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1.0 INTRODUCTION AND PURPOSE

This plan specifies how the natural heritage values of the Joggins Fossil Cliffs will be protected for present and future generations. In doing so it fulfills the requirements of paragraph 108 of the Operational Guidelines for the Implementation of the World Heritage Convention (2005), and supports the nomination and subsequent operation of the Joggins Fossil Cliffs as a World Heritage Site. It constitutes the commitment of the partners (the Joggins Fossil Institute, the province of Nova Scotia -Departments of Tourism Culture and Heritage and Natural Resources-, the Municipality of the County of Cumberland and the Cumberland Regional Economic Development Association) to the conservation, protection and promotion of the property. This Plan identifies the outstanding universal value of the nominated property, the legislative and policy framework for the management of the property, and the management system in place to protect, present and monitor the site. This plan builds on the province of Nova Scotia’s commitment to conservation, protection and promotion of natural heritage through the Special Places Protection Act and responsible coastal resource management through the Beaches Act and associated Regulations.

The management approach of the Joggins Fossil Institute places great importance on the scientific value of the fossil resources and bedrock exposures of the Joggins Fossil Cliffs. As a strategic document, the Joggins Fossil Cliffs Management Plan specifies the commitments and actions that will be implemented in order to protect, conserve and promote the nominated property over the long term.

2.0 STATEMENT OF OUTSTANDING UNIVERSAL VALUE

The coastal cliffs at Joggins reveal the most complete fossil record in the world of terrestrial life in the Pennsylvanian “Coal Age” of earth history. Nowhere is this record of the evolution of life on land and biodiversity in the tropical “Coal Age”—encompassing plant, invertebrate and vertebrate life—rendered more evocatively. The magnificently exposed succession of sedimentary layers preserves the fossils in situ, providing environmental context that is unrivalled in the world. The fossil record includes the two defining, iconic elements of the “Coal Age”: fossil forests of the “coal swamps” and the first reptiles, which as the earliest amniotes are the oldest known representatives of reptiles, birds and mammals. The origin of amniotes, the first vertebrates to achieve the capacity to reproduce on land, was one of the most significant events in the history of life on earth, an evolutionary milestone first recorded with certainty at Joggins. No other locality in the world has provided as much knowledge of the nature of early amniotes or more informative specimens for linking them to more primitive groups of Palaeozoic tetrapods, and to the world in which they lived. Through the power of the Bay of Fundy tides, which are unsurpassed in the world, ongoing discovery is ensured at this site of outstanding universal value.

This dramatic setting is home to what Sir Charles Lyell, founder of modern geology, described as “the finest exposure in the world” of the rocks and fossil record of the Pennsylvanian “Coal Age” of earth history. The fossil record of Joggins figured in the
first debate on evolution, and remains pivotal to understanding the terrestrial origins of vertebrate life, including our own species. This uniquely representative chapter of the earth’s history has been the subject of the research and writings of some of the world’s most influential scientists since the mid-nineteenth century. Joggins has figured in such seminal works as Principles of Geology by Lyell and The Origin of Species by Charles Darwin, and has come to be known as a “Coal Age Galapagos.”

3.0 CRITERION FOR INSCRIPTION ON THE WORLD HERITAGE LIST

The coastal cliffs of Joggins are nominated for inscription to the World Heritage List under “criterion viii” of the Operational Guidelines for World Heritage (2005), which states that sites:

“be outstanding examples representing major stages of Earth’s history, including record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features.”

The nominated property is the most outstanding example of the tropical terrestrial ecosystems of the Pennsylvanian period in earth history. The fossil record, preserved in situ at Joggins, provides environmental context unrivalled in the world. The presence of the first reptiles marks a major evolutionary event in earth’s history, recording a significant advance in the adaptation of invertebrates to life on land. Other events in the history of life are recorded in the fossil record of Joggins, including the first appearance of land snails (the genus Dendropupa), which persist today, and the last appearance of the huge bivalve clam Archanodon, which may prove to be the missing link to the extant unionids. Nowhere is this record of biodiversity and evolutionary innovation of life on land – encompassing plant, invertebrate and vertebrate life – rendered more evocatively, as exemplified by fossils of the world’s earliest known reptile Hylonomus lyelli, entombed within once hollow trees.

