5 S3*
saffron-winged corporal	*Ladona julia*	*G5 S3*
spotted spreadwing	*Lestes congener*	*G5 S3*
emerald spreadwing	*Lestes dryas*	*G5 S3*
amber-winged spreadwing	*Lestes eurinus*	*G4 S2*
sweetflag spreadwing	*Lestes forcipatus*	*G5 S2*
slender spreadwing	*Lestes rectangularis*	*G5 S3*
lyre-tipped spreadwing	*Lestes unguiculatus*	*G5 S2*
frosted whiteface	*Leucorrhinia frigida*	*G5 S3*
crimson-ringed whiteface	*Leucorrhinia glacialis*	*G5 S3*
Hudsonian whiteface	*Leucorrhinia hudsonica*	*G5 S3*
dot-tailed whiteface	*Leucorrhinia intacta*	*G5 S3*
red-waisted whiteface	*Leucorrhinia proxima*	*G5 S3*
sedge sprite	*Nehalennia irene*	*G5 S3*
riffle snaketail	*Ophiogomphus carolus*	*G5 S3*
common whitetail	*Plathemis lydia*	*G5 S3*
ocellated emerald	*Somatochlora minor*	*G5 S2*
ski-tailed emerald	*Somatochlora elongata*	*G5 S3*

forcipate emerald	*Somatochlora forcipata*	*G5 S2*
muskeg emerald	*Somatochlora septentrionalis*	*G5 S1*
forcipate emerald	*Somatochlora forcipata*	*G5 S2*
lake emerald	*Somatochlora singulata*	*G5 S2*
clamp-tipped emerald	*Somatochlora tenebrosa*	*G5 S2*
Williamson's emerald	*Somatochlora williamsoni*	*G5 S1*
brush-tipped emerald	*Somatochlora walshii*	*G5 S3*
saffron-winged meadowhawk	*Sympetrum costiferum*	*G5 S3*
black meadowhawk	*Sympetrum danae*	*G5 S2*
white-faced meadowhawk	*Sympetrum obtrusum*	*G5 S3*
band-winged meadowhawk	*Sympetrum semicinctum*	*G5 S3*
yellow-legged meadowhawk	*Sympetrum vicinum*	*G5 S3*

Plants

arrow-grass	*Triglochin gaspensis*	G3 S1?
Laurentian bladder fern	*Cystopteris laurentiana*	G3 S1?
southern twayblade	*Listera australis*	G4 S1
northern woodsia	*Woodsia alpina*	G4 S1 S2
blue cohosh	*Caulophyllum thalictroides*	G4 G5 S2
rock whitlow-grass	*Draba arabisans*	G4 S2
northern blueberry	*Vaccinium boreale*	G4 S2
showy lady’s-slipper	*Cypripedium reginae*	G4 S2
green spleenwort	*Asplenium trichomanes-ramosum*	G4 S2
Fernald serviceberry	*Amelanchier fernaldi*	G2 G4 S2?
bladder fern	*Cystopteris tenuis*	G5 S3 S4
ground-fir	*Lycopodium sabinifolium*	G4 S3?
black snake-root	*Sanicula odorata*	G5 S1
larger St. John’s wort	*Hypericum majus*	G5 S1
viviparous knotweed	*Polygonum viviparum*	G5 S1
horned beakrush	*Rhynchospora capillacea*	G5 S1
sheathed pondweed	*Stuckenia vaginata*	G5 S1
salt bulrush	*Schoenoplectus robustus*	G5 S1?
hairy rockcress	*Arabis hirsuta var. pycnocarpa*	G5 S1 S2

Kalm's lobelia	*Lobelia kalmii*	G5 S1S2
river anemone	*Anemone virginiana var. alba*	G5 S1S2
Bebb's sedge	*Carex bebbii*	G5 S1S2
rush	*Juncus alpinoarticulatus*	G5 S1S2
fragile rockbrake	*Cryptogramma stelleri*	G5 S1S2
cicley	*Osmorhiza longistylis*	G5 S2
Philadelphia fleabane	*Erigeron philadelphicus*	G5 S2
seabeach groundsel	*Senecio pseudoarnica*	G5 S2
pale jewelweed	*Impatiens pallida*	G5 S2
Drummond rockcress	*Arabis drummondii*	G5 S2
coffee tinker's-weed	*Triosteum aurantiacum*	G5 S2
Canada buffalo-berry	*Shepherdia canadensis*	G5 S2
dwarf blueberry	*Vaccinium caespitosum*	G5 S2
willow dock	*Rumex salicifolius*	G5 S2
lesser wintergreen	*Pyrola minor*	G5 S2
wood anemone	*Anemone quinquefolia*	G5 S2
bog bedstraw	*Galium labradoricum*	G5 S2
umbellate toad-flax	*Comandra umbellata*	G5 S2
northern bog violet	*Viola nephrophylla*	G5 S2
black sedge	*Carex atratiformis*	G5 S2
few-flower spikerush	*Eleocharis quinqueflora*	G5 S2
highland rush	*Juncus trifidus*	G5 S2
blunt-leaf pondweed	*Potamogeton obtusifolius*	G5 S2
maidenhair spleenwort	*Asplenium trichomanes*	G5 S2
northern holly fern	*Polystichum lonchitis*	G5 S2
smooth woodsia	*Woodsia glabella*	G5 S2
umbellate hawkweed	*Hieracium umbellatum*	G5? S2?
boreal American aster	*Symphyotrichum boreale*	G5 S2?

? - indicates that status is uncertain.

13.3. Conservation of Genetic Biodiversity

SPECIES OR VARIETIES OF TRADITIONAL OR ECONOMIC IMPORTANCE AND THEIR USES, E.G. FOR MEDICINE, FOOD PRODUCTION, ETC.

The protection of genetic biodiversity is one of the cornerstones of the conservation function for any biosphere reserve. However this is implemented, it must be done in a cooperative and complementary manner. This responsibility is shared among all of those associated with the core areas—areas that have already been set aside because of their inherent natural history features. There is a clear legislative framework to oversee the conservation of genetic diversity in the wilderness areas, provincial parks, nature reserves and conservation easements within the proposed biosphere reserve. Outside these areas, resource management and conservation efforts are left to private landowners and municipalities. The BLBRA will seek to work with all of these groups, hopefully involving most in the overseeing of the biosphere reserve initiatives.

The Bras d'Or Lake watershed, sitting in the mouth of the St. Lawrence River as it meets the Atlantic Ocean, is an important location to focus on genetic diversity in the face of a variety of driving forces such as global climate change, rising sea levels and invasive species. It is a natural laboratory in which to work toward the conservation of genetic biodiversity.

The Bras d'Or Lake and its watershed contain a rich genetic biodiversity. As mentioned in Section 12, in the Bras d'Or Lake there are varieties of organisms within 1 degree of latitude that are generally spread/found over 30 degrees of latitude. There are species of mysids found only much further north, in the Arctic, and species such as the American oyster, that are typically found much further south. The BLBRA will encourage a clearer understanding of this enormous genetic diversity. There are over 200 listed species at risk within the proposed biosphere reserve including the wood turtle, American marten and Canada lynx.

The BLBRA serves to advance knowledge and cooperation with its participants, and to facilitate a community based, collaborative approach to address sustainable resource use and biodiversity conservation. This can include development and sponsorship of studies, educational programs and exhibits, and habitat stewardship in cooperation with relevant agencies, educational institutions and landowners. It is anticipated that once UNESCO designation is achieved, the organizations, programs and initiatives (see Foreword) will be more effective in their conservation efforts by working together more closely.

14. DEVELOPMENT FUNCTION

14.1. Potential for Fostering Economic and Human Development - Socio-culturally and Ecologically Sustainable

DESCRIPTION OF HOW THE AREA HAS POTENTIAL AS A PILOT SITE TO PROMOTE THE SUSTAINABLE DEVELOPMENT OF ITS REGION OR "ECOREGION".

Protecting the ecological integrity of the Bras d'Or Lake by embracing sustainable economic development has been the subject of discussion and focus of action by many organizations and initiatives over several decades. The results of many workshops and focus groups led to the commissioning of an integrated study of the watershed in 1990, followed by a suggestion brought forward in 1991 at The Future of the Bras d'Or Lakes Conference held in Baddeck to seek a UNESCO designation for the Bras d'Or. As mentioned earlier, the province has enacted the Environmental Goals and Sustainable Prosperity Act (2007) which explicitly links a prosperous economy to a healthy environment. There are 21 goals that relate to water, natural resources, climate change, energy, air quality, and how government operates (Government of Nova Scotia, 2009)

The Bras d'Or watershed is sparsely populated with just over one hundred small rural communities having an approximate total of 14 579 residents (2006 Census data). Cape Breton overall has seen a 12% reduction in total population between 1991 and 2006. Only the First Nations communities have realized population increase during that time. Some consider the lack of population a blessing for environmental sustainability, while many begrudge the years of out-migration of youth, family and friends seeking employment opportunities elsewhere. The challenge for a biosphere reserve is to find ways to have sustainability for both the population base and the ecosystem.

The four First Nations communities situated along its shores consider the Lake the foundation for their cultural, social and economic development. Native fishers have seen a decline in fish species and shellfish in the Lake. Where once a lucrative oyster fishery thrived in the Lake, a number of areas have been closed due to bacterial contamination, MSX, Malpeque disease and interference by invasive species such as the Green crab. Because the Lake is a relatively closed circulation system, fishers see protection of the Lake as essential to avoid disruption of fish habitat.

Fur trapping has been a sustainable cottage industry in the Bras d'Or Lake watershed from ancient times. It continues today, albeit on a much reduced scale. The Mi'Kmaq were proficient trappers, using their furs for clothing, food and shelter and, with the arrival of the

Europeans, as a valuable trading commodity. Many of the Scottish pioneers who settled the watershed lands c.1800, and a handful of their descendents still utilize the marginal but diversified fur industry on a sustainable basis. Fur bearing animals trapped within the watershed include red fox, otter, muskrat, mink, coyote, raccoon, beaver and bobcat. Fur trapping in Nova Scotia is closely regulated and monitored by government. It is not referred to in economic development plans as a potential area for economic development.

Cape Bretoners have benefited from the prosperity (and suffered from the limitations) of the Island's traditional economic base. Despite many economic peaks and troughs we do not have much evidence of increased understanding of the correlation between a healthy ecosystem and the local economy. Dominant is the attitude that environmental degradation is the inevitable outcome of economic development. They know the negative effects of industry closures and the difficulty of securing livelihoods with adequate financial support. The former steel and coal industries have left their scars on the landscape. Although they were located miles away the Bras d'Or Lake, hundreds of residents within the watershed worked in those industries and believed their economic benefits outweighed their environmental threats.

For small communities within the watershed, resource based industries (forestry, mineral resources, fishery and agriculture) have sustained the economy. Bigger centres such as Baddeck have thrived on the tourist industry for over one hundred years. Not surprisingly, when there is a prospect that environmental regulations will increase the cost of production or service, political pressure is often used to block them. Not only is this true in relation to extractive industries, it is seen as well in relation to such areas as agriculture, and the transportation industries. Closing the gap between understanding and behaviour with respect to sustainable economic development is a serious challenge for those who value a vibrant, healthy economy. Consequently, it is a challenge for a successful biosphere reserve program to contribute to understanding of the collective issues and the achievement of the education, best practices, and stewardship required for the future. The requirement is to realize that environmental protection and economic development need not be opposing goals.

Forestry is becoming a more sustainable economic activity within the watershed as NewPage, the pulp and paper company located near Port Hawkesbury, has been certified by Forest Stewardship Certification. On Crown lands, New Page works within the Integrated Resource Management Strategy, developed by the Department of Natural Resources. NewPage encourages their wood suppliers from private lands to operate using "best practices" for forestry management.

Loading Gypsum

The mining industry has sustained whole communities over several generations with gypsum mines in River Denys, Little Narrows and Melford. Marble Mountain was a vibrant community during the late 1800s and early 1900s when marble was extracted for the steel plant in Sydney. Today, a new operation cuts blocks of red and blue marble for shipment around the world. Environmental regulations are stringent for the mining industry, and with regulations come “third party” environmental monitoring. Presently, the only significant monitoring being done in the watershed is this regulatory monitoring. Because of the data collected at one mine site, an unknown “salmonoid” stream was found and is now the subject of an aquatic research project.

The economic sustainability of communities, in the Skye River sub-watershed and on Boularderie Island for example, is a direct response to the viability of farming activities in the watershed. Most farms have undergone environmental audits and farmers are beginning to recognize the need for waste management plans, water and power conservation and watercourse protection.

Within each of these resource-based industries there is great need to educate and abide by “best practices” or “good stewardship practices” for all operational activities. The success of implementing new “stewardship” knowledge will sustain these communities well into the future.

Through its history, Cape Breton’s culture, heritage and economy have been linked directly to its natural resources. Besides the resource-based industries already mentioned, tourism is the most important seasonal employer. Tourism flourishes in the watershed and on all of Cape Breton Island. The Island has been named one of "50 places of a lifetime" by National Geographic Traveler magazine, and the "most scenic island in the world" by Condé Nast Traveler magazine. In National Geographic Traveler’s 2003 poll, Cape Breton appeared in a "second place" finish among “the world's greatest destinations.” Similar reference was made in Fodor’s Travel News (Fodors, 2008). The Winter 2009 Compass (Volume 11), a publication of Bank of Tokyo-Mitsubishi UFJ, contains a one-page “Photo Album” with nine photos from nations around the world. One is a picture of trees and water above a caption that reads “Bras D’Or lakes in Cape Breton, Nova Scotia, one of Canada’s most picturesque regions.”

A combination of the Island’s attractive setting and plentiful Celtic cultural assets has,

since 1997, resulted in a highly successful, annual Celtic Colours International Festival. A description of is flourishing program can be accessed at www.celtic-colours.com . For nine days each October it features local artists along with artists who travel from such locations as Scotland, Ireland, Wales, England, Brittany, Spain, Denmark, Germany, and Cuba as well as from across the United States and Canada. A characteristic of this festival is that its events are offered in local communities, often in very ordinary venues such as parish halls, fire halls and school auditoria where local organizations serve as hosts to celebrate their particular contribution to our living Celtic Culture. Among its many benefits, this Festival serves to extend the tourist season and it brings thousands of additional visitors each year.

Seasonal residents also contribute to the economy, and to cultural and social diversification. The Bras d'Or, referred to in our tourism literature as the "Jewel of Cape Breton", is an extraordinary body of water offering fine views, warm salt water swimming, pleasant summer temperatures and gentle breezes and is coveted as a favourite summer retreat for residents of the Island, from the mainland, and from Europe and the United States. There are no up-to-date statistics on the size of the seasonal population for the Bras d'Or watershed; however, the Cape Breton Regional Municipality identifies 1033 seasonal residential units for the north-eastern part of the Lake. It is likely the number is more than triple this amount for an approximate 3000 seasonal cottages bordering the Lake. It is anticipated that activities undertaken within the scope of a biosphere reserve will include attention to having seasonal residents and tourists contribute their part to achieving the vision of the Biosphere.

This region has a history of strong commitment to community economic development, with a social reform rationale, resulting in the establishment of producer and consumer cooperatives and credit unions. This approach is especially true in the agricultural sector, and earlier in the fisheries. Having to pool resources for economic change was particularly necessary during the economic depression of the 1930's and, for many, has remained part of their community culture.

Conventional economic indicators (e.g. average income, unemployment rates) for Cape Breton place it among the more economically disadvantaged areas within Nova Scotia and the Atlantic provinces. For more than forty years, Cape Breton has been the focus of numerous, often highly substantial, economic development efforts. These include subsidization of local industries in order to protect jobs; attempts to persuade large-scale manufacturers to relocate to Cape Breton; promotion of small locally based companies in rural communities—including those involved in culture, performing arts, visual arts and crafts; and attempts to find opportunities for

technology-based, export-oriented enterprises in diverse sectors, including tourism. The past few years witnessed promotion of information technology enterprises along with related service industries.

The Bras d'Or Lake and watershed are recognized for their research potential, offering opportunities for local communities to work side by side with national and international researchers. The Unama'ki Institute of Natural Resources has undertaken several research initiatives to increase overall understanding, health and productivity of the Lake. CEPI is attending to an overall-management plan for the Bras D'Or Lake and watershed lands. In addition, the region has several educational facilities with programs relating to aquatic and general environmental sustainability. Examples include the Bras d'Or Institute for Ecosystem Research at Cape Breton University (CBU), the Nautical Institute at Nova Scotia Community College, the Aquatic Resources degree program at St. Francis Xavier University, the Bras d'Or Preservation Nature Trust, and the Eco-Centre located in Whycocomagh's Community Education Centre.

The presence of an active Biosphere Reserve will greatly enhance opportunities for collaboration on ecologically appropriate development projects. The people who choose to live on Cape Breton are often multi-skilled and able to put together a living from complementary sources of work. They recognize the value of a lifestyle that offers room for personal growth and community development. Evidence of intent to translate that value into sustainable development is found in the following draft Vision statement contained in Victoria County's Integrated Community Sustainability Plan (Stantec, 2009). Victoria County is part of the proposed biosphere reserve.

> *Victoria County is a spacious, magnificent and bountiful landscape. Nestled within the forest glens and along the mighty Bras d'Or Lakes, are tightly knit, welcoming communities where you will find a generosity of spirit, safety, serenity. We enjoy sustainable livelihoods and benefit from the diverse skill sets within our communities. We cherish a culture rich in artistry and tradition, and a lifestyle in which every generation is healthy and active. We connect the best of the old and new—the natural and the handmade.*

Each of the four Municipal Councils within the Bras d'Or Lake watershed completed an Integrated Community Sustainability Plan by the end of March 2010 as a requirement of the Canada-Nova Scotia Gas Tax Agreement. These are long-term plans developed in consultation

with community members giving direction to realize sustainability objectives for the environment, cultural, social, and economic aspects of each community.

Further reference to Victoria County's plan is located in Appendix 9, along with a description of parts of the plan submitted by the Cape Breton Regional Municipality giving particular attention to ways of dealing with coastal erosion as an impact of climate change on the Bras d'Or Lake.

14.2. Tourism—Yearly Visitors to Bras d'Or Region

INFORMATION ON VISITORS COMING TO THE PROPOSED BIOSPHERE RESERVE EACH YEAR AND TREND TOWARD INCREASING NUMBERS OF VISITORS.

Tourism has become a major industry on the Island with annual revenues totalling over 217 million dollars, attracting on average 700 000 visitors per tourist season over the last five years. The Bras d'Or Lake, central to the Island, receives a good portion of the visitors who come to Cape Breton. Travel pattern statistics conclude total party trips are just short of 300 000 passing through the Baddeck route and accommodation occupation statistics indicate about 95000 room-nights are sold annually around the Bras d'Or Lake. This sector holds promise and is a key component of the region's economic development strategy.

14.2.1. Types of tourism

(STUDY OF FLORA AND FAUNA, RECREATION, CAMPING, HIKING, SAILING, HORSE RIDING, FISHING, HUNTING, SKIING ETC.)

Visitors come to the Bras d'Or Lake region for many reasons including, sailing, boating, kayaking, swimming, scuba diving, cycling, camping, hiking, fishing, hunting and bird watching. As well, and has been mentioned elsewhere in this document, there are opportunities for cultural tourism through museums, music, language, dance, crafts and food. Three golf courses located at various places near the Lake, also serve to attract tourists.

It is especially true to say that the Bras d'Or Lake is renowned worldwide, as a sailing destination due to its simple beauty, sheltered harbours and good strong winds. Yet, given those outstanding resources the extent of sailing, boating and kayaking is, by standards of more populous areas, modest in size. Six marinas based out of St. Peter's, Dundee, Baddeck, Ross Ferry, Orangedale and Grand Narrows offer services to the boating community and visitors. Vessels cruise the Lake, traveling from other ports in the Maritimes, central Canada, the United

States, and from further abroad. Several boat tours are available for visitors to experience the Lake.

Fine scenery, natural resources and wildlife along all shores of the Bras d'Or Lake and its associated channels, make for a rewarding drive or sail. The land surrounding the Lake is rural with a natural landscape that makes it an attractive recreational area. The Bras d'Or Lakes Scenic Drive circles the Lake along shoreline roads and offers an ever-changing panorama of woodlands, farms and villages—ideal for walking, biking and bird watching. Again, from the visitors' perspective these resources have the advantage of being underutilized, but they tend to be insufficiently productive from a commercial perspective.

The tourism industry is expanding to include recreational boating, swimming and passive recreation such as bird watching. For the birdwatcher, there are strong populations of great blue herons, double-crested cormorants and bald eagles that feed in, or near the Lake. River Denys and the Upper Denys Basin are important areas for waterfowl production and act as staging areas for migrating teal, black duck and ring-necked duck; this is also known as a wintering area for bald eagles. Another site of special interest is Spectacle Island Game Sanctuary, harboring nesting cormorants.

Several local dive facilities operate, fully or partially, in the Bras d'Or Lake. Considering organized tours and divers acting independently, it is estimated that several thousand recreational dives typically occur annually in the May-November diving season. One of the best diving sites is situated at the Grand Narrows Railway Bridge where a sunken vessel has become an artificial reef, boasting marine diversity unmatched in the Lake or in the nearby ocean. Other noteworthy sites include pinnacle and shoal formations at the entrance to West Bay. There is considerable potential for growth in this industry and the establishment of another artificial reef could be an additional attraction.

More than a dozen provincial parks and park reserves located around the Lake provide a haven for wildlife. In winter, the Lake supports a substantial seal population.

Gaelic culture provides a significant attraction for visitors to the Bras d'Or Lake area. It stems from Scottish pioneers who populated the watershed of the Bras d'Or since c. 1800. For the two ensuing centuries, their descendants continued to promote the Gaelic language, Scottish music and the heritage of the Gael in general, at various venues on Cape Breton Island, especially within the watershed of the Bras d'Or. They did so, and continue to do so, for at least two compelling reasons: their own pleasure and enjoyment, along with their innate appreciation of that endearing living-culture that can be traced back to the mists of Highland antiquity; and to showcase both seasoned and up-and-coming entertainers for the enjoyment of the discriminating tourist.

By way of example, nowhere within the Bras d'Or Lake watershed has that promotion of Gaelic culture been more consistently, colourfully and unwaveringly displayed, than on the grounds of the Highland Village Museum / *An Clachan Gàidhealach*, a Gaelic folklife centre in Iona. The Highland Village brings to life, Gaelic language, culture and folk traditions through a living historical village. The village also features a natural amphitheatre overlooking the Barra Strait where the Lake meets the Island's centre. Each year since 1962, this theatre is home to an outdoor extravaganza involving artists displaying the very best of Highland song, music and dance–-vaunted and appreciated by tourists and residents alike.

As mentioned earlier, the Celtic Colours International Festival (www.celtic-colours.com) has developed Island-wide as an autumn event, for more than a decade. It captivates international audiences with a national award-winning spectacle featuring both local and international artists whose roots are in the Celtic culture. The influx of visitors at this time fills all available overnight accommodations.

The benefits of tourism are of course important to the local economy. However, many business people who establish facilities for tourists around the Lake experience financial difficulty. The season is short, primarily from June to August. This militates against opportunity for continuous employment, and often implies low-wage work. There are organized efforts, particularly through the Province of Nova Scotia, to advance the Tourist Industry. Destination Cape Breton Association, an organization for tourist businesses, functions in close cooperation with the Province. Clearly, tourism is an area of development that can benefit from the kind of coordination and education generated in a biosphere reserve to attract

visitors to take advantage of a place dedicated to building a healthy relationship between people and nature.

14.2.2. Tourist facilities and description of where these are located

TOURIST FACILITIES AND DESCRIPTION OF WHERE THESE ARE LOCATED AND THEIR LOCATION IN WHICH ZONE OF THE PROPOSED BIOSPHERE RESERVE.

Tourism and service industries have grown around the Lake with growth of attractions that accommodate niche and cultural markets. These are located in the Transition Zone. Included in these are three resort areas with hotel-type accommodation that include golf courses; at Baddeck, Ben Eoin and Dundee. Each is located beside the Lake. Baddeck is a popular recreational area highlighted by a Parks Canada museum commemorating inventive work of Alexander Graham Bell, near access to the Cape Breton Highlands National Park.

Driving around the perimeter of the Lake there are places to dine including, Rita MacNeil's Tea Room in Big Pond; at least two full service restaurants, one Inn, several lunch-type places, cabins, bed and breakfast establishments in St. Peter's; an hotel with dining room in Iona, several lunch-type dining areas in Whycocomagh and Nyanza, and a range of dining and motel accommodations in Baddeck.

In addition to the six marinas mentioned above, there are sailboat rentals available in Baddeck and a kayaking operation in the community of Roberta.

Places of cultural interest include the Wagmatcook First Nation Cultural Center; two museums of history in St. Peter's; and, Chapel Island National Historic Site and historic capital of the Mi'kmaq nation where the annual religious gathering at the St. Anne's Mission attract Mi'kmaq from Atlantic Canada, Quebec and Maine. Life for the early Scottish settlers is represented at the Nova Scotia Highland Village Museum at Iona. At the Marble Mountain Library and Museum one can learn about marble quarrying in the late 1800s. The Orangedale Railway Station Museum offers a look at late 19th century trains and train travel.

14.2.3. Positive and/or negative impacts of tourism

POSITIVE AND/OR NEGATIVE IMPACTS OF TOURISM AT PRESENT OR FORESEEN.

Since 2007, the effects of the weakened American dollar, and increased gasoline prices had a negative impact on Cape Breton tourism. These have particularly negative impact since a large percentage of tourists/visitors come from the north-eastern United States and normally travel by automobile. With this decline there is awakened attention to the question of what it

takes to have a successful tourist industry. It remains true that tourism is regarded as a positive force. It brings necessary revenue, it provides an audience for cultural presentations, and it has no perceptible, negative environmental impact. Indeed, it is apparent that tourists of the kind who are already attracted to the Bras d'Or Lake area, will find the biosphere reserve, as proposed here, a very strong attraction to participate in a place where environmental, economic, social and cultural sustainability are at the root of tourism offerings. With the help of Destination Cape Breton Association a marketing effort will be developed to fit that sustainability format. Past efforts were fragmented with no real entity claiming Bras d'Or Lake product development and promotion. A Bras d'Or Lake biosphere reserve will assist in solidifying collaborative efforts.

14.3. Benefits of Economic Activities to Local People

HOW THE LOCAL COMMUNITIES DERIVE ANY INCOME OR BENEFITS DIRECTLY OR INDIRECTLY FROM THE SITE PROPOSED AS A BIOSPHERE RESERVE AND THROUGH WHAT MECHANISM.

The majority of tourism businesses and service industries are owned, managed, or staffed by local residents—thus providing seasonal and full-time work.

A more recent national trend experienced by tourism and service industries, is the lack of available skilled and willing employees to work the businesses. As a strategy to resolve the issue more businesses are hiring retirees and addressing foreign-worker programs as a future measure.

There is an over-arching value in having the Bras d'Or Lake and its watershed designated a UNESCO Biosphere Reserve. For Cape Breton generally, it would increase recognition—nationally and internationally—of the area as a good place to live, work and visit. This recognition would also encourage funding for research into sustainable, rural, economic, cultural and social development. Realization of this biosphere reserve development proposal, be it in relation to tourism, resource extraction/harvest, or human development, will gain from any environmental assessment process by the fact that it is proposed for an area that values people and nature working together for a common good.

15. LOGISTIC SUPPORT FUNCTION

15.1. Research and Monitoring

The Bras d'Or estuary and its associated watershed have attracted the interest of natural scientists since the arrival of the Mi'kmaq peoples following the retreat of the glaciers approximately 5.5Ky ago. The local ecological knowledge acquired by these first peoples in order to survive and thrive in the ecosystem has been retained to greater or lesser degree in their oral culture, traditions and practices. Recording of Mi'kmaq society and culture represents the earliest western-style social science. It was conducted by Catholic missionaries working with the Mi'kmaq in the early 1600's (Lescarbot 1606, LeClerg 1691, Pastore 1990). Efforts to document Aboriginal Tradition Ecological Knowledge in the context of scientific research, monitoring and management in the Bras d'Or ecosystem is a recent phenomenon (Barsh 2002, Doherty *et al* 2006, Bartlett *et al* 2007, Hatcher *et al* 2009, UINR 2009). The history of European colonization and resource use during the development of Cape Breton's modern society has also received considerable research effort (e.g. MacDougall 1922, MacPhail 1970, Barkham 2004, Bouman *et al* 2004, Morgan 2008).

Modern research activities in the ecosystem began in the 1950's. It has focused primarily on the exploited resources of the estuary and its watershed, and (to a lesser extent), the condition of their natural habitats. The work has been sporadic, punctuated by intense studies of oceanography, fisheries, aquaculture, forestry and mining, and supported by a steady trickle of academic, corporate and community research projects that focus on particular species, habitats and impacts. There are very few long-term monitoring activities on-going in the ecosystem, and all of these are in the terrestrial environments (e.g. river flow, forest diversity, bird abundance, salmon returns). The lack of a continuous recording weather station within the catchment is a signal deficiency.

The main contributors to research activities are the Federal Department of Fisheries and Oceans, the local Universities (Cape Breton University, Saint Francis Xavier University, Dalhousie University), the Unama'ki Institute of Natural Resources and the Eskasoni Fisheries and Wildlife Commission, the local community stewardship groups (e.g. Bras d'Or Lakes Stewardship Society, Middle River Stewardship Society, Stewards of the River Denys – usually in partnership with agencies listed above), and some of the local resource and environmental consulting companies (e.g. ADI Ltd., Stora-Enso/New Page Ltd., Georgia Pacific Ltd.). The main contributors to monitoring activities in the ecosystem are the Provincial Department of

Natural Resources and the Unama'ki Institute of Natural Resources (Reserve lands and adjacent estuarine waters)

Several anthologies and reviews summarize past research in the proposed biosphere reserve, including the UMA Group - Bras d'Or Institute (1990), Davis & Browne (1996), Kenchington (1998), Lambert (2002), Petrie (2002), and Parker *et al.* (2007).

15.1.1. Past and planned research and monitoring to address management questions

AREAS NEEDING STRICT PROTECTION AS CORE AREAS, OR DETERMINE CAUSES OF AND MEANS TO HALT SOIL EROSION, ETC.

Research and monitoring for management decision support in the Bras d'Or ecosystem has been a recurring theme (Mackay 1975, Schneider 1991, Hipwell 2004, Barrington 2005). It is only in the past six years that serious efforts have been made to integrate such efforts in the context of holistic approaches to planning and management (CEPI 2006a, Naug 2007a, b, CEPI 2009a, IISD 2010).

Management-driven research and monitoring in the estuary has largely been directed towards aquaculture development, fisheries, and habitat conservation, pollution abatement and assessment of the impacts of introduced or invasive species. Studies of anadromous, catadromous and freshwater fish extend aquatic habitat research upland along some of the significant river systems of the Bras d'Or. Forestry research and monitoring have been associated with the development of long-term forest management plans for Crown lands and forests. There is little agricultural research being undertaken in the region, although there was some in the past. More recently, the effort has expanded to include the discovery, collection and assembly of synoptic data for ecosystem-based management of the Bras d'Or Lake and watershed (e.g. ADI 2006, Hatcher 2006, Hatcher *et al* 2007, UINR-Membertou Geomatics 2009). In addition, a number of institutional and community-based environmental monitoring projects have recently been initiated in the region (e.g. the *CABIN* stream monitoring program undertaken by the Atlantic Coastal Action Program – Cape Breton; the *CAMP* shore monitoring program undertaken by the Nova Scotia Community College and the Unama'ki Institute of Natural Resources).

15.1.2. Brief description of past research and/or monitoring activities

DATES OF ACTIVITIES AND EXTENT TO WHICH THE RESEARCH AND MONITORING PROGRAMMES ARE OF LOCAL/NATIONAL IMPORTANCE AND/OR OF INTERNATIONAL IMPORTANCE. "PAST" IS ARBITRARILY DEFINED HERE AS PRIOR TO THE YEAR 2000.

•ABIOTIC RESEARCH AND MONITORING (CLIMATOLOGY, HYDROLOGY, GEOMORPHOLOGY, ETC.):

Research into the abiotic elements of the Bras d'Or ecosystem conducted since the early 1940's is compiled or summarized by Fensome & Williams (2001 – geology), Petrie & Bugden (2002 – physical oceanography), Strain and Yeats (2002 – chemical oceanography), Shaw *et al* (2002 – marine geology), Taylor & Shaw (2002 – geomorphology), ADI (2006 – hydrology), C-CIARN (2006 - climatology). Major campaigns of research on the geology and landscape were undertaken in the 1950's and 1980's, usually in the context of mineral assessment. Two large campaigns of oceanographic research were mounted in the mid 1970's and 1990's, which characterized the seasonal structure of the estuarine water column and the major circulations. Programs of stream flow and water quality monitoring were established through the 1970's and 80's, but were subsequently reduced. Weather has been monitored for 30 years at four locations of NS-DNR fire towers in the watershed, but there is no year-round collection of weather or ice data in the ecosystem.

The basic information on the geology, hydrology and oceanography essential for environmental planning is largely available, but there are significant gaps. In particular, there has been little research on the flux of surface and ground water from the watershed to the estuary, very limited interpretation of erosion and sedimentation processes, and few retrospective studies of local climate (e.g. Underwood 1981). Little of the historical data on abiotic factors and processes is available in readily accessible GIS formats (Hatcher *et al* 2007).

•BIOTIC RESEARCH AND MONITORING (FLORA, FAUNA):

Taxonomic inventories of terrestrial plants and animals in the watershed, seabirds, fish, benthic invertebrates, and plankton in the estuary are summarized by Davis & Browne (1996), the Atlantic Canada Conservation Data Centre (2008), Lambert (2002), NS-DNR (2009) and Parker *et al.* (2007). Field studies have focused mainly on forest biology and ecology (e.g. Bouman *et al* 2004, D'Orsay 2004), and on commercially important fish in the context of fisheries and aquaculture. Salmon, oyster, and its pathogens have received the most attention. Other studies published since the 1980's span the entire spectrum of biotic processes, such as the effects of invasive marine species on native species (Cameron B, 2003), the use of lichens as indicators of ecosystem health (Cameron R, 2003), and coyote prey-switching between deer

and hares in the River Denys Basin (Patterson *et al* 1998).

Despite the substantive amount of past research done on various aspects of the biota of the Bras d'Or region, it cannot be said that there is enough information to inform management planning at the scale of the ecosystem. For example, no accurate time series of fisheries landings statistics are available for the estuary, there are not adequate data to configure a food web model, and monitoring of species invasions is a recent initiative (Sefton *et al* 2007, Project UFO 2009). Again, many of the legacy biological data sets are not available in web-distributed, geo-referenced formats (Hatcher *et al* 2007).

Irish Cove EMAN forest-monitoring plot. The EMAN forest monitoring plot at Irish Cove, Cape Breton, has involved forest inventorying of sapling regeneration, lichen diversity and abundance, breeding bird monitoring and summer bird surveys, as well as an ongoing soil inventory of the one-hectare EMAN terrestrial monitoring plot. Preliminary data analysis indicates a healthy ecosystem in Irish Cove.

Note: *The October, 2004 issue of the* EMAN MONITOR *(Volume 2, Issue 3), includes a description written by Clayton D'Orsay, of the second inventory of the one-hectare Irish Cove, Cape Breton EMAN monitoring plot. Terrestrial monitoring protocols are in place there "to detect how different forests, of differing age and composition, react to environmental change." The ultimate purpose of this ongoing undertaking of Cape Breton University and Cape Breton Naturalists Society is to "provide for a more robust early warning system of environmental changes in Eastern Cape Breton Island." This report summarizes the first five-year measurement of the EMAN forest monitoring plot. Begun in 1996, initial measurements were completed in 1999. This project highlights the ongoing commitment of CBU and Cape Breton Naturalists Society.*

• SOCIO-ECONOMIC RESEARCH (DEMOGRAPHY, ECONOMICS, TRADITIONAL KNOWLEDGE, ETC.):

Socio-economic research in the Bras d'Or ecosystem has focused on the history and culture of the Aboriginal and European peoples (see Section 15.1 above), and on the conditions of community economic development. Johnson (1998) reviews forty years of government-directed regional development in Cape Breton, which has signal lessons for the future of sustainable development here.

Of particular relevance to management planning are case studies of collaboration for watershed management, including the Bras d'Or Stewardship Society (Ho 1999), and the Stewards of the River Denys (Barrington 2005). There is also a body work on incorporating LEK (and values) into ecotourism for Cape Breton (e.g. MacKay 1998), and Issues about incorporating ATEK into site and building designs in the Eskasoni First Nation (Bing-Wo 1998). Because the Mi'kmaq people show leadership in environmental conservation of the Bras d'Or's

resources, the historical narrative and interpretive accounts of the Mi'kmaq movement to stop a proposed mining development from1989-1992 is of note (Hornborg 1994).

15.1.3. Brief description of ongoing research and/or monitoring activities
BRIEF DESCRIPTION OF ONGOING RESEARCH AND/OR MONITORING ACTIVITIES (FROM 2000).

Since 2005 there has been a revitalization of research and monitoring in the Bras d'Or ecosystem resulting from a series of initiatives and collaborations. The Collaborative Environmental Planning Initiative (CEPI) for the Bras d'Or, through its Steering Committee and various Task Teams has served to focus research priorities on the needs of integrated planning and management (CEPI 2006a, 2009a). The 18 legally empowered agencies that are signatories of the Bras d'Or Charter have increased their levels of research funding and cooperation as a result. The six year process of nominating the Bras d'Or ecosystem under UNESCO's Man and the Biosphere Program the Bras d'Or Lake Biosphere Reserve Association (BLBRA) has broadened public awareness and knowledge of the watershed's assets and needs for holistic management approaches. The inclusion of the Bras d'Or Ecosystem as a Pilot Site in the Integrated Management and Geospatial Information Network for the Environment (IMAGINE Canada) has afforded a range of new opportunities to discover and share data and information pertinent to management decision support, and to learn of examples elsewhere in Canada. The revitalization of the Bras d'Or Institute (BdOI) at Cape Breton University (CBU), and creation of a Chair of Marine Ecosystem Research has resulted in the acquisition of new infrastructure, the attraction of significant new grant funding, and the training of highly qualified personnel. Memoranda of Understanding between Cape Breton University, the Unama'ki Institute of Natural Resources (UINR), Fisheries and Oceans Canada (DFO), Natural Resources Canada (NRCan), Dalhousie University and Hyperspectral Imaging Ltd. (HIL) have facilitated the initiation of new research projects on oceanography, fisheries and invasive species in the Bras d'Or ecosystem.

Summaries of relevant research and monitoring projects are listed in the sections that follow.

•ABIOTIC RESEARCH AND MONITORING (CLIMATOLOGY, HYDROLOGY, GEOMORPHOLOGY, ETC.):

Mapping and interpreting the marine geology of the Bras d'Or Lakes. Project X-29, Geological Survey of Canada. Complete. (J. Shaw, Atlantic GeoScience Centre, Bedford Institute of Oceanography).

Assessment and mapping of freshwater resources and hydrological structures of the Bras d'Or watershed, including evaluation and prediction of changes associated with climate change. Ongoing. (ADI Ltd., Baechler & Baechler, 2006).

Spatially explicit surveys (remote sensing, *in situ* instrument observations), and numerical models of the physical chemical environment and biotic communities of the watershed's, littoral, and subtidal realm of the Bras d'Or estuary. Ongoing. (Bras d'Or Institute, Cape Breton University, Dalhousie University, Fisheries & Oceans Canada, Satlantic Ltd., HIL). (Hatcher 2006, Hatcher *et al* 2008, Yang *et al*

2007, 2008)

Mapping of threats to Bras d'Or water quality and near-shore habitats associated with erosion and sedimentation. Complete, Membertou Geomatics Ltd., 2009).

Long-term stream habitat assessment (geology, hydrology) related to salmon populations in Glen Brook (River Denys watershed). Ongoing. (F. Baechler (ADI); J. Foulds, Foulds Environmental)

Scenario-based planning for adaptation to climate change, including compilation of local predictions of change in sea level, thermal, precipitation and ice regimes. Ongoing. (C-CIARN, 2009, IISD-BdOI 2009).

• BIOTIC RESEARCH AND MONITORING (FLORA, FAUNA):

Winter condition of coyotes in relation to prey density in two areas of Nova Scotia (one study area was in the River Denys Basin). Complete. (Patterson *et al* 2000).

Studies of habitat use of Canada lynx in Cape Breton. One population within the Bras d'Or watershed. Ongoing. (Nova Scotia Lynx Recovery Team and UINR).

Confirmation of wood turtles in the River Denys Basin. (Gråf and Gilhen 2003).

Seasonal surveys of 55 beaches in the Bras d'Or Lakes for occurrences of piping plovers (*Charadrius melodus*). Gathering of TEK information about past occurrences. Ongoing. (UINR & CBU).

Restoration of black ash in, and by First Nations communities, as a source material for various crafts and other products. Ongoing. (UINR).

Studies of salmon and trout populations related to stream remediation work in Big Brook (River Denys watershed) (J. Foulds, Foulds Environmental)

Biology of *Haplosporidium nelsoni* and its parasitic infection of oysters with MSX (Multinucleated Spherical unknown) in the Bras d'Or Lakes (first detected in 2002). Complete. CBU with members of the Canadian Network in Aquaculture (AquaNet). (Beresford & Hatcher, 2008).

Experimental research to develop MSX-resistant oysters. Ongoing, Eskasoni Fish and Wildlife Commission. Ongoing. (Allison MacIsaac, EFWC and AquaNet).

Design, installation and monitoring of artificial habitats (reef blocks) for lobsters in East Bay and monitoring of results. Ongoing. (Shelley Denny, UINR).

Recruitment of green crabs, including one sampling site at Benacadie Pond in the Bras d'Or Lakes. Complete. (Cameron 2003, Breen 2009).

Patterns of colonization of green crabs in the Bras d'Or and consequences for native lobster, crab and oyster fisheries. Ongoing. (Dalhousie University and UINR).
Monitoring of the prevalence of the Eel parasite (*Anguillicoloides crassus*) in the Bras d'Or estuary. Ongoing. Rockwell *et al* 2009, (M Jones, CBU; S Denny, UINR)

Stock assessment of gaspereau/alewives (*Alosa pseudoharengus*) in the Bras d'Or Lake. Ongoing. (Shelley Denny, UINR).

Mapping of the distribution of benthic communities (i.e. algal beds, seagrass meadows, sediments, etc.) in near shore regions of the estuary using remotely sensed data and *in situ* observations. Ongoing. (B Hatcher, BdOI-CBU, H Ripley, HIL, H Vandermeullen, DFO, UINR).

Collaborative Salmon Initiative and Ocean tracking Network to investigate and revitalize Atlantic salmon (Plamu) stocks in Cape Breton, including the Bras d'Or watershed. Ongoing. (Shelley Porter, CEPI, UINR and Bruce Hatcher, Bras d'Or Institute, Cape Breton University).

Outline of a biodiversity conservation strategy for Nova Scotia (including Cape Breton) based on a network of ecological core areas, areas of connectivity between them and compatible-use buffer zones. (Beazley, *et al.,* 2004).

Assessment of protected areas on freehold lands - StoraEnso. Complete. (C Miller. Published in Proceedings NS Institute of Science in 2004).

EMAN forest monitoring. Carrying out a five-year forest inventory and yearly re-inventorying,

looking at sapling regeneration, lichen diversity and abundance, as well as carrying out an ongoing soil inventory of the one hectare EMAN terrestrial monitoring plot in Irish Cove, Cape Breton. Undertaken to better understand and detect how different forests, of differing age and composition, react to environmental change. Ongoing. (D'Orsay 2004, Bouman2004, Cape Breton University).

Atlantic Zonal Monitoring Program (AZMP) Atlantic Canada wide network of marine sampling sites used to calibrate satellite remotely sensed data of ocean colour to map the distribution of chlorophyll productivity and suspended sediment and coloured dissolved organic matter in surface waters. Two sites in the Bras d'Or estuary: one in the centre of the south basin (great Lake), and one in the centre of Whycocomagh Bay. Ongoing. (Bruce Hatcher, Bras d'Or Institute, CBU, Ed Horne, DFO).

Canadian Shellfish Sanitation Program. More than 400 sites in the Bras d'Or estuary are monitored for mammalian faecal coliform bacteria concentrations during the summer months by staff from Environment Canada. The purpose is to prevent harm to seafood consumers and producers by closing areas that have significant levels of contamination to shellfish harvesting. The data forms the basis for water quality assessments of the estuary (UINR 2007, CEPI 2009b).

•SOCIO-ECONOMIC RESEARCH (DEMOGRAPHY, ECONOMICS, TRADITIONAL KNOWLEDGE, ETC.):

Interpretive narrative of politics and governance in the restoration of the Bras d'Or Lakes watershed region. Complete. (Hipwell 2001, 2004).

Development and Non-Metropolitan Regions in the New Economy, 2003-2006. Complete. (Barham 2004, Serroul 2004).

Studies on the role of community-based tourism for Cape Breton and elsewhere in the Atlantic provinces. SSHRC Project. Ongoing. (CBU & New Dawn Enterprises)

Case study of the experience from the agreement for Mi'Kmaq education in Nova Scotia (includes Cape Breton). Complete. (McCarthy 2001).

Similarities and differences between cooperative movements and community development corporations in promoting development in Nova Scotia (Antigonish Movement and New Dawn Enterprises). Complete. (MacAuley 2001).

Case examples of entrepreneurial roles in depleted communities (including Cape Breton).

Complete. (Johnstone and Lionais 2004).

Understanding the strengths of indigenous communities: A project to inform and inspire First Nations-led development. Currently involves seven Aboriginal communities across Canada, including Wagmatcook (Wagmitkuk). Ongoing since 1999. (York University and Trent University).

Applying integrative science in the Bras d'Or Lakes watershed. Ongoing (Sena Kavanagh *et al*, 2003).

Studies of the River Denys watershed to develop recommendations for improved water quality. (Barrington 2005). Ongoing. (Stewards of the River Denys Watershed Association).

Mapping of fisheries resources and impacted fish habitat based on collections of Aboriginal Traditional Knowledge. Ongoing. Pitu'paq Project Partnership (Eskasoni) and Highlands Coastal mapping Association, (Ingonish).

15.1.4. Brief description of planned research and/or monitoring activities

There is an increasing demand for research products and environmental monitoring that is pertinent to ecosystem-based planning and management within the Bras d'Or ecosystem. The CEPI Steering Committee and State of the Environment Task Team have identified regular, repeated reporting of the health of the ecosystem using a standardized indicator set (i.e. a "Report Card") as a key research and monitoring product (Hatcher *et al* 2008, CEPI 2009a). The content of a recent workshop on research priorities for the Bras d'Or (CEPI 2009b) provides a detailed list of ongoing and planned research in the ecosystem. Specific examples are listed in the sections that follow.