The fossils of Joggins are set apart from those of other Carboniferous sites because they are preserved in situ, rather than having been transported and subsequently deposited. Consequently the ecological context of the Joggins fossil organisms is also preserved allowing for a much fuller understanding of the palaeoecology of the “Coal Age.” An example of the value of this ecological context is demonstrated by recent research at Joggins that has revealed a history of climate change during the “Coal Age” that produced periodic dryland ecosystems that contrast with the more typical tropical wetland environments.

The fossils at Joggins display a high quality of preservation, and the site has been important historically in the evolution of the science of palaeontology. Ongoing discovery and research at this dramatic natural site, continually eroded by the world’s highest tides, ensure that this history will continue.

In addition to its role in fulfilling the above criterion as an outstanding example of earth history, Joggins is one of only a few natural sites in the world that also meets
virtually all international criteria for fossil sites.

4.0 MANAGEMENT FRAMEWORK FOR THE NOMINATED PROPERTY

4.1 Description and Status of the Nominated Property

The nominated property consists of a 14.7 kilometre section of sea cliffs on the eastern shore of Chignecto Bay, a northern arm of the Bay of Fundy in northern mainland Nova Scotia. The site extends north and south of the village of Joggins, from Downing Head, the eastern headland at the mouth of Downey Cove (45° 45' 07” North Latitude 64° 25' 05” West Longitude), south to Ragged Reef Point (45° 40' 24” North Latitude, 64° 23' 09” West Longitude) (Figure 1). The landward boundary is defined as the top of the cliff face or bank. The seaward boundary is 500 metres from the landward boundary.

The nominated property includes the entire coastal exposure of the coal-bearing Joggins formation (the “Classic Section”), and the overlying Springhill Mines formation. The site also includes a portion of the overlying Ragged Reef formation in the south, and the underlying Little River and Boss Point formations of the Cumberland Group, and Claremont and Shepody formations of the Mabou Group in the north. These strata serve as geological buffer zones on either side of the “Classic Section”. The geological buffer is greater for the older, underlying rocks in the north, as discoveries in these strata have the potential to become the oldest known examples of certain fossil taxa (Figure 2).

The geological contact at the base of the Boss Point Formation represents the base of the Pennsylvanian Period in the section, and the Boss Point-Claremont contact coincides with the globally significant Mississippian-Pennsylvanian (“Miss-Penn”) unconformity (45° 42’ 35” North Latitude 64° 26’ 09” West Longitude).

The “Classic Section” at Joggins has been protected since 1972 through provincial legislation. In 2007, the boundaries of the nominated property will designated as a “protected site” through the Special Places Protection Act in recognition of the global scientific importance of the larger area. The property boundary includes geological formations that are considered to contain the features of current interest to the scientific community. The boundary also provides sufficient opportunities to develop infrastructure in support of public education and visitor use of the site. These boundaries have been described in such a way as to allow for variable erosion over the length of the site.

A significant portion (the Lower Cove Beach - including the “Classic Section”) of the site has also been declared a “Protected Beach” pursuant to Nova Scotia’s Beaches Act. Under this Act, the beaches of Nova Scotia are dedicated in perpetuity for the benefit, education and enjoyment of present and future generations of Nova Scotians (Figure 3). This legislation provides for the strong protection and regulation of the full range of land use activities on designated beaches.
Figure 1
Figure 2
Figure 3

Boundary of Nominated Property

Joggins Fossil Cliffs Management Plan
January 2007
4.2 The Effect of Coastal Erosion on the Site and its Boundaries