•ABIOTIC RESEARCH AND MONITORING (CLIMATOLOGY, HYDROLOGY, GEOMORPHOLOGY, ETC.):

Development of coupled, fine scale hydraulic and circulation models linking the watershed, groundwater reservoir and estuary driven by freshwater inflows, wind, tides and external forcing from Sydney Bight (J Sheng, Dalhousie University, B Hatcher, Cape Breton University).

Monitoring of river and stream flow, surface and ground water quality in the Bras d'Or watershed. (F Baechler, ADI Ltd.)

Investigation of nutrient and oxygen dynamics in winter that drive spring phytoplankton blooms in the estuary. (E Horne, DFO, B Hatcher, CBU).

Analyses of composition of bottom sediments of the Bras d'Or Lake. (J Shaw, NRCan).

Better description of the glacial and early post-glacial history of the Bras d'Or basin, and refinement and testing of life cycle models for barrier and spit formations along coast of the Bras d'Or. (J Taylor, NRCan, L Baechler, BLSS)

Evaluation of nutrient and sediment inputs from the watershed to the estuary as a function of drainage basin size, shoreline geomorphology and level of coastal development. (E MacCormick & B Hatcher, BdOI-CBU)

Evaluation and prediction of climate change in the Bras d'Or region. (G Lines, Environment Canada, F Baechler, ADI Ltd.)

•BIOTIC RESEARCH AND MONITORING (FLORA, FAUNA):

Population biology of lobster, crab, oyster, salmon, gaspereaux, smelt and eel in the estuary and aquatic environments of the watershed. (A MacIsaac, EFWC, S Denny, UINR, B Hatcher, M Jones & T Rawlings, CBU, J Gibson & R Bradford, DFO, J Foulds & F Baechler, ADI Ltd.)

Analyses of species composition of plankton communities. (T Lambert, DFO, A MacIsaac, EFWC)

Seasonal and spatial changes in the species composition of invertebrate fauna in relation to the physical environments of the Bras d'Or Lake – CAMP and CABIN monitoring protocols (S Denny, UINR, W Williams, ACAP-CB)

Expanded and regular monitoring of species invasions of the Bras d'Or ecosystem (S Denny, UINR, M Jones, T Rawlings & R Berresford, CBU, B Vercameer, DFO).

Ecological connectivity analyses and epidemiology of oyster parasites and diseases in the Bras d'Or estuary (B Hatcher, BdOI-CBU, J Sheng, Dalhousie University)

Use of lichens as indicators of ecosystem health in the watershed (C Cameron 2003; 2006).

Classify and map biological communities in the littoral zone of the entire estuary. (H Vandermeullen, DFO, B Hatcher, CBU, H Ripley, HIL, N Deagle, NS-DNR)

Compile and distribute an annual report card of the health of the Bras d'Or ecosystem based on ecological indicators (CEPI State of the Environment Task Team (Hatcher *et al* 2008).

•Socio-economic research (demography, economics and traditional knowledge):

Land-use classification and mapping of human activities in the Bras d'Or ecosystem. CEPI Mapping Task Team (Hatcher *et al* 2007)

Calculation of the value of ecosystem goods and services provided by the Bras d'Or estuary and watershed. (Bras d'Or Institute, CBU, UINR, CBRM, GPI-Atlantic)

Documentation of Local and Traditional Ecological Knowledge of the Bras d'Or ecosystem (EFWC, UINR, CBU, DFO)

15.1.5. Estimate regarding national scientists participating in research within the proposed biosphere reserve

On a permanent basis: 9 permanent national scientists

On an occasional basis: 24 occasional national scientists

15.1.6. Estimated number of foreign scientists participating in research within the proposed biosphere reserve

On a permanent basis: 0 permanent foreign scientists

On an occasional basis: 7 occasional foreign scientists

15.1.7. Estimated number of masters and/or doctoral theses carried out on the proposed biosphere reserve each year

Average: 2 B.Sc (Honours), 1 M.Sc. and 0.5 Ph.D. theses per year. Plus 1 Post-doctoral Fellow per year.

Past 5 years: 4 Undergraduate Honours degrees, 4 Masters degrees, 2 Doctoral degrees and 2 Post-Doctoral Fellowships completed.

Institutions: Cape Breton University, Carlton University, Dalhousie University, Saint Mary's University.

15.1.8. Research station(s) within the proposed Biosphere Reserve

The Unama'ki Institute of Natural Resources (UINR), Eskasoni was incorporated in 1999 and institutionally associated with the Eskasoni Fish and Wildlife Commission. UINR works through a number of partnership arrangements especially with the Cape Breton University, Department of Fisheries and Oceans, Environment Canada, Parks Canada, NS Environment, the NS

Department of Natural Resources, the NS Department of Agriculture and Fisheries, NewPage Port Hawkesbury Ltd. and Georgia-Pacific Canada. It is a key coordinating body for the CEPI.

The Eco-Centre, Whycocomagh Education Centre, Whycocomagh.
Established in 2006, the Centre provides hands-on teaching about the natural history and stewardship of their local ecosystems to primary and secondary students. A small running seawater facility is used to retain specimens for demonstration and study year-round in the laboratory. The Director is a teacher and community leader.

Aros na Mara Marine Science Centre, Iona. [PROPOSED]
Plans for an $8M aquarium, laboratory, teaching and entertainment facility have been prepared for a centrally-located site on the waterfront of the Barra Strait linking the North and South Basins of the Bras d'Or estuary (Gatrill Management Assoc. 2007). The name is Gaelic for "House of the Sea". The building is designed to provide research, education and exhibition facilities including wet and dry laboratories, research aquaria, SCUBA support and boat yard, a multi-media orientation theatre, a touch pool and interactive exhibits, and large display aquaria. The project is being developed by the Central Cape Breton Community Ventures Inc. in partnership with UINR and the Bras d'Or Institute for Ecosystem Research, Cape Breton University.

15.1.9. Permanent research stations outside the proposed biosphere reserve

THE LOCATION OF RESEARCH STATIONS DISTANT FROM THE CORE AREA, INCLUDING NAME AND ADDRESS OF THE MOST RELEVANT RESEARCH STATIONS.

In addition to those described in Section 15.1.8, the following should be noted:

Bras d'Or Institute for Ecosystem Research, Cape Breton University, PO Box 5300, Sydney, Nova Scotia, Canada B1P 6L2
Established, in 1974 by Cape Breton University to "apply the resources of the University to the needs of the community", the Institute has contributed key studies of aquaculture, marine science and integrated management in the Bras d'Or ecosystem. Faculty and staff work collaboratively with members of all other schools and departments at the University on research in the Bras d'Or ecosystem and elsewhere in Cape Breton. The Institute collaborates with several other agencies and initiatives, including the Atlantic Coastal Action Program (ACAP-CB), BIO, BLBRA, BLSS, CEPI, Dalhousie University, DFO and the UINR. The current Director (appointed in 2005) holds the University Chair in Marine Ecosystem Research. The Institute

maintains an off-road vehicle, oceanographic research vessel, scientific SCUBA diving facilities. A running seawater system and a full complement of oceanographic and survey equipment. The University provides extensive wet and dry laboratories, as well as a remote sensing and GIS laboratory. CBU is located approximately 50 km from the Barra Strait in the middle of the Bras d'Or estuary.

Institute for Integrative Science, Cape Breton University, PO Box 5300, Sydney, Nova Scotia, Canada B1P 6L2

Established in 2005, the Institute develops and applies the concept of "two-eyed seeing" (comprehending the natural world with both western and indigenous ways of knowing) to both research and education. Faculties at the Institute have developed, and deliver tertiary and secondary curriculum designed to enhance science outcomes for Mi'kmaq students. The Institute maintains close collaborations with Mi'kmaq elders and the UINR. The Director holds a Canada Research Chair in Integrative Science.

Other Universities

Faculty and/or students from several other universities have done work in the Bras d'Or region over the past three decades, including (in alphabetical order): Acadia University, Wolfville, NS. Carlton University, Ottawa, ON.; Dalhousie University, Halifax, NS.; St. Francis Xavier University, Antigonish, NS..; St. Mary's University, Halifax, NS.; the Nova Scotia Community College campus in Port Hawkesbury, NS. These institutions are located in the province between 400 and 1600 km from the Barra Strait in the middle of the Bras d'Or estuary.

Bedford Institute of Oceanography, Dartmouth, NS.

Established in 1962 on the Bedford Basin of Halifax Harbour, the Institute is the largest centre for oceans research in Canada. The multi-agency campus supports approximately 400 staff associated with five divisions in the Department of Fisheries and Oceans, the Geological Survey of Canada (Department of Natural Resources Canada, the Canadian Shellfish Sanitation Program of Environment Canada and the ocean surveillance programs of the Department of National Defense. It is homeport to Canada's east coast fleet of more than 20 research vessels. The Institute has a number of targeted research activities in the Bras d'Or region. It is located in Dartmouth, Nova Scotia, approximately 350 km from the Barra Strait in the middle of the Bras d'Or estuary.

Local Area Office, Fisheries & Oceans Canada, Westmount, NS.
DFO maintains fisheries officers and scientists with responsibility for monitoring compliance with and management outcomes of the Fisheries Act and Species at Risk Act in the eastern part of the province, including the freshwater and estuarine habitats within the proposed Biosphere reserve. The facility has a laboratory, patrol vessel and SCUBA diving capacity. The Office is located approximately 40 km from the Barra Strait in the middle of the Bras d'Or estuary.

Regional Office, Nova Scotia Department of Natural Resources, Coxheath, NS.
The provincial government maintains a large facility and staff to monitor and manage the living and physical resources of the region, including those within the proposed biosphere reserve. The staff includes wildlife biologists and geomatics specialists. As well as the dry laboratories and GIS, the unit maintains several trucks and a small helicopter. The Office is located approximately 40 km from the Barra Strait in the middle of the Bras d'Or estuary.
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15.1.10. Permanent monitoring plots
YEAR ESTABLISHED, THE OBJECTIVE OF MONITORING, THE TYPE AND FREQUENCY OF OBSERVATIONS AND MEASUREMENTS, AND WHETHER AN INTERNATIONALLY RECOGNIZED PROTOCOL IS BEING USED, FOR EXAMPLE THE SMITHSONIAN-MAB MAPMON PROTOCOL FOR MONITORING FOREST BIODIVERSITY.

Several types of monitoring are taking place in the proposed biosphere reserve:

Nova Scotia Ambient Air Quality Monitoring (thirteen stations, including Sydney and Port Hawkesbury). Readings include Ozone, N0x SO_2 PM2.5 . Nova Scotia Department of Environment.

Automatic stream gauge recorders maintained as part of the automatic stream gauge network part of the Water Survey of Canada (Environment Canada): Upper Middle River (since 2003), and River Denys (established in [2007).

Compliance-based water quality monitoring at mine sites, landfill sites, municipal sewage treatment plants, wastewater discharge sites and registered water supplies.
Nova Scotia Environment, and Indian and Northern Affairs Canada, for First Nation sites.

Monitoring of 412 near shore sites in the Bras d'Or estuary for mammalian faecal coliform bacteria as part of the Canadian Shelfish Sanitation Program operated by Environment Canada.

Oceanographic monitoring at two sites in the centre of deep basins in the Bras d'Or Lake

(157m depth) and the Whycocomagh Bay (48m depth) as part of the Atlantic Zonal Monitoring Program coordinated by the Bedford Institute of Oceanography. A full suite of hydrological, chemical and optical variables are measured through the entire water column monthly at each site by staff from the Bras d'Or Institute at CBU and the Unama'ki Institute of Natural Resources.

Surveys of lichens as indicators of ecosystem health over a network of thirty, 0.4-hectare circular plots with a 36-metre radius in fourteen protected areas, including the Bornish Hill Nature Reserve (within the proposed Biosphere Reserve). To be surveyed every five years as part of a program of the Nova Scotia Department of Environment.

Forest biodiversity monitoring using protocols modified from the SI / MAB design by EMAN (Environment Canada). There is one site within the proposed biosphere reserve at Irish Cove.

15.1.11 Research facilities or research stations

METEOROLOGICAL AND/OR HYDROLOGICAL STATIONS, EXPERIMENTAL PLOTS, LABORATORY, COMPUTERIZED DATABASES, GEOGRAPHICAL INFORMATION SYSTEM, LIBRARY, VEHICLES, ETC.

Government agencies and the universities have a wide range of facilities, including all of the above. Arrangements for access and use have to be made directly with appropriate administrative authorities.

15.1.12. Other facilities

FACILITIES FOR LODGING OR FOR OVERNIGHT ACCOMMODATION FOR SCIENTISTS ETC.

The full range of accommodation as well as other facilities can be found within, and also relatively close to, the proposed biosphere reserve.

15.1.13. Proposed biosphere reserve Internet connection

The registered address for the Bras d'Or Lake Biosphere Reserve is 532 Chebucto St. Baddeck, NS. It is located with the Bras d'Or Preservation Nature Trust where there is Internet access.

The official web site for the Bras d'Or Lake Biosphere Reserve is www.blbra.ca This site gives a basic introduction to the proposed biosphere reserve, outlines the history of its development and encourages citizens to find out more information and how to contact the Bras

d'Or Lake Biosphere Reserve Association. All nomination documents and minutes of Board meetings can be downloaded from the site.

15.2. Environmental Education and Public Awareness

ENVIRONMENTAL EDUCATION--SOMETIMES REFERRED TO AS EDUCATION FOR SUSTAINABLE DEVELOPMENT--CAN BE AIMED AT SCHOOL CHILDREN, THE ADULT POPULATION OF THE LOCAL COMMUNITIES, AND VISITORS FROM HOME AND ABROAD.

Sometimes referred to as education for sustainable development, environmental education is a principal function of the proposed biosphere reserve. It is a subset of the overall capacity building function. Its exact form remains to be determined through collaborative association with partner organizations, especially the CEPI, Cape Breton University, the Bras d'Or Preservation Nature Trust, the Bras d'Or Stewardship Society, the Whycocomagh EcoCentre and various programs of cooperating organizations. It is envisioned that the biosphere reserve will support the educational aims of these, and other entities through expertise relating to effective approaches to program design and learning technology.

15.2.1. Environmental education and public awareness activities

Education and public awareness activities include local history and culture as well as environmental aspects of the Bras d'Or Lake ecosystems. Some are based at centres (see below) and others are components of advocacy organizations such as the Bras d'Or Stewardship Society, or community groups such as the Stewards of the River Denys Watershed Association. Promotional tourist literature often provides considerable background information for the general public.

15.2.2. Facilities for environmental education and public awareness activities

VISITORS' CENTRE; INTERPRETATIVE PROGRAMMES FOR VISITORS AND TOURISTS; NATURE TRAILS; ECOMUSEUM DEMONSTRATION PROJECTS ON SUSTAINABLE USE OF NATURAL RESOURCES.

The main facilities for environmental education and public awareness activities within the proposed biosphere reserve are noted below, in alphabetical order:

Alexander Graham Bell National Historic Site and Museum, Baddeck.
Operated by Parks Canada on a 19-hectare site overlooking the Bras d'Or Lake, Baddeck Bay and the Beinn Bhreagh complex which includes Alexander Graham Bell's former summer estate. A Scots-American who also lived in Canada for periods of time, Bell (1847-1922) was a prolific inventor and innovator. The museum was opened in 1956, and expanded to its present

form in 1996. It has "…a unique exhibit complex where models, replicas, photo displays, artefacts and films describe the fascinating life and work of Alexander Graham Bell" (Parks Canada website) and attracts about 120,000 visitors annually.

Alexander Graham Bell Environmental Stewardship Centre, North Baddeck.
Proposed by the Bras d'Or Preservation Nature Trust to provide research and outdoor education facilities.

Battery Provincial Park and Canal Historic Site, St. Peter's.
The 46-hectare provincial park overlooks the historic canal and is on the site of Fort Dorchester, a small installation, built by the British in 1794 on the short isthmus separating the Bras d'Or Lake from the Atlantic Ocean. The 800-metre-long by 30-metre-wide canal and locks were completed in 1869 to allow vessels to sail between the Lake and the Atlantic. The canal was restored by Parks Canada as a National Historic Site in 1985 and is operated by them during the summer. It is mainly for the use of pleasure craft. The park has camping facilities, trails and interpretive sites about the complex.

Bras d'Or Lakes and Watershed Interpretive Centre, Baddeck.
The Centre was constructed and is operated by the Bras d'Or Preservation Society in a former post office building on the main street of Baddeck. The centre opened in 2000 and has a set of interactive displays on the history, ecology and human impacts on the Bras d'Or, as well as a reference library and a small meeting room for presentations to the public.

Bras d'Or Stewardship Society
The society sponsors meetings in various communities to discuss issues about the Bras d'Or with local residents. Its newsletter (also available online) reports on findings and discussions about potential measures for ecological improvement of the Lake and its watershed.
Highland Village Centre, Iona.

The village is set on a 17.4-hectare site, high on a hillside (Hector's Point) with panoramic views of the Bras d'Or Lake and countryside. It is a living-history museum and cultural centre to celebrate the Gaelic experience in Nova Scotia during the period from about 1790 to the 1920s. The village has ten restored historic buildings with artefacts arranged in a chronological display, beginning with a full-scale replica of a Hebridean Blockhouse, c. 1800. The village operates a garden and farm program with rare breeds of farm animals (e.g. Highland cattle). Costumed animators demonstrate daily life, including crafts and weaving. There is also a museum,

conference hall and a shop selling Gaelic books and music. A regular program of events runs from May through early December, including Gaelic language courses. A stage and amphitheatre are used for traditional céilidhs, step-dancing, piping, square dancing and other events.

Marble Mountain Library and Museum, Marble Mountain.

This library and museum is operated by the Marble Mountain Community Association. It features photos, artefacts and journals documenting the limestone and marble quarry industry of the late 19th and early 20th centuries. The Marble Mountain Wharf Preservation Society operates a modern boat ramp facility.

Nicolas Denys Museum, St. Peter's.
Operated by the St. Peter's Community Club in memory of Nicolas Denys (1598-1688). Denys arrived from France to become the first permanent settler in the community, in 1650. With his family, he operated a trading post there for many years. As a centennial project in 1967, a replica of the house and trading post was built. It contains artefacts and displays of 17th century items, including facsimiles of Deny's writings about the region during the 1670s.

Orangedale (Intercolonial) Railway Museum, Orangedale.
The station, built in 1886, operated until 1990. The Orangedale Station Association restored the station as a museum with railroad displays, artefacts, a model railroad and a seasonal tourist information centre with a tearoom. Various types of old rail cars are displayed on the adjacent grounds. The museum celebrates railroading in the late 19th century and train travel in the Bras d'Or region.

Wagmatcook Culture and Heritage Centre.
Inaugurated in 2001, this museum and cultural centre on the shores of the Bras d'Or in Wagmatcook First Nation, is dedicated to teaching about and reviving the Mi'kmaq culture. It contains displays, photographs, artefacts and genealogical records. It features a conference hall for events such as drumming, dancing, storytelling and meetings. The centre offers courses in Mi'kmaq language, dancing and drumming and also houses a restaurant featuring traditional Mi'kmaq food.

15.3. Specialist Training

ACQUISITION OF PROFESSIONAL SKILLS BY MANAGERS, UNIVERSITY STUDENTS, DECISION-MAKERS ETC. DESCRIBE SPECIALIST TRAINING ACTIVITIES: FOR EXAMPLE RESEARCH PROJECTS FOR STUDENTS; PROFESSIONAL TRAINING AND WORKSHOPS FOR SCIENTISTS; PROFESSIONAL TRAINING AND WORKSHOPS FOR RESOURCE MANAGERS AND PLANNERS; EXTENSION SERVICES TO LOCAL PEOPLE; TRAINING FOR STAFF IN PROTECTED AREA MANAGEMENT.

In addition to activities mentioned in Section 15.1.8. and Section 15.2.2. the following are noted:

Eskasoni Fish and Wildlife Commission courses related to developing a professional Mi'kmaq fishing industry;

On-the-job training associated with field studies undertaken by the UINR, including a Coastal Monitoring Program (CAMP) partnered with Fisheries & Oceans Canada;

Role of the Mi'kmaq College Institute at CBU to provide training opportunities for Aboriginal students in tertiary education;

The Toqwa'tu'kl Kjijitaqnn / Integrated Science Program at CBU which includes TEK courses (entitled MSiT) as a major within the BSc in Community Studies degree program;

Certificate training course in Scientific Diving, compliant with new provincial occupational diving regulations, Bras d'Or Institute, CBU;

Diploma in Environment Technology offered by the Nova Scotia Community College out of its Port Hawkesbury Campus.

EMAN workshops and short training courses for volunteers to undertake various kinds of ecological monitoring, using standardized monitoring protocols. The EMAN sites are part of a national network, with sites present in several of Canada's Biosphere reserves. There is thus opportunity for learning from collaborations with other Canadian Biosphere Reserves, including the SW Nova BR, which also has an EMAN site.

15.4. Potential to Contribute to the World Network of Biosphere Reserves

COLLABORATION AMONG BIOSPHERE RESERVES AT A NATIONAL, REGIONAL AND GLOBAL LEVEL IN TERMS OF EXCHANGE OF SCIENTIFIC INFORMATION, EXPERIENCE IN CONSERVATION AND SUSTAINABLE USE, STUDY TOURS OF PERSONNEL, JOINT SEMINARS AND WORKSHOPS, INTERNET CONNECTIONS AND DISCUSSION GROUPS, ETC.

The proponents of this biosphere reserve believe there is potential to contribute to the World Network of Biosphere Reserves. Initially contribution will be exercised on an opportunistic basis, in cooperation with the CBRA.

15.4.1. Collaboration with existing biosphere reserves at the national level
ONGOING OR PLANNED ACTIVITIES.

Specific initiatives to collaborate with other Canadian biosphere reserves have are just starting, with visits from members of the SW Nova BR to explain nomination, management and research planning and activities. If this proposal is approved by UNESCO, the new Bras d'Or Lake Biosphere Reserve will:

Seek membership in the CBRA and become involved in some national pilot projects sponsored by the association;

Exchange experiences with other biosphere reserves that are addressing issues of marine coastal ecosystems; and

Share the experience of co-management arrangements for resources with others committed to the integration of TEK with Western science to learn, by involving the best of both worlds.

15.4.2. Collaboration with existing biosphere reserves at the regional or subregional levels
COLLABORATION WITH EXISTING BIOSPHERE RESERVES AT THE REGIONAL OR SUBREGIONAL LEVELS, INCLUDING PROMOTING TRANSFRONTIER SITES AND TWINNING ARRANGEMENTS(ONGOING OR PLANNED ACTIVITIES). ('REGIONAL' REFERS TO THE REGIONS AS AFRICA, ARAB REGION, ASIA, AND PACIFIC LATIN AMERICA, AND THE CARIBBEAN, EUROPE. TRANSFRONTIER BIOSPHERE RESERVES CAN BE CREATED BY TWO OR MORE CONTIGUOUS COUNTRIES TO PROMOTE COOPERATION TO CONSERVE AND SUSTAINABLY USE ECOSYSTEMS WHICH STRADDLE THE INTERNATIONAL BOUNDARIES. TWINNING ARRANGEMENTS USUALLY CONSIST OF AGREEMENTS BETWEEN SITES LOCATED AT SOME DISTANCE IN DIFFERENT COUNTRIES TO PROMOTE ACTIVITIES SUCH AS COOPERATIVE RESEARCH PROJECTS, CULTURAL EXCHANGES FOR SCHOOLCHILDREN AND ADULTS, ETC.