As with any coastal site, the effects of erosion have a considerable impact on the cliffs. As this natural impact cannot be reasonably mitigated, boundaries have been described to maintain their integrity over time. The Joggins Fossil Cliffs are affected twice daily by the tides of the Bay of Fundy, which are the largest in the world. Not only do these tides have an impact on coastal erosion, they also reveal a large subtidal area twice daily during ebb (low) tide. This foreshore area includes a series of resistant bedrock “reefs” that offer a third dimension to the view of the strata revealed in cross-section in the cliffs. These reefs are also rich in fossils and offer special opportunities for visitors and researchers (Figure 4).

It is in recognition of the dynamic nature of coastal erosion, that the boundary has been described according to the physical features of the cliff and bank rather than absolute surveyed boundaries. As the cliffs erode the site boundary is congruent with the new exposure. The boundary is defined by topographic features visible in the landscape and therefore ensures that they are clearly identifiable on the ground and ultimately useful for site management.

A preliminary analysis of coastal erosion based on interpretation of historic air photos at Joggins was conducted in 2006. This analysis revealed that most of the area is subject to minimal to moderate rates of erosion, ranging from nil to 25
cm/year. The erosion trends suggest that there will be little effect on buildings, infrastructure or roads over the next century. The exceptions are the road near Lower Cove Beach, and Hardscrabble Road north of Hardscrabble Point (Figure 5).

4.3 Adjacent Land Use and Buffer Zone

Paragraph 104 of the *Operational Guidelines for the Implementation of the World Heritage Convention* makes provision for the identification of a buffer zone to protect World Heritage Sites from threats beyond their boundaries. In the case of the Joggins Fossil Cliffs, the integrity of the fossil heritage is naturally protected by the cliff, whose sheer face prevents development, and which is continually renewed by erosion. Nonetheless, four legislative controls including:

a) the *Municipality of the County of Cumberland Secondary Planning Strategy* and *Land Use Bylaw for the Joggins Planning Area* (2006), through the *Municipal Government Act* (1998),
b) the *Beaches Act* and associated *Regulations* (1989),
c) the *Mineral Resources Act* (1990), and
d) the *Special Places Protection Act* (1989),
support the conservation of lands adjacent to the property and establishes a buffer to the nominated property. These legislative controls ensure the integrity of the nominated property for future generations (Figure 6, 7 and 8).
Figure 6
Figure 7
The Municipality of the County of Cumberland Secondary Planning Strategy and Land Use Bylaw for the Joggins Planning Area contains planning policies and land use regulations that provide stringent protection to the lands adjacent to the nominated property, as contemplated by the Operational Guidelines. Within the Planning Strategy and Land Use Bylaw there are two specific policies developed to protect lands immediately adjacent to the nominated property. These two policies include strict protection within 20 metres of the landward property boundary and encompass an area of 29.4 hectares (14,700 metres X 20 metres = 29.4 hectares). The two specific policies —“Cliffs and Shoreline Setbacks” and “Prohibited Uses and Structures”—support the stewardship of the natural heritage values, and protect the features and setting of the Joggins Fossil Cliffs. These two policies provide legal protection for the land adjacent to the landward side of the nominated property. These stringent policies assist in the conservation of the nominated property and will protect the property for future generations.

The policy pertaining to “Cliffs and Shoreline Setbacks” includes development restrictions in areas within 20 metres of the cliffs and shoreline to ensure that there will be no development and that environmental effects from the human activities or land uses will not interfere with the natural erosion processes which regularly expose fossils at the cliffs or adversely affect the setting or views of the Joggins Fossil Cliffs or the aesthetic qualities of the views and natural vistas along the shorelines.

The policy of “Prohibited Uses and Structures” includes land use bylaws for areas within 20 metres of the cliffs and shoreline that prohibit grading or alteration in elevation or contour of the land, the excavation and deposition of fill, defacing the cliffs, constructing permanent or temporary structures and outdoor storage of scrap or salvage material.