Currently collaboration with existing biosphere reserves at the regional or subregional levels is not planned. Initial efforts (over the first two or three years following designation) will go toward working with other Canadian biosphere reserves and especially biosphere reserves located nearby such as Southwest Nova in Nova Scotia and Fundy in New Brunswick
In developing these regional collaborations, we will seek partners that take holistic approaches to the management of coastal areas so that the unique characteristics of littoral zones are acknowledged in management decisions. We seek approaches to the development of ecotourism services and products that respect different cultures and traditions while also being of benefit to local communities. Particular attention will be paid to developing genuine collaborations with other BRs that have developed effective, cross-cultural procedures that respect and learn from LEK and TEK in its different forms.

15.4.3. Collaboration with existing biosphere reserves in thematic networks at the regional or international levels

INDICATE ONGOING AND PLANNED ACTIVITIES. NETWORKS OF SITES WHICH HAVE A COMMON GEOGRAPHIC THEME SUCH AS ISLANDS AND ARCHIPELAGOES, MOUNTAINS, OR GRASSLAND SYSTEMS, OR A COMMON TOPIC OF INTEREST SUCH AS ECOTOURISM, ETHNO BIOLOGY ETC.

Upon designation the Bras d'Or Biosphere reserve will automatically a member of EUROMAB, the association of Biosphere Reserves of Europe, North America, Turkey and Israel. This association will facilitate international cooperation and exchanges.

Following designation, efforts will be made to find out how best to share information with other biosphere reserves around the world, ones that share similar conservation and sustainable development issues. In particular, sites that encompass estuarine and marine components will be sought, to share learning regarding:

Examples of candidate biosphere reserves that appear to relate to circumstances of the proposed Bras d'Or Lake are Urdubai BR (Bay of Biscay in Spain and the Basque region with possible historical links to Cape Breton fisheries), and Wadden Sea BR with different units in the Netherlands and Germany along the coast of the North Sea.
It is expected that the main venue for sharing this kind of information will be through Internet connections, conferences and personal visits—as opportunities allow.

The BLBRA will keep track of opportunities by following announcements on the UNESC0 / MAB website, and through the CBRA.

15.4.4. Collaboration with existing biosphere reserves at the international level

ONGOING AND PLANNED ACTIVITIES: NOTABLY THROUGH INTERNET CONNECTIONS, TWINNING ARRANGEMENTS, BILATERAL COLLABORATIVE RESEARCH ACTIVITIES, ETC.

Internet connections have the potential for identifying/presenting opportunities for bilateral collaborative research activities and twinning arrangements. The BLBRA will keep track of opportunities by following announcements on the UNESC0 / MAB website, and through the CBRA.

16. USES AND ACTIVITIES

16.1. Core Areas

16.1.1. Description of the uses and activities occurring within the core areas

WHILE THE CORE AREA IS INTENDED TO BE STRICTLY PROTECTED, CERTAIN ACTIVITIES AND USES MAY OCCUR OR BE ALLOWED, CONSISTENT WITH THE CONSERVATION OBJECTIVES OF THE CORE AREA.

Core areas are protected from any form of settlement or resource extraction and so their use will be limited to research and monitoring, recreational hiking and other forms of ecotourism. Some core areas do have a limited number of residences and/or out-buildings but these are permitted in each specific case under the relevant conservation easement or legislative regulation.

16.1.2. Possible adverse effects on the core area uses or activities occurring within or outside the core areas

TRENDS AND STATISTICS AVAILABLE.

There are expected to be few, if any, adverse effects from activities either inside, or outside the core areas. The core areas are restricted to low impact activities by personnel sensitive to the reason for the protection of the area; accidental events are unlikely. The entire proposed biosphere reserve is rural in nature and resource extraction is limited to surface mining and forestry (not in core areas). If there is a trend, it is toward greater environmental stewardship in general and, for the Province of Nova Scotia, the establishment of more protected areas. An external force that may result in adverse effects is global warming, which, if temperatures rise may affect the biogeography of the region. Sea level rise, exacerbated by global warming will affect the protected beach core areas through inundation and storm damage over time.

16.2. Buffer Zones

16.2.1. The main land uses and economic activities in the buffer zones

BUFFER ZONES SUPPORT A VARIETY OF USES PROMOTING MULTIPLE FUNCTIONS OF A BIOSPHERE RESERVE WHILE ENSURING THE PROTECTION AND NATURAL EVOLUTION OF THE CORE AREAS.

The main land use in the buffer zones is timber harvesting by NewPage and by private contractors. The wood harvested is primarily softwood and is used in the paper mill at Port Hawkesbury. This activity is carried out under the guidelines laid out in the Integrated Resource Management Strategy, adopted by the Province of Nova Scotia. This strategy, and harvesting operational guidelines of NPPH itself, have resulted in NewPage receiving the internationally recognized FSC certification for sustainable woodlot management.

Tourism is another significant economic activity in the buffer areas. People from around the world, and local residents, enjoy the rich natural beauty of Cape Breton Island. Lying just outside the proposed biosphere reserve is the Cape Breton Highlands National Park. This

natural history attraction brings people to the Island and therefore to many different places within the biosphere reserve. Cultural tourism is also a significant economic activity, as exemplified by the Alexander Graham Bell Museum in Baddeck, on the shores of the Bras d'Or.

16.2.2. Possible adverse effects on the buffer zones

POSSIBLE ADVERSE EFFECTS ON THE BUFFER ZONES USES OR ACTIVITIES OCCURRING WITHIN OR OUTSIDE THE BUFFER ZONES IN THE NEAR AND LONGER TERMS.

There are not expected to be any short to medium-term adverse effects from the uses or activities occurring within or outside the buffer zones. The long-term effects of global warming are expected to impact shoreline ecosystems as the level of the ocean continues to rise.

16.3. Transition Areas

THE SEVILLE STRATEGY GAVE INCREASED EMPHASIS TO THE TRANSITION AREA SINCE THIS IS THE AREA WHERE THE KEY ISSUES ON ENVIRONMENT AND DEVELOPMENT OF A GIVEN REGION ARE TO BE ADDRESSED. THE TRANSITION AREA IS, BY DEFINITION, NOT DELIMITED IN SPACE, BUT RATHER IS CHANGING IN SIZE ACCORDING TO THE PROBLEMS THAT ARISE OVER TIME. DESCRIBE BRIEFLY THE TRANSITION AREA AS ENVISAGED AT THE TIME OF NOMINATION, THE TYPES OF QUESTIONS TO BE ADDRESSED THERE IN THE NEAR AND THE LONGER TERMS. THE SIZE IS GIVEN ONLY AS AN INDICATION.

16.3.1. Main land uses and major economic activities in the transition areas

The main land uses in the transition area are farming, small urban settlements and the Bras d'Or Lake itself. Farming and tourism are the economic activities that dominate. The Island's cultural history is also a major tourist attraction, be it the museum in Baddeck that displays the world of Alexander Graham Bell, the array of annual Highland and First Nations celebrations, or the Celtic Colours International Festival that showcases the rich musical heritage in communities throughout the Island. The lake is used for commercial activities (e.g., fishing and transportation) as well as recreational pursuits such as swimming, diving, fishing and boating.

16.3.2. Possible adverse effects of uses or activities on the transition areas

The transition areas can be adversely affected by a variety of uses or activities. Land clearing for residential, farming or resource extraction can cause increased discharge into streams and rivers causing increased erosion resulting in the movement of sediment downstream and eventually into the Bras d'Or lake. Sewage derived from residences or watercraft is another possible adverse effect that results in closures of certain areas to shellfish harvesting. These closures have had a serious impact on shellfish (e.g., oyster) cultivation.

Ballast water discharge is another potential adverse effect that has been linked to a variety of invasive species such as the MSX parasite and the Green crab (See section 12.1.3).

17. INSTITUTIONAL ASPECTS

17.1. State, Provincial, Regional, or Other Administrative Units

HIERARCHICAL ORDERED LIST OF ADMINISTRATIVE DIVISIONS IN WHICH THE PROPOSED BIOSPHERE RESERVE IS LOCATED (E.G. PROVINCES, COUNTIES, DISTRICTS).

Below is a list, in hierarchical order, denoting administrative divisions in which the proposed biosphere reserve is located:

- Government of Canada
- Province of Nova Scotia
- Eskasoni First Nation
- Membertou First Nation
- Potlotek (Chapel Island) First Nation
- Wagmatcook First Nation
- We'koqmaq (Waycobah) First Nation
- Cape Breton Regional Municipality
- Inverness County
- Richmond County
- Victoria County

17.2. Units of the Proposed Biosphere Reserve

THE NAMES OF THE DIFFERENT LAND MANAGEMENT UNITS (AS APPROPRIATE, E.G. PROTECTED AREA, TERRITORIES OF MUNICIPALITIES, PRIVATE LANDS) MAKING UP THE CORE AREAS, THE BUFFER ZONES, AND THE TRANSITION AREA.

Several different land management units make up the core areas:

Total for all Core Areas	7 712 ha
Middle River Wilderness Area	5 347 ha
North River Wilderness Area	554 ha
Trout Brook Wilderness Area	216 ha
Bornish Hill Nature Reserve	833 ha
Washabuck River Nature Reserve	67 ha
Whycocomagh Provincial Park	192 ha
Barachois Provincial Park	118 ha
Ben Eoin Provincial Park	89.5 ha
Battery Point Provincial Park	15.5 ha

Groves Point Provincial Park	4.6 ha
Spectacle Island Game Sanctuary	13 ha
Pony's Point Easement	142 ha
Nature Conservancy of Canada	72 ha
Boulaceet Farm Easement	36 ha
Beinn Bhreagh Easement	4 ha
Iona Protected Beach	4.5 ha
Shenacadie Protected Beach	2.2 ha
Christies Protected Beach	1.1 ha
Malcolm Cove Protected Beach	0.5 ha

Several different land management units make up the buffer zones:

Total for all Buffer Zones	61 460 ha
C2 lands under the IRM (NSDNR)	56 018 ha
NewPage Port Hawkesbury Ltd. Protected Areas	2 291 ha
NewPage Port Hawkesbury Ltd.	2 187 ha
Non-designated parks	831 ha
Irish Cove EMAN site	100 ha
Kidston Island	17 ha
Alexander Graham Bell National Historic Site	10 ha
St. Peter's Canal Historic Site	6 ha

Several different land management units make up the transition areas:

Total for all Transition Areas	287 616 ha
Bras d'Or Lake	109 154 ha
County (municipal) and private lands	172 731 ha
First Nations	5673 ha

17.2.1. Contiguous units or separate

A BIOSPHERE RESERVE MADE UP OF SEVERAL GEOGRAPHICALLY SEPARATE UNITS IS CALLED A "CLUSTER BIOSPHERE RESERVE".

The proposed Biosphere Reserve is a contiguous unit. Please see **Map 1**. In total, there are nineteen separate core areas and a large number of buffer areas within a well-defined watershed boundary.

17.3. Protection Regime of the Core Areas and Buffer Zones

17.3.1. Core areas:

INDICATE THE TYPE (E.G. UNDER NATIONAL LEGISLATION) AND DATE SINCE WHEN THE LEGAL PROTECTION CAME INTO BEING AND PROVIDE JUSTIFYING DOCUMENTS (WITH ENGLISH OR FRENCH SUMMARY OF THE MAIN FEATURES).

Please see **Appendix 5** for copies of the main statutes.

Nova Scotia
Wilderness **A**reas **P**rotection **Act**. 1998, c. 27, s. 1.
Special **P**laces **P**rotection **Act**. R.S., 1989 c. 438, s. 1.
Provincial **P**arks **A**ct, R.S.N.S. 1989, c. 504
Wildlife **A**ct, R.S.N.S. 1989, c. 504
Beaches **A**ct, R.S.N.S. 1989 amended 1993, c. 9, s. 9
Conservation **E**asements **A**ct. 2001, c. 28, s. 1.

17.3.2. Buffer zone(s):

THE TYPE (E.G. UNDER NATIONAL LEGISLATION) AND DATE SINCE THE LEGAL PROTECTION CAME INTO BEING AND PROVIDE JUSTIFYING DOCUMENTS (WITH ENGLISH OR FRENCH SUMMARY OF THE MAIN FEATURES. IF THE BUFFER ZONE DOES NOT HAVE LEGAL PROTECTION, INDICATE THE REGULATIONS THAT APPLY FOR ITS MANAGEMENT).

Crown **L**ands **A**ct, R.S.N.S. 1989, c. 114
Canada **N**ational **P**arks **A**ct. 2000, c. 32

17.4. LAND USE REGULATIONS OR AGREEMENTS APPLICABLE TO THE TRANSITION AREA

Federal
Canada **S**hipping **A**ct, R.S.C. 1985, c. S-9
Fisheries **A**ct, R.S.C. 1985, c. F-14, s. 1.
Indian **A**ct, R.S.C. 1985, R.S. c. I-6, s. 1.
Migratory **B**irds **C**onvention **A**ct. 1994

Provincial: Nova Scotia
Forest **A**ct, R.S.N.S. 1989, c 179
Municipal **G**overnment **A**ct. R.S.N.S. 1998 c 18
Environment **A**ct, S.N.S. 1994-95, c. 1, s. 1.
Sporting Mountain Municipal Planning Strategy and Land Use Bylaw
St. Peter's Municipal Planning Strategy and Land Use Bylaw
Baddeck Municipal Planning Strategy and Land Use Bylaw
Whycocomagh Municipal Planning Strategy and Land Use Bylaw
Cape Breton Regional Municipality Municipal Planning Strategy and Land Use Bylaw

17.5. Land Tenure of Each Zone

RELATIVE PERCENTAGE OF OWNERSHIP IN TERMS OF NATIONAL, PROVINCIAL, LOCAL GOVERNMENT, PRIVATE OWNERSHIP, ETC. FOR EACH ZONE.

17.5.1. Core areas

Land Ownership/Tenure	Percentage
Provincial	75%
Private	25%

17.5.2. Buffer zones

Land Ownership/Tenure	Percentage
Federal	1%
Provincial	95%
Private	4%

17.5.3. Transition areas:

Land Ownership/Tenure		Percentage
Federal	(Bras d'Or Lake)	38%
Provincial		1%
Municipal		1%
Private		58%
First Nations		2%

17.5.4. Foreseen changes in land tenure

LAND ACQUISITION PROGRAM (E.G. TO PURCHASE PRIVATE LANDS, OR PLANS FOR PRIVATIZATION OF STATE-OWNED LANDS).

The main land acquisition program in the Bras d'Or watershed is the purchase of private lands by individuals who want to settle in the Bras d'Or or to use the area for recreational purposes such as summer vacations. The province has a goal of protecting 12 percent of all lands in Nova Scotia and it is anticipated that new protected areas will be created in the medium term, by the purchase of lands as protected areas.

First Nations have a land claim of the entire area; that is under negotiation with federal and provincial levels of government. These claims are based on the premise that the Mi'kmaw were living here, on their land, when Europeans first arrived. These negotiations are civil in nature and are based on legal arguments related to treaties that were or were not made

between the two nations. Since all First Nations communities within the proposed area have endorsed the Biosphere Reserve nomination, any change in land tenure would not impact the Biosphere Reserve.

17.6. Management Plan or Policy and Mechanisms for Implementation

17.6.1. Local communities' association with nomination process

HOW, AND TO WHAT EXTENT, HAVE THE LOCAL COMMUNITIES LIVING WITHIN AND NEXT TO THE PROPOSED BIOSPHERE RESERVE, BEEN ASSOCIATED WITH THE NOMINATION PROCESS (RANGING FROM BEING AN ENTIRELY LOCALLY DRIVEN INITIATIVE, TO A MORE 'TOP DOWN' APPROACH LED BY GOVERNMENT AUTHORITIES OR SCIENTIFIC INSTITUTIONS. DESCRIPTION OF THE STEPS TAKEN AND THE STAKEHOLDERS INVOLVED). (SEE **APPENDIX 6**)

Local communities within the proposed biosphere reserve have been consulted through their municipal governments throughout the span of time leading to the creation of the nomination document. There have been over ten presentations to municipal governments, schools and community groups describing the nature of a biosphere reserve and the proposed Bras d'Or Lake Biosphere Reserve. Over twenty people have been involved in the writing and editing of this document, including great support from Nova Scotia Environment and the Department of Natural Resources.

Groups currently active in the work to promote a healthier, sustainable ecosystem have either been included in the current Board of Directors of the Biosphere Reserve Association or they have been kept up-to-date as progress has been made.

On two occasions, in the summer of 2006 and 2007, a brochure (**Appendix 7**) was handed out to residents within the watershed, talking about what a biosphere reserve is and what is being proposed. All meetings of the Biosphere Reserve Association are open to the public and the first Annual General Meeting (2007) drew over ninety people.

Master lists of contact names have been prepared and these individuals receive regular progress reports on the activities of the Association and the progress regarding the nomination.

17.6.2. Main features of management plan or land use policy

(DESCRIBE THE 'VISION' OF WHAT THE PROPOSED BIOSPHERE RESERVE IS EXPECTED TO ACHIEVE IN THE SHORT AND LONGER TERM, AND THE BENEFITS FORESEEN FOR THE LOCAL COMMUNITIES AND OTHER STAKEHOLDERS).

The vision of The Bras d'Or Lake Biosphere Reserve is to see the Bras d'Or Lake watershed as a special place where communities join together in thoughtful promotion of environmental assets and responsible economic development. The biosphere reserve will focus on the three functions of a biosphere reserve: conservation, sustainable economic development

and logistic support. The Biosphere Reserve Association will work in concert with other initiatives currently working toward a healthy, sustainable environment within the watershed. As a member of the world network of Biosphere Reserves, exchanges of experiences and collaborative projects will be encouraged within the UNESCO "family". The Cooperation Plan (**Appendix 1**) outlines the vision and proposed activities for the biosphere reserve.

17.6.3 The designated authority to implement this plan
THE DESIGNATED AUTHORITY OR COORDINATION MECHANISMS TO IMPLEMENT THIS PLAN OR POLICY (NAME, STRUCTURE AND COMPOSITION, ITS FUNCTIONING TO DATE).

The Bras d'Or Lake Biosphere Reserve Association

Elsewhere in this document (**Appendix 1**) is a description of the Association's Board representation. It reflects a range of interests at work around the Lake. Gathering information for this proposal began in earnest in 2003. A wide distribution of community and agency representatives contributed to its preparation. The Association was registered with Nova Scotia's Registry of Joint Stock Companies in 2005. Two thrusts have occupied regular meetings of the Board (approximately 4 meetings per year): determining best ways to document attributes of the proposed biosphere reserve area; and informing the public about the meaning and implications of a Biosphere Reserve. It is anticipated that the Association will continue to function with its broad base of representation and collaboration as it implements and further develops its Cooperation Plan following designation.

17.6.4. The means of application of the management plan or policy
FOR EXAMPLE, THROUGH CONTRACTUAL AGREEMENTS WITH LANDOWNERS OR RESOURCES USERS, TRADITIONAL USERS' RIGHTS, FINANCIAL INCENTIVES, ETC.

The Cooperation Plan will be implemented under the direction of a board of directors and hired staff. Mechanisms of implementation will include close collaboration with programs of organizations/agencies whose mandates relate to the health of the area's ecosystem. Positive re-enforcement of sustainable development activities will be encouraged through awards and publicity. It is hoped that free, open workshops of best practices will be held throughout the watershed.

17.6.5. Local community participation in formulation and implementation of the management plan

HOW AND TO WHAT EXTENT THE LOCAL COMMUNITIES PARTICIPATE IN THE FORMULATION AND THE IMPLEMENTATION OF THE MANAGEMENT PLAN OR POLICY (INFORMED/CONSULTED: DECISION MAKING ROLE ETC.

A draft of the Cooperation Plan was circulated to fifty organizations/agencies in February, 2008. Responses are incorporated in **Appendix 1** of this document.

A broad community-wide consultation will be one of the first activities of the Biosphere Reserve Association. The Association will receive input from the general public regarding the current Cooperation Plan and to help determine a management plan along with specific actions/programs.

17.6.6. Year of start of implementation of the management plan

The Cooperation Plan will be implemented upon achieving designation.

17.7. Funding Support for Management Plan

BIOSPHERE RESERVES REQUIRE TECHNICAL AND FINANCIAL SUPPORT FOR THEIR MANAGEMENT AND FOR ADDRESSING INTERRELATED ENVIRONMENTAL, LAND USE, AND SOCIO-ECONOMIC DEVELOPMENT PROBLEMS. INDICATE THE SOURCE AND THE RELATIVE PERCENTAGE OF THE FUNDING (E.G. FROM NATIONAL, REGIONAL, LOCAL ADMINISTRATIONS, PRIVATE FUNDING, INTERNATIONAL SOURCES ETC.) AND THE ESTIMATED YEARLY BUDGET IN THE NATIONAL CURRENCY.

Potential Funding source:	**Potential supporting bodies:**
National Government (40%)	Environment Canada Canadian Biosphere Reserve Assoc Parks Canada Enterprise Cape Breton Corporation Department of Fisheries and Oceans Natural Sciences and Engineering Research Council
Provincial government (20%)	Nova Scotia Environment Nova Scotia Department of Development
Municipal (15%)	Regional Development Authorities Municipal Governments
Private Organizations (10%)	ENGOs: Bras d'Or Stewardship Society, Bras d'Or Preservation Nature Trust Industry: NewPage, Georgia-Pacific
Individuals (15%)	Memberships & donations

The yearly budget is estimated to be between $125,000 – $200,000 CDN.
A major portion of time and program expenses will be in-kind from volunteers and partner organizations.

17.8. Authority in Charge

17.8.1. The proposed biosphere reserve as a whole

- Name: Bras d'Or Lake Biosphere Reserve Association

IF APPROPRIATE, NAME THE NATIONAL (PROVINCIAL) ADMINISTRATION TO WHICH THIS AUTHORITY REPORTS:

- Nova Scotia Registry of Joint Stock Companies, Service Nova Scotia and Municipal Relations, Halifax, NS

17.8.2. The core areas
THE NAME OF THE AUTHORITY OR AUTHORITIES IN CHARGE OF ADMINISTERING ITS LEGAL POWERS (IN ORIGINAL LANGUAGE WITH ENGLISH OR FRENCH TRANSLATION.

- NAMES: The core areas are administered by the Province of Nova Scotia, the Bras d'Or Preservation Nature Trust and individual landowners (conservation easements plus private land stewardship).
- Legal powers: The legal statutes relating to core areas are listed in Section 17.3.

17.8.3. The buffer zones

- Name: The buffer areas are administered by the Province of Nova Scotia, NewPage Port Hawkesbury Ltd., Parks Canada and the Baddeck Village Commission.
- Legal powers (if appropriate): The legal statutes that relate to the buffer zones are listed in Section 17.3.

18. SPECIAL DESIGNATIONS:

SPECIAL DESIGNATIONS RECOGNIZE THE IMPORTANCE OF PARTICULAR SITES IN CARRYING OUT THE FUNCTIONS IMPORTANT IN A BIOSPHERE RESERVE, SUCH AS CONSERVATION, MONITORING, EXPERIMENTAL RESEARCH, AND ENVIRONMENTAL EDUCATION. THESE DESIGNATIONS CAN HELP STRENGTHEN THESE FUNCTIONS WHERE THEY EXIST, OR PROVIDE OPPORTUNITIES FOR DEVELOPING THEM. SPECIAL DESIGNATIONS MAY APPLY TO AN ENTIRE PROPOSED BIOSPHERE RESERVE OR TO A SITE INCLUDED WITHIN. THEY ARE THEREFORE COMPLEMENTARY TO, AND REINFORCING OF, THE DESIGNATION AS A BIOSPHERE RESERVE.

Name:

(√) UNESCO World Heritage Site
N/A

(√) RAMSAR Wetland Convention Site
N/A

(√) Other international/regional l conservation conventions/directives [Please specify]
N/A

(√) Long term monitoring site [Please specify]
EMAN site in Irish Cove

(√) Other [Please specify]
Middle River Wilderness Area
North River Wilderness Area
Trout Brook Wilderness Area
Washabuck River Nature Reserve
Bornish Hill Nature Reserve
Spectacle Island Game Sanctuary

19. SUPPORTING DOCUMENTS

CLEAR, WELL-LABELED MAPS ARE INDISPENSABLE FOR EVALUATING BIOSPHERE RESERVE PROPOSALS. THE MAPS TO BE PROVIDED SHOULD BE REFERENCED TO STANDARD COORDINATES WHEREVER POSSIBLE. ELECTRONIC VERSIONS ARE ENCOURAGED.

(√) General location map

A GENERAL LOCATION MAP OF SMALL OR MEDIUM SCALE MUST BE PROVIDED SHOWING THE LOCATION OF THE PROPOSED BIOSPHERE RESERVE, AND ALL INCLUDED ADMINISTRATIVE AREAS, WITHIN THE COUNTRY, AND ITS POSITION WITH RESPECT TO MAJOR RIVERS, MOUNTAIN RANGES, PRINCIPAL TOWNS, ETC.

Please see **Figure 3-1**.

(√) Biosphere Reserve zonation map [large scale, preferably in black & white for photocopy reproduction]

[A BIOSPHERE RESERVE ZONATION MAP OF A LARGER SCALE SHOWING THE DELIMITATIONS OF ALL CORE AREA(S) AND BUFFER ZONE(S) MUST BE PROVIDED. THE APPROXIMATE EXTENT OF THE TRANSITION AREA(S) SHOULD BE SHOWN, IF POSSIBLE. WHILE LARGE SCALE AND LARGE FORMAT MAPS IN COLOUR ARE ADVISABLE FOR REFERENCE PURPOSES, IT IS RECOMMENDED TO ALSO

ENCLOSE A BIOSPHERE RESERVE ZONATION MAP IN A A-4 WRITING PAPER FORMAT IN BLACK & WHITE FOR EASY PHOTOCOPY REPRODUCTION. IT IS RECOMMENDED THAT AN ELECTRONIC VERSION OF THE ZONATION MAP BE PROVIDED].
Please see **Figure 4-1**, **4-2**, **Map 1**.

(√) Vegetation map or land cover map
[A VEGETATION MAP or LAND COVER MAP SHOWING THE PRINCIPAL HABITATS AND LAND COVER TYPES OF THE PROPOSED BIOSPHERE RESERVE SHOULD BE PROVIDED, IF AVAILABLE].
Please see **Map 2**.

(√) List of legal documents (IF POSSIBLE WITH ENGLISH OR FRENCH TRANSLATION)
[LIST THE PRINCIPAL LEGAL DOCUMENTS AUTHORIZING THE ESTABLISHMENT AND GOVERNING USE AND MANAGEMENT OF THE PROPOSED BIOSPHERE RESERVE AND ANY ADMINISTRATIVE AREA(S) THEY CONTAIN. PLEASE PROVIDE A COPY OF THESE DOCUMENTS, IF POSSIBLE WITH ENGLISH OR FRENCH TRANSLATION].
Please see **Appendix 5**.

(√) List of land use and management plans
[LIST EXISTING LAND USE and MANAGEMENT PLANS (WITH DATES AND REFERENCE NUMBERS) FOR THE ADMINISTRATIVE AREA(S) INCLUDED WITHIN THE PROPOSED BIOSPHERE RESERVE. PROVIDE A COPY OF THESE DOCUMENTS]

1. Integrated Resource Management Plan for Nova Scotia (see Goals in Preface)
2. River Denys 3 year Management Plan (SRDWA)
3. CEPI Management Plan for the Bras d'Or (under development)

(√) Species list (to be annexed)
[PROVIDE A LIST OF IMPORTANT SPECIES (THREATENED SPECIES AS WELL AS ECONOMICALLY IMPORTANT SPECIES) OCCURRING WITHIN THE PROPOSED BIOSPHERE RESERVE, INCLUDING COMMON NAMES, WHEREVER POSSIBLE.]
Please see **Section 13.2**.

(√) List of main bibliographic references (to be annexed)
[PROVIDE A LIST OF THE MAIN PUBLICATIONS AND ARTICLES OF RELEVANCE TO THE PROPOSED BIOSPHERE RESERVE OVER THE PAST 5-10 YEARS].
Please see **REFERENCE** section.

20. ADDRESSES

20.1. Contact Address of the Proposed Biosphere Reserve

GOVERNMENT AGENCY, ORGANIZATION, OR OTHER ENTITY (ENTITIES) TO SERVE AS THE MAIN CONTACT ON THE MABNET TO WHOM ALL CORRESPONDENCE WITHIN THE WORLD NETWORK OF BIOSPHERE RESERVES SHOULD BE ADDRESSED.

Name:	Bras d'Or Lake Biosphere Reserve Association
Street or P.O. Box:	532 Chebucto St., P.O. Box 711
City with postal code:	Baddeck, NS B0E 1B0
Country:	Canada
Telephone:	902-674-2578
Telefax (or telex):	902-674-2218
E-mail:	contact@blbra.ca
Web site:	www.blbra.ca

20.2. Administering Entities of the Core Areas:

Name:	Nova Scotia Environment, Province of Nova Scotia
Street or P.O. Box:	P.O. Box 442, 5151 Terminal Road
City with postal code:	Halifax, NS B3J 2P8
Country:	Canada
Telephone:	902-424-3600
Telefax (or telex):	902-424-0503
E-mail:	
Web site	www.gov.ns.ca/nse/

Name:	Department of Natural Resources, Province of Nova Scotia
Street or P.O. Box:	PO Box 698
City with postal code:	Halifax, NS B3J 2T9
Country:	Canada
Telephone:	902-424-5935
Telefax (or telex):	902-424-7735
E-mail:	
Web site	www.gov.ns.ca/natr/

Name:	Bras d'Or Preservation Nature Trust
Street or P.O. Box:	P.O. Box 711
City with postal code:	Baddeck, NS B0E 1B0
Country:	Canada
Telephone:	902-295-1675
Telefax (or telex):	902-295-1434
E-mail:	info@brasdor-conservation.com
Web site	www.brasdor-conservation.com

20.3. Administering Entities of the Buffer Zone

Name:	Department of Natural Resources, Province of Nova Scotia
Street or P.O. Box:	PO Box 698
City with postal code:	Halifax, NS B3J 2T9
Country:	Canada
Telephone:	902-424-5935
Telefax (or telex):	902-424-7735
E-mail:	
Web site	www.gov.ns.ca/natr/

Name:	NewPage Port Hawkesbury
Street or P.O. Box:	120 Pulp Mill Road
City with postal code:	Port Hawkesbury, NS B9A 1A1
Country:	Canada
Telephone:	902-625-2460
Telefax (or telex):	902-625-2388
E-mail:	
Web site	www.newpageporthawkesbury.com/

Name:	Parks Canada
Street or P.O. Box:	259 Park Service Road
City with postal code:	Louisbourg, NS B1C 2L2
Country:	Canada
Telephone:	902-733-3500
Telefax (or telex):	902-733-2473
E-mail:	
Web site	www.pc.gc.ca/

Name:	Baddeck Village Commission
Street or P.O. Box:	P.O. Box 376
City with postal code:	Baddeck, NS B0E 1B0
Country:	Canada
Telephone:	902-295-2705
Telefax (or telex):	
E-mail:	
Web site	

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ADI Limited, 2006. State of the Environment Report - Freshwater Resources. *For* The Unama'ki Institute of Natural Resources. 56 pages. (N.B. This document is sometimes also cited as "Baechler and Baechler 2006" after the two authors)

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Atlantic Coastal Action Program Cape Breton (ACAP-CB). Home Page. 2009. <www.acapcb.ns.ca> Accessed: 29 January

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Annex to Biosphere Reserve Nomination Form, February 2004
MABnet Directory of Biosphere Reserves
Biosphere Reserve Description[9]

ADMINISTRATIVE DETAILS

Country:	CANADA
Name of BR:	BRAS D'OR LAKE BIOSPHERE RESERVE
Year designated:	(*to be completed by MAB Secretariat)*
Administrative authorities:	Bras d'Or Lake Biosphere Reserve Association
Name contact:	(20.1)
Contact address:	(20.1)
Related links *(web sites)*:	www.blbra.ca

DESCRIPTION

GENERAL DESCRIPTION: *(SITE CHARACTERISTICS IN 11.1; HUMAN POPULATION IN 10; LAND MANAGEMENT UNITS IN 17.2)*

The Bras d'Or estuary and its associated watershed is one of Canada's charismatic ecosystems. The Holocene transgression flooded a complex river-lake system of diverse geology, creating a small, deep inland sea with twelve significant watersheds draining both highlands and lowlands. Its position at the nexus of the Greenland Current, the Gulf of St. Lawrence, and the Gulf Stream's "meander" fostered post-glacial colonization from Arctic, temperate and tropical regions. The resulting marine biodiversity includes representative organisms from environments spanning 30 degrees of latitude. It complements an extensive watershed dominated by sub-boreal Acadian forest interspersed with a variety of terrestrial biomes associated with a broad range of bedrock features, glacial-fluvial deposits, soil horizons and micro climatic zones. The presence of a sea, within an island, within an ocean, has permitted the evolution of a unique suite of communities within a compact, scenic domain currently known as the Bras d'Or. Terrestrial, marine and coastal habitats proved as suitable for *Homo sapiens* as for other organisms; indigenous people colonized the region as soon as retreating glaciers allowed. Their descendents comprise the five Mi'kmaq bands that constitute a significant proportion of the current population, and that occupy a substantial portion of the watershed lands. Waves of European colonists, primarily from France, Scotland and England, capitalized on the natural resources of the area, progressively exploiting forest wood, arable land and mineral deposits (particularly coal, precious metals, aggregate and limestone) in addition to the prolific marine fish that originally drew them across the Atlantic.
At its peak during the early part of the last century, the human population of the Bras d'Or was at least twice its current size. Subsequent economic and demographic transitions gutted many of the renewable resource industries and these transitions continue to challenge the economic viability of extractive enterprises. The emergence of a knowledge-based service economy has been slow, due in part to the chronic economic depression that has afflicted the entire Island during the past four decades and led to massive out-migration of youth. Non-resident and non-working ownership of much of the best coastal land further challenges economically sustainable development of the Bras d'Or. Recreational, cultural and nature tourism is the underachieving best hope for economic

[9] To be posted on the MABnet once the nomination has been approved. The numbers refer to the relevant sections of the nomination form.

and population growth in the Bras d'Or. Higher prices for gasoline threaten the viability of tourist volume, while at the same time, it offers the potential to fuel a resurgence of local agriculture, aquaculture and renewable energy production. An emerging cohort of the Mi'kmaq peoples (whose mean age is half that of the white population and who are more site-attached to the region) is showing leadership and enthusiasm for a new way of making the Bras d'Or "work" without destroying its natural essence. Thus, a significant opportunity exists for the low-density population, of high education, to experiment with creative approaches to reconciling economically and ecologically sustainable development. The Collaborative Environmental Planning Initiative for the Bras d'Or Lakes reflects the best intentions of more than twenty agencies and organizations, all legally empowered to manage human activity in the region. It represents the human spirit of the Bras d'Or that, along with the remarkable non-human elements of the ecosystem, ensures that a UNESCO MAB Biosphere Reserve in this watershed will contribute substantially to the sustained ecological, cultural, and socioeconomic vitality of the area and surrounding region, and become a model of harmony between human activities and a diverse biosphere that will be recognized nationally and internationally.

Major ecosystem type: Temperate Needleleaf Forests and Woodlands
Major habitats & land cover types: Bras d'Or Lake; Bras d'Or Forests; Subwatersheds
Location (latitude & longitude): Centroid: 45°53'12.992" N 60°42'13.608" W
Total area (ha): 356 588
Core area*(s):* 7 712
Buffer zone*(s):* 61 460
Transition area*(s)* 290 770
Different existing zonation: N/A
Altitudinal range (metres above sea level): +270 metres to – 280 metres relative to sea level

RESEARCH AND MONITORING
BRIEF DESCRIPTION: Section 15.1.3

Answers to certain questions are essential to the implementation of ecosystem-based management in the Bras d'Or:

Is the estuary/watershed healthy?
How do various land-use activities affect the diversity, productivity and aesthetics of the biotic communities?
Why have the fisheries collapsed and can they recover?
What are the most sensitive populations and habitats?

A local university, public research agencies and institutions (at four levels of government) and private environmental associations and companies have a long history of site-based research in the Bras d'Or. The nomination of the Bras d'Or as a biosphere reserve has already served to align and focus research and the designation (if achieved) will provide a framework for the knowledge and monitoring necessary to answer these questions.

SPECIFIC VARIABLES (PLEASE FILL IN THE TABLE BELOW AND TICK THE RELEVANT PARAMETERS)

ANNEX TABLE:

Abiotic		Biodiversity	
Abiotic factors	X	Afforestation/Reforestation	
Acidic deposition / Atmospheric factors		Algae	X
Air quality	X	Alien and/or invasive species	X
Air temperature	X	Amphibians	
Climate, climatology	X	Arid and semi-arid systems	
Contaminants	X	Autoecology	X
Drought		Beach / Soft bottom systems	X
Erosion	X	Benthos	X
Geology	X	Biodiversity aspects	X
Geomorphology	X	Biogeography	
Geophysics	X	Biology	X
Glaciology		Biotechnology	
Global change		Birds	X
Groundwater		Boreal forest systems	X
Habitat issues	X	Breeding	
Heavy metals		Coastal/Marine systems	X
Hydrology	X	Community studies	X
Indicators	X	Conservation	X
Meteorology	X	Coral reefs	
Modeling	X	Degraded areas	
Monitoring/Methodologies	X	Desertification	
Nutrients	X	Dune systems	
Physical oceanography	X	Ecology	X
Pollution, pollutants	X	Ecosystem assessment	X
Siltation/Sedimentation	X	Ecosystem functioning/structure	X
Soil	X	Ecotones	X
Speleology		Endemic species	
Topography	X	Ethology	
Toxicology		Evapotranspiration	
UV radiation		Evolutionary studies / Palaeoecology	
		Fauna	X
		Fires/Fire ecology	
		Fish	X
		Flora	X
		Forest systems	X
		Freshwater systems	X
		Fungi	
		Genetic resources	
		Genetically modified organisms	
		Home gardens	
		Indicators	
		Invertebrates	X
		Island systems/studies	

		Lagoon systems	X
		Lichens	X
		Mammals	X
		Mangrove systems	
		Mediterranean type systems	
		Microorganisms	
		Migrating populations	X
		Modeling	X
		Monitoring/Methodologies	X
		Mountain and highland systems	
		Natural and other resources	X
		Natural medicinal products	X
		Perturbations and resilience	
		Pests/Diseases	X
		Phenology	X
		Phytosociology/Succession	
		Plankton	X
		Plants	X
		Polar systems	
		Pollination	
		Population genetics/dynamics	
		Productivity	
		Rare/Endangered species	X
		Reptiles	X
		Restoration/Rehabilitation	X
		Species (re) introduction	
		Species inventorying	X
		Subtropical and temperate rainforest	
		Taxonomy	
		Temperate forest systems	
		Temperate grassland systems	
		Tropical dry forest systems	
		Tropical grassland and savannah	
		Tropical humid forest systems	
		Tundra systems	
		Vegetation studies	
		Volcanic/Geothermal systems	
		Wetland systems	X
		Wildlife	X

Socio-economic		Integrated monitoring	
Agriculture/Other production systems		Biogeochemical studies	
Agroforestry		Carrying capacity	
Anthropological studies	X	Conflict analysis/resolution	
Aquaculture	X	Ecosystem approach	X
Archaeology	X	Education and public awareness	X
Bioprospecting		Environmental changes	
Capacity building	X	Geographic Information System (GIS)	X
Cottage (home-based) industry		Impact and risk studies	
Cultural aspects	X	Indicators	
Demography	X	Indicators of environmental quality	X
Economic studies	X	Infrastructure development	
Economically important species	X	Institutional and legal aspects	X
Energy production systems		Integrated studies	
Ethnology/Traditional practices/Knowledge		Interdisciplinary studies	X
Firewood cutting		Land tenure	
Fishery	X	Land use / Land cover	X
Forestry	X	Landscape inventorying/monitoring	X
Human health		Management issues	X
Human migration		Mapping	X
Hunting	X	Modeling	X
Indicators		Monitoring/Methodologies	
Indicators of sustainability		Planning and zoning measures	X
Indigenous people's issues	X	Policy issues	X
Industry		Remote sensing	X
Livelihood measures		Rural systems	
Livestock and related impacts		Sustainable development/use	X
Local participation	X	Transboundary issues/measures	
Micro-credits		Urban systems	
Mining	X	Watershed studies/monitoring	X
Modeling	X		
Monitoring/Methodologies			
Natural hazards			
Non-timber forest products			
Pastoralism			
People-Nature relations	X		
Poverty			
Quality economies/marketing			
Recreation	X		
Resource use			
Role of women			
Sacred sites	X		
Small business initiatives			
Social/Socio-economic aspects	X		
Stakeholders' interests	X		
Tourism	X		

Transports			

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Appendix 1 A Cooperation Plan for the Bras d'Or Lake Biosphere Reserve

I. INTRODUCTION

The United Nations Educational, Scientific and Cultural Organization (UNESCO) provides the following introduction to Biosphere Reserves[10]:

"Biosphere reserves are sites recognized under UNESCO's Man and the Biosphere Programme, which innovate and demonstrate approaches to **conservation and sustainable development**. They are under national sovereign jurisdiction, yet share their experience and ideas nationally, regionally and internationally within the World Network of Biosphere Reserves. Currently, there are more than 529 sites worldwide in more than 105 countries."

These areas demonstrate innovative approaches to living and working in harmony with nature. There are fifteen biosphere reserves in Canada.

The three major functions of a biosphere reserve are: sustainable development, conservation of biodiversity and logistic support. This latter term refers to actions such as research, monitoring, education, training, or demonstration projects that various partners in a biosphere reserve provide, in support of actions promoting conservation and sustainability. Biosphere reserves in Canada tend to refer to this third function as capacity building; the term also used here.

It is critically important that the objectives of the Bras d'Or Lake Biosphere Reserve are compatible with the ongoing programs and activities of the area's respective agencies and organizations. The Biosphere Reserve designation must add value. It must not duplicate, substitute or in any way conflict with existing efforts. Consequently, it is necessary to spell-out a plan that will guide the work of the Biosphere Reserve in cooperation with various stakeholder groups around the Lake. Following is an initial attempt at such a plan. An earlier draft was circulated for comment to approximately fifty of the organizations/ agencies/ industrial interests that share the purpose of ensuring that all who live around the Lake do so in harmony with nature as they work and play in its magnificent setting. This draft is to serve as a base for

[10] http://portal.unesco.org/science/en/ev.php-URL_ID=4801&URL_DO=DO_TOPIC&URL_SECTION=201.html, January, 2010

establishing a more-specific plan in cooperation with the stakeholder groups as partners, following designation of the Bras d'Or Lake region as a UNESCO Biosphere Reserve.

The following plan responds to UNESCO's encouragement to have a guide for the proposed biosphere reserve—one that will harmonize with plans and activities of other organizations and agencies working in the interest of the Lake and its watershed.

Like other biosphere reserves in Canada, the proposed Bras d'Or Lake Biosphere Reserve has no authority over land and water use. Everything it fosters depends on cooperation, hence the term—Cooperation Plan.

This Cooperation Plan is for the residents, businesses and other organizations and agencies within, or having program jurisdiction within the proposed biosphere reserve. It interprets the three functions of a biosphere reserve (sustainable development, conservation of biodiversity and logistic support) in terms of accomplishments, current actions, and challenges that best reflect local circumstances. It encourages innovation, fosters pride in local achievements and creates a desire to share experiences with others in Canada and elsewhere in the world.

II. Background of the Proposed Bras d'Or Lake Biosphere Reserve

In 2003, the Bras d'Or Preservation Nature Trust took steps to further its continuing goal to recognize the deep and remarkable canyon in the Bras d'Or Lake's St. Andrews Channel as a place worthy of biosphere reserve (BR) designation, under the UNESCO Man and the Biosphere Programme. A steering committee was formed that year to explore how the canyon might qualify for this distinction. Members worried at first that a reserve would mean isolation of that area of the Lake. They soon found that UNESCO's requirements include human activity as part of the reality of conserving a selected area. It turned out that the canyon did not meet an essential biosphere reserve requirement—that of having a protected area within it. The steering committee then turned to the much bigger prospect of having all of the Lake and its watershed nominated for biosphere reserve designation.

During the intervening years, activity centred on three principal activities: establishing an organizational base, gathering support for the idea of having a biosphere reserve designation, and preparing a nomination document to submit to UNESCO.

Members of the original twelve-member steering committee came from a range of organizations with particular interests in the Lake, along with several members-at-large who

represented residents' interests throughout the watershed area. That representation continued when the Bras d'Or Lake Biosphere Reserve Association was formed in 2006. Additional members were named to the Board of Directors to include the forestry and mining industry, the community college and another member-at-large. Later, in 2009, Board membership was further expanded to include representation from each of four Municipal Councils of the area.[11]

Over the years since 2006, opportunities were taken to explain the implications of a biosphere reserve. These included presentations to municipal councils; the Pitu'paq Partnership (an alliance of the Island's mayors, wardens and chiefs); representatives of Cape Breton's regional development agencies; the Steering Committee of Collaborative Environmental Planning Initiative (CEPI) – on which the BLBRA is represented; along with Mayors and Wardens from Cape Breton Island and a range of federal and provincial government agency representatives; the Board of the Unama'ki Institute of Natural Resources (UINR)which includes the five Unama'ki Chiefs; the four Municipal Councils within the watershed area; representatives of the Mining Association of Nova Scotia and of the Nova Scotia Mining Society; and, a range of community groups. A summary of these opportunities is presented in **Appendix 6** of the Nomination Document

Public information objectives are realized through radio and newspaper media, distribution of a brochure to all residents around the Lake (permanent and part-time) and through three well-attended Annual General Meetings of the Association. Those meetings featured, respectively, a guest speaker from the Atlantic region's two biosphere reserves: Southwest Nova and Bay of Fundy, and a Panel of knowledgeable persons who addressed the question: A Bras d'Or Lake Biosphere Reserve, Should We Bother? A master list is maintained with names of all who have expressed interest in the biosphere reserve idea; this resource serves as a distribution list for occasional news reports.

[11] Members-at-Large: Jim Foulds, Doug Landry, Philip MacLennan, Teresa MacNeil; Representation from organizations active in issues relating to the Lake: Albert Marshall, Unama'ki Institute of Natural Resources, and Eskasoni Fish and Wildlife association; Vince MacLean, Central Cape Breton Community Ventures; Lynn Baechler, Bras d'Or Stewardship Society; Grosvenor Blair, Bras d'Or Preservation Trust; Kimberley Paul, Pitu'paq Partnership and Union of Nova Scotia Indians; Shirley McNamara, Pitu'paq Partnership; Representation from Industrial Interests: Foncie Farrell, NewPage Port Hawkesbury Ltd., Gerard MacMaster, Georgia Pacific (Canada) Inc.; Representation from educational institutions: Christena Goyetche, Nova Scotia Community College; Bruce Hatcher, Bras d'Or Institute of Cape Breton University; Betsy Jardine, Whycocomagh Education Centre's Eco Centre; Representation from four Municipal Councils: Mae Rowe, Cape Breton Regional Municipality; Gail Johnson; Municipality of Richmond County; Edward MacDonald, Municipality of Inverness County; Paul MacNeil, Municipality of Victoria County; Participant Observer: Shelley Porter, Coordinator for CEPI.

Preparation of the nomination document involved dozens of contributors: members of the Board; representatives of scientific disciplines (e.g. biology, geology and geography); representatives of related governmental agencies (e.g. the province's departments of Natural Resources, Agriculture and Fisheries and Environment); and practitioners in such fields as economic development, history, forestry and municipal planning. Professor George Francis provided generous, and voluntary, consultative assistance throughout the entire process. He is associated with the Canadian Biosphere Reserves Association and is Professor Emeritus at the University of Waterloo.

As evidenced by the representation on its board and the number and scope of the organizations/agencies consulted the Bras d'Or Lake Biosphere Reserve Association (BLBRA) works in close association with key stakeholder groups.

Against this background of activities to date, the Cooperation Plan first presents the Vision Statement for the proposed biosphere reserve. It then identifies some strategic directions and some immediate priorities for the next few years under the headings: Conservation of Biodiversity, Sustainable Development and Capacity Building. Included here is mention of the roles of potential partner organizations and of tools and resources for the priority actions to implement the Cooperation Plan.

III. VISION OF THE PROPOSED BIOSPHERE RESERVE

The Bras d'Or Lake watershed is a special place where communities join together in thoughtful promotion of environmental assets and responsible economic development.

IV. CONSERVATION OF BIODIVERSITY

Conservation of biodiversity in the proposed biosphere reserve has been secured largely by provincial programs administered by Nova Scotia Environment (NSE), the Nova Scotia Department of Natural Resources (NSDNR)—and through industry efforts and Environmental Non-Government Organization (ENGO) activity.

NSDNR has completed, and continues to refine, an Integrated Resource Management Plan for the lands owned by the Province of Nova Scotia within the proposed biosphere reserve area. This plan identifies areas set aside for strict protection, those managed for non-forestry values, as well as those managed primarily for forestry. Sites of special significance, including

those known to support rare, threatened, or endangered species, become unavailable for forestry activities.

Through the NSE, plans are also being developed for the existing provincial system of protected areas found within the biosphere reserve. These plans will identify priorities, appropriate activities and management strategies for these areas.

As a requirement of its Forest Stewardship Council (FSC) certification NewPage Port Hawkesbury Ltd. (NPPH) has recently completed a High Conservation Forest Assessment for the lands they manage (both provincial lease and private ownership). This is an exhaustive list of all ecologically significant areas, as well as the management strategies that will be employed to ensure their protection. NPPH is also developing a land use plan where 90 percent of the land it manages will be identified for Acadian forest restoration objectives.

Private woodlot owners within the Bras d'Or watershed may choose to be members of the Nova Scotia Land Owners and Forest Fibre Producers Association (NSLFFPA) that holds an FSC group certification. Woodlot owners are eligible, and encouraged to have their woodlots FSC certified through this group. This allows for assurances that appropriate conservation of biodiversity can occur at a woodlot level, and individual owners are recognized for their efforts.

Private groups are also active in securing biodiversity conservation. Examples of these include the Nova Scotia Nature Trust and a program of the Bras d'Or Preservation Nature Trust.

The Collaborative Environmental Planning Initiative (CEPI) is focused on the development of an overall-management plan for the Bras d'Or Lake and watershed lands, as well as to facilitate the plan's implementation. The CEPI is a collaboration of partners who are interested in fostering a healthy ecosystem and who bring both traditional and western perspectives to the table. It is described as "a broad partnership between federal, provincial, municipal and First Nations governments, industry, NGOs, academia and community …".[12] It is a powerful and positive resource for addressing issues relating the Lake and its watershed. As mentioned above, the Bras d'Or Lake Biosphere Reserve Association is represented on the CEPI steering committee. The March, 2010 meeting of the CEPI Steering Committee received and commented on the 4th draft of a Management Plan entitled The Spirit of the Lakes Speaks.

Potentially, the BLBRA will be in a position to help with implementation of many of CEPI's vital plans and initiatives and to promote/celebrate best practices for land use and resource management in the watershed. It is envisioned that the BLBRA will act as a conduit

[12] Naug, Jason G. "Developing an Environmental Management Plan for the Bras d'Or Lakes Watershed – An Analysis of its Scope and Approach for Addressing Issues." August, 2007, p.84

between the various groups focused on sustainable activities in the Bras d'Or Lake and the general public living within its watershed. Such a conduit can help ensure that understanding occurs at all levels and that information is freely and readily available. This will strengthen the development and implementation of management plans, best practices and initiatives that are compatible with local values and reflect the tenets of the biosphere reserve.

STRATEGIC DIRECTIONS

-Support the CEPI in the development of its management plan for the Bras d'Or Lake.
-Promote the work of the CEPI within the area in order to facilitate acceptance and uptake of its management plan.
-Work with the CEPI to ensure that the management plan meets the tenets of the UNESCO Biosphere Reserve designation.
-Promote and support the work of other conservation groups and organizations within the area.
- Address new and multi-dimensional challenges, such as those presented by invasive species, climate change, and sea level fluctuation.
-Help to publicize information regarding conservation within the Bras d'Or Lake watershed.
-With the help of existing organizations, gather, and where necessary, develop, indicators of healthy ecosystems and communities.
-With the help of existing organizations, promote, and where necessary, develop best practices for conservation.

IMMEDIATE PRIORITIES

-Engage with the CEPI to determine how the biosphere reserve could assist achievement of their objectives related to conservation of biodiversity.
-Work with institutions such as schools, community colleges and Cape Breton University to advance their educational objectives in relation to conservation.
-Undertake a gap analysis, focused on indicators and monitoring, to determine where future monitoring efforts are required, and what capacities are available to carry out the monitoring.
- Initiate discussions with organizations within the overall Bras d'Or Lake community on how the BLBRA can help meet their communication goals.

-Examine best conservation practices in place, identify where there are gaps, and decide how awareness of these needs can be best communicated within the watershed area.

TOOLS AND RESOURCES REQUIRED

-Resources within the BLBRA to develop and implement a communications strategy.
-A student research project looking at examples of best practices.

V. SUSTAINABLE DEVELOPMENT

Part II, Section 14, of this nomination document describes how the Bras d'Or Lake area has potential for fostering economic and human development which is socio-culturally, and ecologically sustainable." The focus of this Cooperation Plan is to consider how BLBRA will contribute to current, ongoing measures to promote sustainable livelihoods and sustainable communities within the proposed biosphere reserve.

More than a century of large-scale steel and coal operations in Cape Breton Island's "industrial area" has drawn citizens' attention to negative environmental effects of enterprises that pollute air, water and soil. Add to this, the growing national and international attention to the issue of climate change, and the result is a citizenry that is gradually waking-up to the need to protect, preserve and enhance environmental quality. Acting in response to that need becomes particularly important when one's immediate setting is the relatively pristine Bras d'Or Lake and its watershed. While the past several decades have seen increasing regulations designed to protect the integrity of the Lake and its watershed, in the eyes of the general population they are often unwelcome restrictions.

Part of the difficulty of introducing environmental regulations are the realities found in an economy with few job opportunities, a fragile industrial base and low or fixed incomes for many of the area's citizens. Having a viable economic base is imperative. An inadequate financial base for both government and citizens deters the comprehensive enforcement and adoption of all environment regulations, albeit NSDNR actively enforces regulations under the **C**rown **L**and **A**ct and the **B**eaches **A**ct. Increased environmental regulations for business raise the challenging prospect that enterprises cannot be attracted to come, and might be tempted to leave.

The challenge of meeting requirements of both sides of the economic and environmental equation is a formidable challenge to meet. Organizations and agencies in the Lake area are

making progress as they address this dilemma. Industry, regulatory agencies and voluntary groups are gradually confronting practices that degrade the area's natural resources and inherent beauty. Government departments, including NSDNR, DFO, EC, NSDOE and NSTIR work cooperatively to manage and enforce guidelines and regulations on activities occurring throughout the watershed. Public education and awareness efforts by NSDNR attempt to have the public become aware of their responsibilities and obtain permission to carry out activities.

All of the organizations represented on the BLBRA Board of Directors contribute to progress toward sustainable development. Examples among them are the Bras d'Or Stewardship Society which sponsored the Bras d'Or Green Craft Challenge to encourage best practices by boaters with respect to protecting the Lake; the Bras d'Or Preservation Nature Trust with a program to protect environmentally, private land in the Bras d'Or watershed; and the Pitu'Paq Partnership which combines the strengths of municipal and First Nations governments to work on remediation of sewage contamination in the Bras d'Or Lake.

The most comprehensive approach to enhance the Lake's environmental health is through the Collaborative Environmental Planning Initiative (CEPI), described above. It has undertaken development of a Management Plan for the Bras d'Or and its watershed as well as to facilitate implementation of the plan by governments and other relevant stakeholders.

Each of the four Municipal Councils has recently completed an Integrated Community Sustainability Plan (ICSP). These are long-term plans providing direction for the sustainability objectives of each municipality. Three have forwarded a synopsis of their plan, included here as Appendix 9.

All of these organizations function within a development climate that pays keen and experienced attention to ways and means of improving livelihoods and increasing employment opportunities. Programs are in place under federal, provincial and municipal sponsorship to attract and expand industries with a focus on innovative ways of enabling human and natural resources to be economically productive (c.f., description of Development Potential in Part II, Section 14, Nomination Submission, Bras d'Or Lake Biosphere Reserve).

A Bras d'Or Lake Biosphere Reserve will have access to its counterparts across Canada and throughout the world to assemble substantive and credible information dealing with issues relating to sustainable development. It is anticipated that much of that information will have practical implications not only for the BLBRA program but for the programs of its partners.

STRATEGIC DIRECTIONS

Immediate priorities

- In cooperation with Partners, determine the critical concerns of the Lake area regarding the conflict between economic development and the tenets of sustainable development.
- Through BLBRA's national and international networks, identify and disseminate, to Partners, examples of sustainable development activities/projects that relate directly to concerns identified in the Lake area.
- Engage with the CEPI to determine the best role for the BLBRA to play as support for its sustainable development objectives.

VI Capacity Building

Learning is a fundamental builder of capacity. As stated in Part I, UNESCO Biosphere Reserve designation provides endless opportunity to build capacity through research, monitoring, education, training and organization development. Already individuals, organizations and communities have found that preparing the nomination document for the proposed biosphere reserve created significant learning experiences. It provided an opportunity to identify the numerous efforts already in place to improve the ecological condition of the Bras d'Or and its watershed, the potential to enhance those efforts through coordination and cooperation, and the opportunity to contribute ideas as a result of communication with other biosphere reserves in the world, and with other, related UNESCO programmes.

The activities in place are led by official agencies, academic institutions, industry, voluntary groups, and by an extensive collaborative initiative involving many of these interests. They involve a range of actors from local citizens to expert professionals. The interests of those participants may be as limited as individual concern about a single issue; or, they may be as comprehensive as the CEPI goal to achieve an environmental management plan for the Lake and its watershed. Taken together, these activities involve not only large repositories of information and talent relating to the environmental health of the Lake, but also rich ground for program contributions through a biosphere reserve. They involve an impressive corps of people who share common concern that this great natural asset, the Bras d'Or Lake, will be sustained and probably enhanced.

While much is known about the Lake, the level of knowledge is far from uniform, and far from sufficient. In general, the public lacks adequate awareness of conditions and measures threatening the ecological integrity of the Lake. Despite continuous enforcement of regulations by government agencies whose mandates serve to protect the Lake, there are times when the need for enforcement seems to be ignored; perhaps because of anticipated negative response, resulting as it might, in corresponding political fall-out. Resources assembled through a biosphere can improve public awareness of regulations and thereby generate greater appreciation of the role of enforcement agencies. Enhanced public understanding will lend necessary support to enforcement agencies and likewise serve as a deterrent to those who use their political strength to flaunt existing laws and regulations.

The BLBRA has a public education role to play in support of existing environmental stewardship efforts. It can assist citizens to identify factors that lead to environmental degradation and unsustainable use of ecological resources. It can assist citizens to clarify, express and examine reasons why they resist some proposed regulations designed to protect the Lake. It can forge links between the need to adopt remedial measures and the readiness of citizens and developers to alter particular environmental behaviours. In other words, BLBRA can be a force for promoting informed and prudent change, as distinct from imposed, ill-considered change.

An essential part of achieving informed change is accessing reliable information to demonstrate that change is necessary and evaluating the effectiveness and overall impact of remedial measures. This suggests a range of research and monitoring roles for the biosphere reserve, most often in cooperation with partner organizations. Thus, the BLBRA has three principal goals within its capacity-building mandate:

(1) to **educate** the public within the biosphere reserve about the state of the area's biodiversity, and about the ideals and principles associated with of sustainable development;

(2) to foster, in cooperation with partner organizations, a comprehensive and excellent **research program** within the biosphere reserve;

(3) to build **consensus** among residents of every community around the Lake that, together, they constitute a Bras d'Or Lake community; and

(4) to associate with Biosphere Reserves of Canada and of the world as a **source** of best practice examples, models for change and technical knowledge.

(5) In keeping with the Decade for Education for Sustainable Development, access ideas upon which to build a **program of teaching and learning** in relation to conservation and sustainability for the biosphere reserve area.

STRATEGIC DIRECTIONS

- Cooperate with partner organizations to determine the scope and nature of public information requirements relating to the Lake's ecosystem.
- Cooperate with partner organizations to construct a comprehensive education/information plan directed toward all who reside within the biosphere reserve.
- Cooperate with cultural entities to support inter-community plans and events that feature the range of cultural backgrounds found in the overall Bras d'Or Lake community.
- Assist skill development in local communities to observe and define a range of natural conditions, accurately and reliably[13].
- Continue to build the BLBRA website to cross-link and publicize the work of partner organizations to the point where it becomes an interactive 'one stop' source of information about different components and functions of the biosphere reserve.
- Cooperate with partner organizations to define research questions pertaining to problems within the Lake area.
- Cooperate with partner organizations to secure funds for research projects.
- Establish strong ties with national and international groupings of biosphere reserves through various communication technologies, including conferences, to inform the work of all partner organizations in programs relating to the Lake's ecosystem.

IMMEDIATE PRIORITIES

-Following the biosphere reserve designation, strengthen the association with partner (and potential partner) organizations that began with this Cooperation Plan to:

a) Construct a comprehensive education plan that situates each organization to take responsibility for programs in keeping with their resources;

[13] Reference: "A Case for Watershed Monitoring" by Lynn Baechler and Fred Baechler in *The Blue Heron*, January 2005.

b) Establish a comprehensive estimate of research requirements relating to the Lake's ecosystem and determine where responsibility lies for initiating priority research projects;
c) Decide on the nature and extent of information sharing to be undertaken through the BLBR website; and
d) Continue to identify and work with additional groups with a view to recruiting new partners.

- Continue to develop an organization structure and program that will achieve management requirements of a viable non-governmental organization in terms of funding, personnel, office facilities, program and accountability practices.

TOOLS AND RESOURCES FOR PRIORITIES

Communication with partner organizations will surely be facilitated through their representation on the Board of BLBRA. Meetings and workshops may be held for the specific purpose(s) of designing comprehensive education and research plans. Through presentations at regular meetings of respective organizations, approval may be obtained to cooperate on information sharing through the BLBRA website.

Decisions about steps required to achieve an adequate organization structure supported by funding and personnel will be made through and by the Board of Directors of BLBRA thorough consultation with partner organizations, and prospective funding sources..

Work on behalf of the BLBRA will continue to be performed by volunteers until funding for a budget is in place to support paid personnel.

VII Summary

The above three major functions of a biosphere reserve: conservation of biodiversity, sustainable economic development and capacity building; are interdependent in the sense that achievement of dimensions of one benefits the other. Attention to sustainable development requires capacity building and is likely to result in conserving biodiversity. These general functions have to be broken down into practical terms as the BLBRA continues to build its Cooperation Plan. Such questions as the following need to be answered:

- “Where in the Lake area is attention to conservation of biodiversity most critically required?”
- “What critical skills are required to foster sustainable development in the Lake area?”
- “Which partner organizations require the kind of support that a biosphere reserve can provide?”

Reliable answers to questions such as these will be found through open exploration of the accomplishments, current actions and the challenges experienced by partner organizations. Complementing and assisting the work of partner organizations will form a principal part of the day-to-day work of the biosphere reserve.

Roles of Biosphere Reserve Partners

Partners

The organizations represented on the Board of Directors of the BLBRA are considered Partners for purposes of the Biosphere Reserve Cooperation Plan. Descriptions of these organizations are contained in the Foreword of this document - in the section on Organizations, Programs, Collaborative Initiatives and Special Definitions.

Appendix 2 Maps 1 and 2: Large scale Maps of Biosphere Reserve

These are found in 2 folders at the back of this document.

If they are not included in this copy, see the web site www.blbra.ca . Click on “Documents” for links to these Maps and the full Nomination Submission.

Appendix 3 IUCN Categories

World Conservation Union / International Union for the Conservation of Nature and Natural Resources, IUCN Protected Areas Management Categories:

Ia *Strict Nature Reserve: protected area managed mainly for science:*
Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.

Ib *Wilderness Area: protected area managed mainly for wilderness protection:*
Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

II *National Park: protected area managed mainly for ecosystem protection and recreation:*
Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.

III *Natural Monument: protected area managed mainly for conservation of specific natural features:*
Area containing one or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.

IV *Habitat/Species Management Area: protected area managed mainly for conservation through management intervention:*
Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.

V *Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation:*
Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.

VI *Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems:*
Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

Appendix 4 Letters of Support

Entities responsible for Core and Buffer areas:

- Nova Scotia Environment *
- Nova Scotia Department of Natural Resources *
- Nova Scotia Department of Economic and Rural Development *
- Nature Conservancy of Canada
- Bras d'Or Preservation Nature Trust
- Henry Fuller
- NewPage Port Hawkesbury
- Parks Canada
- Baddeck Village Commission

First Nations:

- Unama'ki Institute of Natural Resources

Municipal Governments:

- Municipality of the County of Richmond
- Cape Breton Regional Municipality
- Municipality of the County of Victoria

Federal & Provincial Agencies:

- Department of Fisheries and Oceans
- Environment Canada
- Nova Scotia Department of Tourism, Culture and Heritage
- Destination Cape Breton
- Strait-Highlands Regional Development Agency

Government – Community Collaboration:

- The Collaborative Environmental Planning Initiative (CEPI)

Community Groups:

- Bras d'Or Stewardship Society
- Stewards of the River Denys Watershed Association
- Central Cape Breton Community Ventures
- Bras d'Or Preservation Nature Trust
- Wallace MacAskill Yacht Club
- Celtic Colours Festival Society
- Cape Breton Centre for Craft and Design
- Silver Dart Centennial Association
- Centre for Sustainable Communities - Atlantic Coastal Action Program – Cape Breton

Industry:

- NewPage Port Hawkesbury

Academic:

- Cape Breton University
- Nova Scotia Community College – Strait Area Campus

Individual:

- Jim St. Clair

*** (see Section 5 – Endorsements – page 62)**

Note: Letters have been omitted from this hard-copy version.

Appendix 5 Copies of Main Statutes for Core Areas and Buffer Zones

Primary statutes which provide legal protection to Core and Buffer Areas within the Biosphere Reserve:

Wilderness Areas Protection Act. 1998, c. 27, s. 1.
Special Places Protection Act. R.S., 1989 c. 438, s. 1.
Provincial Parks Act, R.S.N.S. 1989, c. 504
Beaches Act, R.S.N.S. 1989 amended 1993, c. 9, s. 9
Conservation Easements Act. 2001, c. 28, s. 1.
Crown Lands Act, R.S.N.S. 1989, c. 114

Note: The acts have been omitted from this hard copy version

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Appendix 6 Engaging the Public

From the outset, the initiative to gain UNESCO Biosphere Reserve status for the Bras d'Or Lake and its watershed placed high value on informing local residents, and on being connected with several levels of government, their agencies and a host of voluntary organizations associated with the Lake. This was done in a variety of ways, always with an eye fostering attention to, interest in, and understanding of the implications of a Biosphere Reserve.

Such popular terms as "public consultation," "public awareness-building," and "citizen engagement" apply. But they do not adequately capture the range of activities required to ensure that the meaning of the designation was accurately understood, and that the inherent nature of the Lake and its watershed was adequately described. The very first meeting the Steering Committee in 2003 was itself part of the process of building awareness and understanding. Volunteers could only be recruited and continue to serve when they were convinced it was a worthwhile undertaking. Since then, the objective was to ensure that the accurate and full understanding of a UNESCO Biosphere Reserve.

Governance

The process of preparing the Nomination Submission was conducted primarily by volunteers who worked without benefit of established financial resources, assisted by expertise found in various agencies of government, and in university and industry settings. It took cooperation among organizations and individuals to construct the project's emerging design. Thus, the process itself has been an exercise in creating public awareness. Public trust and support were built gradually. For example, from the outset, the Steering Committee was formed on a base of representation from non-governmental organizations dedicated to the well-being of the Lake, and representation from a distribution of geographic areas around the Lake. In 2006 the non-profit organization registered as an Association with Nova Scotia's Registry of Joint Stock Companies. This provided for an elected Board and specific reporting requirements. Currently, the Board of nineteen Directors has nine representatives from non-governmental organizations, two from industry, four from the municipal governments of the area, and four "at-large" members from various geographic locations around the Lake. This governance arrangement has enabled the project to gain broad attention and commitment particularly within the respective jurisdiction of each organization. On average, the Board meets six times a year in

local community centres located around the Lake. These open meetings present an opportunity to build public awareness of the Biosphere Reserve project.

Residents

Several strategies were employed to familiarize the overall Bras d'Or Lake community with the implications of achieving the UNESCO World Biosphere designation. Five thousand brochures were printed and distributed to permanent residents in 2006. An additional 1500 brochures (Appendix 7) were printed in 2007 for distribution to summer residents around the Lake. Each of the three Annual Meetings of the Biosphere Reserve Association provided an opportunity to draw public attention to the project through radio and television interviews, and newspaper articles. Again, the venue for those public meetings was in selected communities beside the Lake (St. Peter's, Bras d'Or and Whycocomagh). An article about the Biosphere Reserve initiative was published in a special industrial development edition of the Cape Breton Post. Local public information meetings were held each year, beginning in 2005; sometimes in community centres; sometimes in private homes. There is a practice of soliciting membership in the Association. The Master List numbers approximately 200 names. Currently, the Board of Directors is establishing a membership policy to reflect the best interests of members and the Association.

Lake-Related Organizations

As mentioned in the above section on governance, organizations represented on the Board of Directors have a direct line to information about the Nomination process. In several

instances those organizations featured presentations about the proposed Biosphere Reserve at meetings of their membership. Such presentations were made for two semi-annual meetings of the Bras d'Or Stewardship Society, for two meetings of the Pitu'paq partnership, for two meetings of the Unima'ki Institute of Natural Resources, for a Steering Committee meeting of CEPI (Collaborative Environmental Planning Initiative), for an Institute of the Whycocomagh Eco-Centre, for an Unama'ki Forum, and for an invitational meeting with representatives of Stora Enso and another later, when that mill was renamed: NewPage Port Hawkesbury Ltd. Two members of the Association's Board serve as member of the Board of the Bras d'Or Stewardship Society, and one as a member of the Steering Committee of CEPI.

Governments

Measures taken to include various levels of government throughout the Nomination process varied with the respective requirements. Those ranged from the need for accurate data to include in the document, the need to inform local governments about the essential characteristics of a Biosphere Reserve, and, the need to ensure that all levels of government were informed of the initiative and invited to contribute to and comment on the Association's work.

Each of the four municipal governments within the Bras d'Or watershed received at least two presentations about the Biosphere Reserve initiative. At first, the objective was to provide information and, over time, to gain formal support. This turned out to be more challenging than expected. In some cases Council members expressed (on behalf of their constituents) fears that restrictions they believed to be associated with a Biosphere Reserve might impede industry, such as the fishery and mining. To date, three of the four municipalities have provided formal expressions of formal; the remaining one remains convinced of the implied barrier to economic (industrial) development. All four have elected representatives to the Association's Board.

Selected agencies of both Federal and Provincial governments were contacted throughout the process of preparing the Nomination Document. For example, letters were sent to Deputy Ministers of Departments whose mandate related directly to protection of the lake and/or its watershed informing them of the Association's initiative. In the case of Departments where the relationship was especially significant (e.g., Nova Scotia's Departments of Environment, Natural Resources, and of Economic and Rural Development) two meetings were held with senior officials in Halifax, the Province's Capital. The Draft Nomination Document and

the Draft Cooperation Plan were circulated to a total of fifty entities within the respective levels of government requesting comment and/or support.

Following a meeting with representatives of provincial and municipal development agencies, a request was made for a financial contribution to cover several expense categories: printing and distribution of brochures, travel expenses for a resource person for each of the Annual Meetings, and direct costs associated with those meetings. In all, these contributions amounted to approximately $6,000. Later, because the Board determined it was necessary to provide information through public communication media and to produce and print a final "edition" of the Nomination Document, a fund-raising event was held which generated approximately $10,000.

The implications of this lack of financial support are that volunteers pay the cost of their travel to meetings, as well as usual communication costs, such as printing and website maintenance. It is interesting to speculate about the reasons why public (i.e., government) agencies are reluctant to provide funding support for this kind of initiative.

General Purpose

The Association has enjoyed the advantage of a website since 2005. It carries up-to-date evidence of progress with the nomination document, announcements and records of meetings, and references to information of a general nature relating to UNESCO's Biosphere Reserve program.

Occasional newsletters are sent to a Master list of approximately 200 names of individuals and organizations.

As can be seen in the Nomination document, excellent response came from organizations and individuals who were asked to contribute written pieces in response to various information requirements. As well, the document was enlivened by many contributed photographs.

The Table below lists some of the measures taken to engage a broad spectrum of stakeholders.

Presentations/Meetings to Inform Organizations and Public about Proposed Bras d'Or Biosphere Reserve; 2003-2010

Year	Date	Audience
2003	27-Jan-03	2 leaders, Unama'ki Institute of Natural Resources
		and Eskasoni Fish and Wildlife Association - in Eskasoni
	28-Jan-03	4 representatives Dept. Fisheries and Oceans - in Dartmouth
	28-Jan-03	1 representative Sustainable Communities Initiative - in Halifax
	21-Aug-03	Bras d'Or Conference, Eskasoni; Federal, Provincial, Municipal (including Native), Public representation in Eskasoni.
	22-Sep-03	Pitu'Paq Partnership (representing 5 Municipal councils and 4 Band Councils) - in Port Hawkesbury
2004	31-Jan-04	2 Richmond County leaders - in St. Peter's
	21-Feb-04	Teleconference: Steering Committee (in Baddeck) and George Francis(in Ontario)
	3-May-04	Collaborative Environmental Planning Initiative (CEPI) and Unama'ki Institute Presentation
	11-Jun-04	representatives of Unama'ki, Eskasoni Fish and Wildlife, DFO, Union of NS Indians, George Francis - in Eskasoni
	11-Jun-04	representatives UCCB faculty, George Francis - in Sydney
	14-Jun-04	representatives of Bras d'Or Stewardship Society, George Francis - in Baddeck
	21-Jul-04	Public meeting with rep. of CBRA (Brian Craig) - in St. Peter's
	14-Aug-04	Bras d'Or Stewardship Society presentation - Jim Foulds - Baddeck
	7-Oct-04	Unama'ki Forum - speech to reps of fed., Prov. Municipal, Band Council and Public in Wagmatcook
2005	3-Mar-05	UCCB Faculty with Jim Foulds - in Sydney
	4-Mar-05	Unama'ki (Chiefs) and CEPI - in Eskasoni
	25-Apr-05	Victoria County Council - in Baddeck
	5-Jun-05	Public meeting at Dundee Resort, Richmond County
	8-Aug-05	Cape Breton Regional Municipality Planning Advisory Group - in Sydney
	12-Sep-05	Richmond County Council - in Arichat
	3-Oct-05	Inverness County Council - in Port Hood
	11/21/2005	Meeting with reps. Of Cape Breton Regional development Agencies - in Baddeck
2006		Established Website for Bras d'Or Lake Biosphere Reserve Association
		Printed and Distributed 5000 brochures to Watershed Residents
		Letters to Ministers and D.Ms of related Federal and Provincial Departments re BR
		Articles in 3 weekly and 1 daily newspaper re BR Initiative
	2-Apr-06	Sustainable Communities Initiative (SCI) – Cheticamp
	16-Jun-06	Pitu'Paq Partnership – Eskasoni
	9/7/2006	Meeting with senior Native representative – Eskasoni
	11/14/2006	Meeting of potential contributors to Nomination Document - George Francis in Eskasoni
	11/14/2006	Presentation to CEPI - George Francis and BR Board Members – Eskasoni
2007		Re-print of Brochure distributed to Watershed's Part-time Residents
	3/15/2007	Meeting with MLAs MacLeod, Clarke and Bain re support for BR
	2/22/2007	Meeting with MLA MacLeod re support for BR

Presentations/Meetings to Inform Organizations and Public about Proposed Bras d'Or Biosphere Reserve; 2003-2010

Year	Date	Audience
	2/16/2007	Presentation to Senior staff of NS Departments of Environment, Natural Resources and Tourism in Halifax
	6-Mar-07	Meeting with reps of Stora Enso Forest Industry
	11-Apr-07	Integrated Resource Management group - NSDNR - Schubenacadie
	27-30/04/07	series of Public Media Interviews re AGM (radi0)
	30-Apr-07	2007 AGM - Public meeting in St. Peter's
	1-May-07	series of newspaper items pre and post AGM
	13-Jun-07	High School Students - Rankin School of the Narrows - Iona
	9-Jul-07	Meeting with rep of Strait-Highlands Development Agency re Nom. Doc.
	23-Jul-07	Conference of Ecologists - Whycocomagh Eco-Centre
2008	Mar - Apr	Distribution of Draft Nom. Doc. And Cooperation Plan to 50 agencies/orgs for comment
	9-Apr-08	Meeting with Cape Breton Naturalists
	May 16/08	Meeting with Deputy Minister, NS Dept. of Environment, in Halifax
	May 26-08	2008 AGM - Public meeting in community of Bras d'Or
	20-28 May	Series of public media Interviews re AGM and Press Releases
	July 8/08	Meeting with representative of Parks Canada
	July 15/08	Teleconference, BLBRA Board
	Aug. 11/08	Half-day meeting, Document Committee
	Sept. 19/08	Half-day meeting, Document Committee
	Sept 24/08	meeting, BLBRA Board reps and senior staff of 4 Provincial Departments, in Halifax
	Oct. 6/08	BLBRA Board meeting in community of Sampsonville
	Nov. 10/08	Meeting of reps of BLBRA Board with Inverness County Council
	Nov 12/08	" " " " " Victoria County Council
	Nov. 18/08	" " " " " Cape Breton Regional Municipality Council
2009	Jan. 13/09	half-day meeting, Document Committee
	Feb. 5/09	BLBRA Board at Baddeck (included meeting with senior staff person, DFO and with representatives of Nova Scotia's two mining associations
	Feb. 6/09	CBC Information Morning Interview
	March 2, 2009	Presentation to Municipal Council – Victoria County
	April 6/09	Inverness County Council at Port Hood
	May 14/09	Seniors' "Thoughtful Thursdays" group – Thom Oommen - Mabou
	May 22/09	BLBRA Annual Meeting (Public) at Whycocomagh
	May 5/09	Meeting in St. Peter's with President, NS Mining Society
	July 28/09	Meeting in Port Hawkesbury: RDA and Economic Dev. reps
	August 15/09	Report to Bras d'Or Stewardship Society Meeting, Baddeck
	August 20/09	Meeting with rep. of Unama'ki Institute of Natural Resources, Eskasoni
	Sept. 9/09	Kitchen meeting at Teresa MacNeil's home
	Sept. 14/09	Presentation to Richmond County Council

Presentations/Meetings to Inform Organizations and Public about Proposed Bras d'Or Biosphere Reserve; 2003-2010

Year	Date	Audience
	October 3/09	Presentation to potential funders – Beinn Bhreagh
	October 14/09	Inverness/Victoria Federation of Agriculture meeting
	October 27/09	Cape Breton Federation of Agriculture – North Sydney Forum
	October 28/09	Kitchen meeting at Chris Goyetche's home
	November 1/09	Presentations to the Whycocomagh and East Lake Ainslie Pastoral Charge – at Grant and Stewart churches – United Church of Canada
	November 27/09	Climate Change Conference as part of Flight of the Silver dart celebrations
2010	January 26/10	Inverness – Guysborough Presbytery – United Church of Canada
	February 3/10	North Sydney Rotary Club
	February16/10	CBC – Cape Breton – Information Morning interview
	February 23/10	Presentation to NS Ministers of Environment, Natural Resources and Economic and Rural Development – Halifax
	March 9/10	Natural Resources Technology class – NSCC – Strait Area Campus
	March 11/10	Kiwanis Club of Sydney
	March 18/10	The Bell Club, Baddeck
	April 1/10	Baddeck Valley Wood Producers Co-op AGM – Guest speaker

How could becoming a biosphere reserve help the Bras d'Or Lake?

Biosphere reserve status brings world-wide recognition to places that are distinct ecosystems which showcase how people can work with their environment. The Bras d'Or Lake, and Cape Breton generally, would be recognized as a good place to live, work and visit - both nationally and internationally. This recognition would also encourage funding for research into sustainable rural and economic development.

It would advance additional biological and ecological studies to support existing conservation priorities. It would promote "best practices" for cultural, social and ecological sustainability, in part by providing information from other biosphere reserves and elsewhere to apply within the Bras d'Or Lake watershed.

What do you think?

Your questions and comments are invited about the idea of the Lake and its watershed becoming a biosphere reserve.

Does it sound like a good idea?
Do you have questions or concerns?
Do you want more information?
Do you want to get involved?

Please contact the Association through its website or any of the following telephone numbers or email addresses:

Bras d'Or Lake Biosphere Reserve Association
www.blbra.ca
Office telephone: (902) 295-2947
email: contact@blbra.ca

Chair: Teresa MacNeil
Telephone: (902) 535-2151
email: tmacneil@stpeterscable.com

Vice-Chair: Grosvenor Blair
Telephone: (902) 295-3447

Secretary: Jim Foulds
Telephone: (902) 674-2578
email: jim@ecoboy.ca

Treasurer: Philip MacLennan
Telephone: (902) 871-2956

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The Bras d'Or Lake Biosphere Reserve ASSOCIATION

Securing the Future... of the Bras d'Or Lake

The Bras d'Or Lake as a World Biosphere Reserve

What is a World Biosphere Reserve?

It is a special place that demonstrates how people can live in harmony with nature. It promotes sustainable economic development by balancing conservation of life forms with their use.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) recognizes biosphere reserves as part of its Man and the Biosphere program. There are over 500 biosphere reserves around the world and 13 in Canada, including one in southwestern Nova Scotia.

This program places people and what they do as the key factor for the long-term, healthy development of communities.

A biosphere reserve will hasten the day when the Bras d'Or Lake will be the Community Centre for all who reside along its shores.

How does a site become a UNESCO biosphere reserve?

A comprehensive nomination document is sent to the Canadian *Man and the Biosphere* office in Ottawa which then forwards the application to UNESCO. The document includes detailed geographic information about the lake and its watershed and describes its social, cultural, and natural history. It will highlight the many ongoing activities that show that the area is already functioning as a biosphere reserve. The nomination document must also include evidence of broad support from government, major interest groups, and the general public.

The nomination document is expected to be ready to send to UNESCO in 2008.

Who is working on this?

All who assist do so as volunteers.

A number of organizations have recognized the Bras d'Or Lake as a priceless asset to Cape Breton's way of life. Many of them continue to take action to preserve the Bras d'Or Lake as a healthy ecosystem.

Representatives of some of these organizations are directors of the Bras d'Or Lake Biosphere Reserve Association:

Lynn Baechler, Bras d'Or Stewardship Society

Grosvenor Blair, Bras d'Or Preservation Foundation

Kimberly Paul and Richard Fogarty, Pitu'paq Partnership

Bruce Hatcher, Bras d'Or Institute for Ecosystem Research

Albert Marshall, Elder Advisor, Collaborative Environmental Planning Initiative

Vince MacLean, Central Cape Breton Community Ventures

Christena Goyetche, Nova Scotia Community College

Kari Easthouse, Stora Enso

Betsy Jardine, Whycocomagh Eco Centre

Gerard MacMaster, Georgia Pacific (Canada) ltd.

Other Directors at Large

Jim Foulds, Southside Boularderie

Philip MacLennan, Beaver Cove

Doug Landry, St. Peter's

Teresa MacNeil, Johnstown

Summary Document Brochure Handout

Welcome to the Bras d'Or
Pjilita'q ula Pitu'paq
Fàilte oirbh dha 'n Bhras d'Or
Bienvenue au Bras d'Or

"We are all too inclined, I think, to walk through life with our eyes closed. There are things around us and right at our very feet that we have never seen, because we have never looked. We should not keep forever on the public road, going only where others have gone; we should leave the beaten track occasionally and enter the woods. Every time you do that you will be certain to find something you have never seen before. Of course, it will be a little thing; but do not ignore it, one discovery will lead to another, and before you know it you will have something worth thinking about to occupy your mind, for all really big discoveries are the results of thought." - Alexander Graham Bell
Presented at the Parks Canada, Ecological Integrity - A Call to Action Workshop (Nov 13 -14, 2001)

WHY IS THIS PLACE WORTHY OF SPECIAL RECOGNITION? ➜

Amaquadees Pond, Eskasoni - one of the many "nursery" barachois ponds around the Lake

Why should the Bras d'Or Lake and watershed be designated as a UNESCO* Biosphere Reserve?

The designation under the UNESCO "Man and the Biosphere Program" will give international recognition to this special place and will provide an incentive for future generations to live and work in vibrant and sustainable communities!

INTRODUCTION

This is a brief summary of a much larger application document written for the United Nations Man and the Biosphere Program to have the Bras d'Or Lake and its watershed designated as a UNESCO Biosphere Reserve. Readers may want to refer to the original document at www.blbra.ca for more detail.

The Bras d'Or Lake has long been known as Canada's inland sea. In reality it is a unique estuarine ecosystem, with cold (Arctic) and warm water (Virginian) species thriving within a few hundred metres of each other. The coastline of the Bras d'Or Lake is a complex sequence of barrier beaches, rocky headlands, barachois ponds and wetlands. The watershed is a place where Mi'kmaq, and descendants of early French, Scottish, and English settlers live together with more recent newcomers, working to build healthy and vibrant communities. Four languages are spoken in the watershed, English, French, Mi'kmaq and Gaelic. Many rural residents make their living from the forest, mineral extraction, agriculture and fisheries sectors. Others in established communities benefit from the seasonal tourist industry, the presence of schools, small health centres, museums and government offices. Throughout the Bras d'Or Lake watershed, in fact throughout all of Cape Breton Island artisans, musicians and storytellers steeped in local history and culture, abound.

THE PROJECT

A Biosphere Reserve is an outstanding region recognized under the UNESCO Man and the Biosphere Program. Biosphere Reserves focus on elements of sustainable development: respect for the environment, healthy and equitable economies, cultural richness and vibrant communities, today and into the future.

November 18, 2009 1 / 8

Did you know Cape Breton Island was recently voted one of the 3 best islands in the world! - Travel and Leisure (2009).

Baddeck Bay: February 22, 2009
100th Anniversary celebrations of first flight in Canada

The Bras d'Or Lake watershed is defined "as that portion of the Cape Breton land mass which directs surface water runoff downslope to its lowest internal point (the Bras d'Or Lake). Surface water runoff generally converges into progressively larger streams and/or rivers as it moves downstream". Other words used to define a watershed are: drainage basin and catchment basin. The Middle River, Skye River, Baddeck River, River Denys, etc. watersheds are sub-watersheds of the Bras d'Or Lake watershed as these rivers, among many others, flow into the Bras d'Or Lake.

St Peters Marina

Cape Breton Island has a complex bedrock geology and is reflective of the earth's chaotic history over a long period of geologic time.

The idea of designating the Bras d'Or Lake a UNESCO Biosphere Reserve was conceived by the Bras d'Or Preservation Foundation in 1993. By 2002 committed volunteers were working toward the designation for the Lake and its watershed. In 2006 the Bras d'Or Lake Biosphere Reserve Association was formed with a Board of Directors representing communities, groups and industry around the Lake.

The designation is a way to give international recognition to the Lake. The designation will also provide an impetus for research and monitoring, not only for the environment and fragile ecosystems, but also for social and health sciences, and for culture and history.

The task of completing the Submission Document (a document format set by the UN) was started late in 2007. Local scientists, educators, historians, community leaders and interested individuals (all volunteers) rose to the occasion to ensure the document was completed accurately.

The submission process, defined by the United Nations, requires support from the residents. Support is reflected through many local community groups and organizations, agencies and industry, and all levels of government: Municipal, Provincial, Federal and First Nations. When support is obtained from these sources, the Submission Document will be submitted to the United Nations in Paris for their consideration of this area as one of 15 Biosphere Reserves in Canada.

Board meetings (open to the public) and public meetings have been held in communities around the Lake. Team members have made presentations on the Bras d'Or Lake Biosphere Reserve concept to the four municipal councils and the Band Council Chiefs, to the Collaborative Environmental Planning Initiative (CEPI)**, representatives of two Regional Economic Development Agencies, and to various community groups.

WHAT IS THE PROPOSED BRAS D'OR LAKE BIOSPHERE RESERVE?
The area proposed as the Bras d'Or Lake Biosphere Reserve is 3566 km^2 in the central portion of Cape Breton Island. The Biosphere Reserve is defined by the perimeter of the watershed of the Bras d'Or Lake, and includes the Lake itself, which covers 1091.5 km^2.

DID YOU KNOW NORTH MOUNTAIN, CREIGNISH HILLS AND THE BOISDALE HILLS ARE KNOWN FOR EXTENSIVE MARBLE DEPOSITS? The lowlands around the Lake are important source rocks for industrial minerals including celestite, gypsum, anhydrite, salt potash, dolomite and limestone as well as occurrences of copper, lead and zinc.

Relatively steep hills (rising to 490 m elevation) behind a narrow coastal plain provide topographic variety that includes elevated plateaus/tablelands, deep ravines, and lowlands that have diverse forest mosaics. Much of the area is second growth successional forests resulting from extensive forest cutting in the past.

Forest at Johnstown

DID YOU KNOW BALD EAGLES FROM THE BRAS D'OR LAKE WATERSHED WERE RE-LOCATED TO RE-ESTABLISH THE EAGLE POPULATION IN THE NORTHEASTERN UNITED STATES?

DID YOU KNOW THE BRAS D'OR LAKE IS APPROXIMATELY 2/3RDS AS SALTY AS THE ATLANTIC OCEAN? The Lake and its aquatic habitats support a distinctive mix of marine and freshwater fauna. Some species assemblages are associated with arctic ecosystems, others with sub-tropical ecosystems.

Biosphere Reserves are comprised of three areas: Core Area(s), Buffer Area (s) and the Area of Cooperation.

A Biosphere Reserve is intended to serve three functions: promote conservation and sustainable economic development, and provide support for research and education. A Biosphere Reserve is established to promote and demonstrate a balanced relationship between humans and the biosphere (people living in, working in and enjoying their environment).

The biosphere reserve concept can serve as a framework to reinforce projects already underway, enhancing people's livelihoods and ensuring environmental sustainability. Work by the Ross Ferry Stewardship Society, the Stewards of River Denys Watershed Association and CEPI are good examples of such projects.

When designated, the Bras d'Or Lake Biosphere Reserve becomes a member of the World Network of Biosphere Reserves. Integrated research and monitoring can be shared with other Biosphere Reserves within Canada and around the world. Scientific information is essential for policy makers and their constituents, informing them on environmental and developmental issues, as well as serving as a basis for broader global assessments, such as climate change.

OUR LAND

The total land area of the proposed Biosphere Reserve is 2474 km^2. There are 19 areas within the watershed, which because they are ALREADY protected by legislation, are considered Core Areas. The Core Areas range in size from the Middle River Wilderness Area (53.47 km^2) to Malcolm Cove Protected Beach (0.005 km^2).

The core areas total 77.12 km^2 of the land based watershed. These core areas constitute 2.16% of the entire watershed or 3.1% of the land based portion of the watershed. Core Areas include wilderness areas, nature reserves, provincial parks, a game sanctuary, land trusts and protected beaches.

Buffer Areas in the Bras d'Or model do not surround each core area, as one might expect, but instead include 614.6 km^2 of federal, provincial (Crown), municipal and private lands within the Bras d'Or Lake watershed in which sustainable activities are ALREADY taking place, long term ecological

DID YOU KNOW THERE IS A 770 METRE DIFFERENCE BETWEEN THE HIGHEST POINT IN THE WATERSHED AND THE DEEPEST POINT IN THE LAKE? St. Andrews Channel has a maximum depth of 280 m below sea level, while the average Lake depth is 30 m.

Malagawatch - Submerging coastline - November 2008

DID YOU KNOW THE SHORELINE OF THE BRAS D'OR LAKE IS 1272 KM LONG, INCLUDING ISLANDS AND LAGOON SHORES OF THE LARGE COASTAL BARRIERS? – SHAW ET. AL, 2006. Well preserved, submerged coastal landforms in the Bras d'Or Lake may be potential targets for finding archaeological evidence of the early Mi'kmaq peoples living in the area.

Did you know the Bras d'Or Lake watershed falls under 4 different Municipal jurisdictions and 5 First Nations Bands? These political units work together for clean water, in a group known as **PITU'PAQ**, a Mi'Kmaq word for "flowing into oneness".

monitoring is taking place or land is designated as historical sites. The large areas (560.2 km^2) of Category 2 (C2) Crown land fall under Integrated Resource Management (IRM). According to the Nova Scotia Department of Natural Resources, "IRM is a planning and decision making process that coordinates resource use so that long term sustainable benefits are optimized and conflicts among users are minimized. IRM includes planning for minerals, forests, recreation, wilderness, energy, wildlife and parks". Human activity, therefore, is **NOT DENIED** in "buffer" areas: these are integral parts of a biosphere reserve. Resource activities such as forestry and mining, and recreation and wilderness activities are planned and conducted to maintain special features and enhance use opportunities.

The NewPage Port Hawkesbury lands, either set aside, or IRM managed lands account for 44.8 km^2 of the watershed, while non-designated parks, ecological monitoring sites, historic sites and municipal lands account for 9.6 km^2. Together, the buffer areas account for 24.8% of the land based portion of the Bras d'Or Lake watershed.

The Area of Cooperation extends to the perimeter of the Bras d'Or Lake watershed. It is the remainder of the Biosphere Reserve, where people live, work and play. Best stewardship practices will be promoted in this area.

OUR LAKE

The Bras d'Or Lake (1091.5 km^2) accounts for approximately 31% of the proposed Biosphere Reserve. Technically the Bras d'Or Lake is not a lake. It's an estuarine ecosystem with different salinities, temperature ranges, and water circulation patterns. These variations occur because of the narrow links to the Atlantic Ocean, a complicated bathymetry, low rates of flushing and varying freshwater inflows.

The Bras d'Or Lake was created approximately 6000 years ago, when sea level overtopped a bedrock sill in the Great Bras d'Or Channel at about 25 metres below sea level, enlarging the Lake and changing it from fresh to salt water.

The shoreline of the Bras d'Or Lake, as in the rest of Atlantic Nova Scotia, is a submerging coastline, due both to geologic processes and climate change. Scientists predict

DID YOU KNOW THE BIGGEST FORESTRY OPERATOR IN THE WATERSHED HAS SEVERAL ENVIRONMENTAL AND QUALITY CERTIFICATIONS? New Page Port Hawkesbury is the only forest company in the world registered to FSC, CSA, SFI and ISO forest management standards. This certification means much of the forested area of the Bras d'Or Lake watershed is managed to a very high standard. New Page Port Hawkesbury is an active supporter of the Bras d'Or Lake Biosphere Reserve proposal.

Yellow Lady Slipper: Georgia Pacific Melford Site (2009)

DID YOU KNOW GEORGIA-PACIFIC CANADA, WHICH OPERATES A GYPSUM MINE AT MELFORD, SIGNED A MEMORANDUM OF UNDERSTANDING (MOU) WITH FIRST NATIONS CHIEFS AROUND THE LAKE? As a result, royalties are paid to support scientific research in the Bras d'Or Lake watershed. They also fund research for a Salmonid Management Zone in Glen Brook and enhanced habitat in Big Brook, both are tributaries of River Denys. Georgia-Pacific Canada is a supporter of the Biosphere Reserve concept.

the rate of modern sea level rise (~0.37 m/century) will increase to 60 cm/century by 2030 AD and 115 cm/century by 2100 AD.

OUR PEOPLE, CULTURE AND HERITAGE

The Mi'kmaq people have a long history (> 5000 years) in the Bras d'Or area, and currently represent approximately 30% of the human population of the watershed. Early European fishers arrived in the 1500's. During the 1600's through to the mid 1700's the French were the dominant European presence on Cape Breton Island. By the late 1700's the Scots started to arrive. From this period through to the early 1900's farming was important in the watershed. Forests were cut for ship building; old giant white pine were cut for masts. Small ferries carried people from one shore to another. The Lake was the main transportation route tying communities together.

From the 1830's major reservations of land were set aside for First Nations people as they changed their mode of life from migratory hunters and gatherers to living on small farms, fishing for oysters and making saleable handcrafts.

By the late 1800's, the Lake and area were becoming a major attraction for the developing tourist industry. Now communities host ceilidhs, festivals, concerts and other events to celebrate their culture, their talent and their place.

OUR PAST, AND A VISION FOR OUR FUTURE

Protecting the ecological integrity of the Bras d'Or Lake by embracing sustainable economic development has been the subject of discussion and focus of action by many organizations and initiatives over several decades.

Through its history, Cape Breton's culture, heritage and economy have been linked directly to its natural resources; mining, forestry, fishing, farming and steel making. Within the resource based industries, during development projects and even residential construction, there is great need to educate and abide by "best practices" or "good stewardship practices". The success of spreading and implementing new "stewardship" knowledge will sustain these activities well into the future.

Additional Reading:

A Community Guide to Canada's Biosphere Reserves at: www.centrenature.qc.ca/pdf/ResBio/Biospherebrochure_E.pdf

Altantic Geoscience Society, 2001. The Last Billion Years A Geological History of the Maritime Provinces of Canada, edited Fensome, R.A. and G.L. Williams, Special Publication No 15, Nimbus Publishing, 212 pages.

Nova Scotia Museum, 1996, Theme Regions: Natural History of Nova Scotia, Vol II, co published by the Province of Nova Scotia and Nimbus Publishing, 304 pages.

Parker, M., M. Westhead, P. Doherty and J. Naug. 2007. Ecosystem Overview and Assessment Report for the Bras d'Or Lakes, Nova Scotia, Canadian Manuscript Report of Fisheries and Aquatic Sciences.

Shaw, J., R.B. Taylor, E. Patton, D.P. Potter, G.S. Parkes, and S. Hayward, 2006, The Bras d'Or Lakes, Nova Scotia; Sensitivity of the Coasts of the Bras d'Or Lakes to Sea-level Rise, Geological Survey of Canada, Open File Report 5397, pgs 89.

Stewart, James E. (editor), 2002, Proceedings of the Nova Scotia Institute of Science, Halifax, Nova Scotia, Dalhousie Printing Centre, Volume 42, Part 1, 174 pages.

www.gov.ns.ca/natr/ for more information on Integrated Resource Management and the Natural Resource Strategy 2010.

www.uinr.ca For more information on the Unama'ki Institute of Natural Resources (UINR) and their publication "UINR Marten".

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* UNESCO is the United Nations Educational Scientific and Cultural Organization

** CEPI is the Bras d'Or Lakes Collaborative Environmental Planning Initiative

If you have any questions, comments and / or want to get involved with this project, please contact a BLBRA Board member at info@blbra.ca

or call 902-674-2578

Because the Bras d'Or Lake is an extraordinary body of water offering fine views, warm salt water swimming, pleasant summer temperatures and gentle breezes, it is coveted as a favourite summer retreat for sailors, permanent residents of the Island and for summer residents.

Over the last 15 years there have been a wide variety of Non-Governmental Organizations (NGO's) initiated to address important community and/or Lake wide issues. These include the Bras d'Or Stewardship Society, the Bras d'Or Preservation Foundation and the Middle River Watershed Society, among others. These groups working with government, have made a significant impact on sewage from boats, ballast water, on-site sewage disposal systems, wetland awareness, and are now looking at guidelines for shoreline development.

Biosphere reserve designation will greatly enhance opportunities to link communities around the Lake with ecologically sensitive tourism activities.

The Bras d'Or Lake and watershed are recognized for their research potential, offering opportunities for local communities to work side by side with national and international researchers. The Unama'ki Institute of Natural Resources has undertaken several research initiatives to improve overall understanding, health and productivity of the Lake. The region has several educational facilities with programs relating to aquatic and general environmental sustainability, culture and history. Examples include the Bras d'Or Institute for Ecosystem Research at Cape Breton University (CBU), the Nautical Institute at Nova Scotia Community College, the Highland Village, the Gaelic College, the Aquatic Resources degree program at St. Francis Xavier University, and the Eco-Centre located in Whycocomagh's Community Education Centre.

There are many opportunities to work together on ecologically and economically appropriate development projects in the proposed biosphere reserve. The people who choose to live in Cape Breton are often multi-skilled and able to put together a living from complementary sources of work. They recognize the value of a lifestyle that offers room for personal growth and community development.

QUESTIONS ABOUT THE PROPOSED BIOSPHERE RESERVE

Q1. Who will oversee the Biosphere Reserve (BR)?

The activities of the Biosphere Reserve will be overseen by the BLBRA working with other local organizations already focusing on conservation, sustainable development, and capacity building (research, monitoring and education) in their programs.

Q2. How will the Biosphere Reserve, research and monitoring and educational programs be funded?

Environment Canada provides basic funding for all Biosphere Reserves in Canada. There are many other potential sources of funds through provincial and federal grants, private foundations, legacies, etc.

Q3. Will my property taxes increase if the BR designation proceeds?

Neither your property assessment nor your property tax will increase because your property is within the BR. There is proven potential for the sustainable development in a Biosphere Reserve to increase the tax base.

Q4. What benefit will the designation of a BR be to communities and residents in the watershed?

The BR Designation offers hope to reverse the out migration of young people, to bring young people back to a thriving rural economy where they can work and learn and support their families using a combination of our rich natural resources (forestry, mineral resources, small scale mixed farming), sustainability principles and high tech communication resources (high speed internet) supported by near-by research facilities at Cape Breton University, the Coast Guard College, Nova Scotia Community Colleges (Marconi College - Sydney, Nautical Institute - Port Hawkesbury), the Gaelic College, the Highland Village and several business colleges.

With a faltering world economy, this designation offers hope to maintain and perhaps grow tourist facilities in the area, as citizens and researchers from other parts of the country and other nations come to visit, study and observe in our "special place".

The reversal of youth out migration, and re-establishment of small farming initiatives may ultimately lead to growing fresh food markets and food security for the Cape Breton population.

This is an effort to not only maintain the beauty, culture and ecological integrity of this "special place" but to keep communities vibrant and sustainable. Sustainable economic development will provide the tax base for healthy, sustainable communities within and around the watershed.

People may just want to say "I live in a world recognized special place, a UN Biosphere Reserve. It's a place where there will always be something to learn!".

Q5. Will natural resource development, tourist and recreational facilities, or industrial opportunities be hindered if this area is designated as a BR?

No. No additional laws or regulations come with the BR designation. Provincial regulations (e.g., environmental assessments) are already part of doing business in Nova Scotia. They will not be any different because a project is located in the BR. Efforts to stimulate economic growth will not be restricted by the BR designation. A BR association is not an advocacy group.

Q6. If my land is in the Bras d'Or Lake BR will MY use of that land be restricted?

No. Activities (building construction, water course impacts, shoreline manipulation etc.) are already regulated by your municipal, provincial and federal laws. At the present time, NGO's are working with municipal governments to establish consistent development guidelines in order to protect the shoreline of the Lake against over development and erosion, and to protect residents and developers against the effects of climate change and rising sea level. If in the future there are any restrictions on your land, it would be due to changes in municipal regulations - not the BR designation.

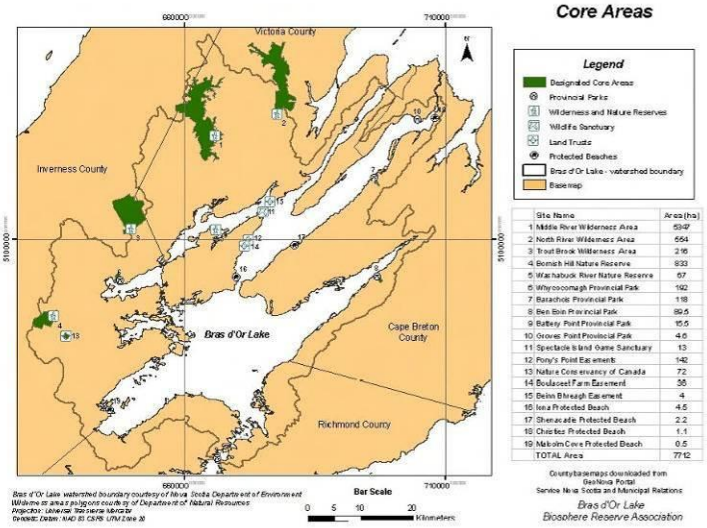
Q7. How does the BR initiative relate to other initiatives around the Lake?

The Biosphere Reserve Association will work with existing groups and organizations, toward greater stewardship of the Lake and watershed.

Q8. If the area is designated as a BR, will more wilderness areas be created?
No. The designation of a Biosphere Reserve does not create new protected areas. The focus of Biosphere Reserves is not protected areas, but rather how people can work and live and still respect their environment.

Q9. How does a UNESCO Biosphere Reserve differ from a UNESCO World Heritage Site?
A World Heritage Site "protects" the item of cultural or natural significance. Biosphere Reserves do not protect anything - they promote harmony between people and the environment. They are areas of recognition not of regulation!

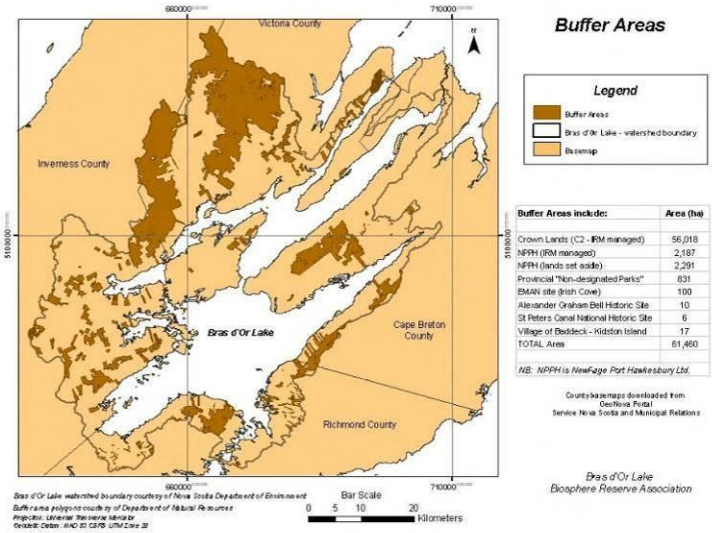
Q10. Will the United Nations have any influence on development policies in the BR?
No. The UN does not have any influence on development policies in the BR. Criteria (conservation, sustainable development, and capacity building) which are met when a BR is designated are re-evaluated after ten years for evidence of progress.



Team members have worked closely with the NS Department of Natural Resources to identify buffer areas, and with the NS Department of Environment as they defined core areas and prepared the large maps for the Document.

Core Areas (protected areas), shown in GREEN are ALREADY protected by legislation.

Buffer Areas, shown in BROWN are ALREADY managed lands, integrating land use activities and maintenance of special features.



November 18, 2009

Appendix 8 Draft Constitution and By-Laws

D R A F T

CONSTITUTION

Bras d'Or Lake Biosphere Reserve Association

ARTICLE I

1.1 **Name**

The name of the Association is:

1.1.1 Bras d'Or Lake Biosphere Reserve Association

ARTICLE II

2.1 **Purpose**

The purpose and objective of the Association is:

2.1.1 To achieve under the UNESCO "Man and the Biosphere Program" designation of the Bras d'Or Lake and its associated watershed area as a **UNESCO Biosphere Reserve.**

ARTICLE III

3.1 **Membership**

The association is member based. It actively seeks out both individuals and organizations as members to achieve shared goals.

3.1.1 Membership in the Association shall be open to individuals, not-for-profit organizations, businesses, institutions and governments interested in furthering the objective of the Association.

ARTICLE IV

4.1 **Board of Directors**

The Association shall be governed by a Board of Directors. Directors shall be elected, as defined in the by-laws of the Association, by a vote of the Members at the Annual General Meeting (AGM) of the Association.

4.1.1 **Officers of the Association**

The Officers of the Association shall include a President, a Secretary, and a Treasurer. The Officers shall be elected by the board from among the Board Membership.

4.1.2 The bylaws of the Association, as revised from time to time, shall specify further details such as minimum and maximum number of Directors, nomination and election procedures, and terms of office, filling vacancies, and quorum.

ARTICLE V

5.1 Authority and Amendment

5.1.1 The Association and all its Officers shall be governed by its Constitution, its by-laws and those policies duly approved at its meetings. The Constitution shall be the fundamental governance of the Association.

5.1.2 Changes to the constitution will be as per accepted standards for associations of this type.

ARTICLE VI

6.1 **Dissolution**

6.2 In the event of dissolution of the Association, all remaining assets after payment of all liabilities shall be distributed to one or more registered charitable or not-for-profit organizations at the discretion of the Board of Directors.

D R A F T

BY-LAWS
Bras d'Or Lake Biosphere Reserve Association

By-Law 1

Membership

i) There shall be two classes of membership, namely organizational and individual.
ii) Except for organizations mentioned in these by-laws, new organizational membership must be approved by the Board of Directors
iii) A Member is defined either as an individual member or an appointed representative of a member organization or member government.
iv) The membership year is the year beginning at the AGM.
v) Annual membership fees will be determined by the Board of Directors. Individual and Organizational membership fees may differ.

By-Law 2

Board of Directors - Composition

i) There shall be a minimum of 14 and a maximum of 20 members on the Board of Directors.
ii) Elected (14) – These members have been elected by the membership at the AGM. Terms of office may vary as determined in the by-laws.
iii) Remaining (up to 6) – These members are appointed to the board by the Board of directors

By-Law 3

Qualifications for Elected Directors

i) Each elected director shall be a member in good standing at least 30 days prior to election.
ii) Directors must be at least 18 years of age.

By-Law 4

Terms of Office

I) A director may hold office up to 3 years on the board. The schedule and term will be determined by the board. A director may opt to continue to serve beyond their term providing he/she meets the election criteria.

II) The Board may at any meeting fill vacancies on the Board on a temporary basis until the next AGM

By-Law 5

Meetings

i) Board of Directors meetings shall be generally on a monthly basis with a minimum 6 meetings per year. Time and place of each meeting to be at the discretion of the President.

ii) Quorum for a meeting shall be those directors present at a duly called meeting.

iii) Rules of order shall be governed where possible by "Roberts".

iv) Teleconference Board meetings duly requested by the President and agreed by the Board are permissible.

v) The AGM shall be held in the spring of each year at a place and time designated by the Board

vi) Notice of Meetings will be prepared by the secretary and sent to the Board a minimum of 5 days prior to the meeting. Notice for the AGM shall be a minimum of 30 days for the membership.

Appendix 9 Municipal Integrated Community Sustainability Plans

Supplementary information

ONE-PARAGRAPH SYNOPSIS – VICTORIA COUNTY ICSP

The benefit of the Municipality of the County of Victoria's ICSP lies in both the process and the final outcome. Citizens and stakeholders have collaboratively renewed and strengthened the County's vision and goals for the future. The key sustainability themes of Victoria County's ICSP are: tourism; employment opportunities; community assets; population; livability and social well-being; and environmental stewardship. The pursuit of environmental, economic and socio-cultural health are core values to residents. The ICSP serves to renew these core values and provide concrete steps from which to spring forward on Victoria County's continuing evolution.

Cape Breton Regional Municipality
Office of the Mayor - John Walter Morgan, B.Sc., M.B.A./LL.B.
Civic Centre, 320 Esplanade
Sydney, NS B1P 7B9

March 19, 2010

Ms. Teresa MacNeil, Chair
Bras d'Or Lakes Biosphere Reserve Assoc.
15531 Route 4, Johnstown
RR #1 St. Peters, NS BOE 3BO

Dear Ms. MacNeil:

Please accept this letter as a brief overview of what the Cape Breton Regional Municipality has included in it's Integrated Sustainability Plan (ICSP) for CBRM with respect to sustainable development.

A final draft of the ICSP is going to Committee on Thursday March 18th, and to a special meeting of Council on March 5t of this month. This draft ICSP includes the adoption of development guidelines recommended in the Bras d'Or Lakes Development Report. CBRM recognizes the general concern with coastal erosion and the ICSP contains policies recommending cooperation with senior levels of government with the objective of developing comprehensive erosion setback provisions to be implemented in CBRM's Land Use By-law. This aligns with the recommendation to establish a minimum elevation for new construction to minimize the prospect of future inundation and/or erosion impacts. The Guidelines also recommend the institution of development setbacks on the shores of the lakes and tributary waterways to reduce the impacts of flooding and preserve vegetation on banks that filter contaminants from run off and can provide shading that is frequently beneficial to the promotion of fish and wildlife in waterways. This is also contained within the draft ICSP, policies to reduce the impacts of flooding and preserve vegetation on banks that filter contaminants from run off and can provide shading that is frequently beneficial to the promotion of fish and wildlife in waterways.

The report contains a number of recommendations intended to reduce the risks of land development, sewage disposal, and recreational boating in the Bras D'Or Lakes. It also

fax (902) 563-5585 e-mail: jwmorgan@cbrm.ns.ca phone (902) 563-5000

contains provisions to adapt to coastal erosion, which is now being accentuated by the impacts of climate change. Global warming threatens to increase water levels substantially.

CBRM intends to undertakes maintenance generally to protect its infrastructure, from rising sea levels and associated storm surges on the Atlantic Coast and within the Bras d'Or Lakes system threaten waterfront roadways and structures if not through submersion then through erosion.

I trust this gives you a sense of where CBRM is headed with it's ICSP.

Yours truly,

Mayor John W. Morgan, B.Sc., M.B.A./LL.B.
JWM/tfd

MAP NO. 1

PROPOSED BRAS D'OR LAKE BIOSPHERE RESERVE

Land Tenure with "Core" and "Buffer" Areas

N
W E
S

Scale 1:125,000
1 centimeter equals 1.25 kilometers
1 inch equals 1.2 miles

0 5 10 km
0 5 Miles

Legend

Area of Interest

- Bras d'Or Lake Watershed Boundary

Transport and Utilities

- Trans Canada Highway
- Arterial Highway
- Trunk Highway
- Collector Highway
- Local Road
- Loose Surface Road
- Railway
- Transmission Line

Land Tenure and Proposed Core and Buffer Areas

Core Areas (Comprised of Existing Protected Areas)

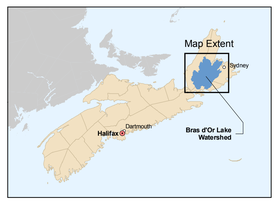
- Smaller Core Areas
- Larger Core Areas

Buffer Areas (Comprised of Crown Lands)

- Smaller Buffer Areas
- Larger Buffer Areas

Other Areas

- Smaller Indian Reserves
- Larger Indian Reserves
- Other Crown Lands



North American Datum (NAD) 1983, CSRS98. Universal Transverse Mercator, zone 20.

Map produced by Nova Scotia Environment as a courtesy for the Bras d'Or Lake Biosphere Reserve Association. April 2010. For more information contact Nova Scotia Environment, 5151 Terminal Rd., 5th Floor, PO Box 697, Halifax, NS. B3J 2T8.

www.gov.ns.ca/nse/

This product may contain information derived from the following databases:

The Restricted and Limited Use Lands database, the Crown Lands Ownership database, and the Forest Inventory database. All obtained courtesy of the NS Department of Natural Resources.

The Nova Scotia Topographic Database, and the Nova Scotia Atlas Database. All obtained courtesy of Service Nova Scotia & Municipal Relations, the Nova Scotia Geomatics Centre.

MAP NO. 2

PROPOSED BRAS D'OR LAKE BIOSPHERE RESERVE

Land Use and Forest Cover Types

N
W E
S

Scale 1:125,000
1 centimeter equals 1.25 kilometers
1 inch equals 1.2 miles

0 5 10 km
0 5 Miles

Legend

Area of Interest

- Bras d'Or Lake Watershed Boundary

Transport and Utilities

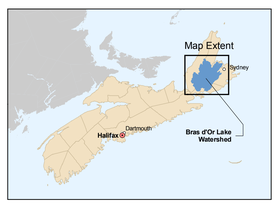
- Trans Canada Highway
- Arterial Highway
- Trunk Highway
- Collector Highway
- Local Road
- Loose Surface Road
- Railway
- Transmission Line

Forested Cover Types

- Forested Lands
- Freshwater Wetlands
- Barrens

Non-forested Cover Types

- Urban Areas
- Agricultural Areas
- Pits or Quarries
- Other Non-Forested Lands
- Coastal Habitat Areas



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This map is a geographic representation only and should not be used for legal purposes or navigation. Though effort has been made to ensure this map is error free, please note that the information shown may not be the most current available. Nova Scotia Environment does not accept responsibility for any errors or omissions contained herein.