The definition of the boundary of this 20-metre buffer is contingent on the definition of the landward property boundary (the cliff), and as the cliffs erode the protection within the buffer migrates landward as well. Currently, at present rates of erosion, this 20-metre area equates to approximately 100 years of protection. Furthermore, the protection afforded to the property by these municipal policies extends in perpetuity as the cliffs and associated buffer move landward through erosion.

For the most scientifically important part of the nominated property, the beach and cliffs are protected 100 feet (30.48 metres) landward from the mean high-water mark. Within this buffer zone land use activities are restricted through the application of the Beaches Act and associated Regulations. The added protective measures governed under the Beaches Act and associated Regulations specifically apply to the “Classic Section” of the nominated property where the most important fossil discoveries and research have taken place and where visitation is highest.

In addition to the buffer zone, complementary planning and regulatory controls are in place, further contributing to conservation of the nominated property. The entire length of the property and adjacent lands are “closed” for mineral exploration through the application of the Mineral Resources Act. “Closures” under the Mineral Resources Act...
Resources Act are created when land is withdrawn by the Minister of the provincial Department of Natural Resources from general application of the Act under Section 22. Therefore, the principles regarding acquisition of a mineral exploration licence do not apply to withdrawn (“closed”) areas. The Municipality of the County of Cumberland Secondary Planning Strategy and Land Use Bylaw for the Joggins Planning Area come into effect from as far away as seven kilometres. For the entire Planning Area, land use zoning has been established and policies pertaining to protection of views, outdoor lighting, health and safety, and traffic management are in place. Additionally, the Special Places Protection Act provides for the protection and conservation of heritage objects (fossils) for the entire province of Nova Scotia (Figures 9 and 10).

5.0 MANAGEMENT GOALS AND PRINCIPLES FOR THE NOMINATED PROPERTY

5.1 Management Goals

The management and operation of the nominated property will be guided by the following goals:

Goal 1: to provide for the protection, study and safe enjoyment of the Joggins Fossil Cliffs by:
- ensuring that human activities do not compromise the natural integrity of the Joggins Fossil Cliffs;
- ensuring that scientific research remains a focal point for property management;
- ensuring that visitors to the fossil cliffs are aware of, and protected to the extent possible, from hazards associated with cliffs, tides and other natural hazards.
characteristics of the site;

d) developing site brochures and signage featuring scientific, stewardship and public safety information; and,
e) developing and implementing an Emergency Response Plan.

**Goal 2: to promote wide recognition, understanding and appreciation of the scientific, educational and cultural values represented by the Joggins Fossil Cliffs by:**

a) implementing a fossil collecting policy that focuses on the inherent scientific value of all fossils;
b) developing and implementing a fossil collecting and cataloguing process that maximizes the scientific potential of each fossil;
c) ensuring that fossil collectors are an acknowledged part of the long-term research goals of the fossil site;
d) ensuring that World Heritage Site status, if granted, will be recognized responsibly in all aspects of publicity in relation to the Joggins Fossil Cliffs in accordance with UNESCO guidelines.

**Goal 3: To instil a strong sense of community pride and stewardship in the Joggins Fossil Cliffs by:**

a) supporting land use zoning to protect community interests over the long-term;
b) providing for community input and encouraging community participation;
c) supporting entrepreneurial development in the Joggins-River Hebert area;
d) employing a governance model to ensure that developments associated with the Joggins Fossil Cliffs respect the local culture, history, traditions and way of life.

**Goal 4: to establish a world-class sustainable tourism destination that contributes to local, regional and provincial economies by:**

a) developing and operating a facility and supporting infrastructure for visitor services, interpretation and education;
b) promoting visitation through regional, national and international media.

**Goal 5: To ensure community involvement in the interpretation and promotion of the Joggins Fossil Cliffs and provide a range of interpretive opportunities for visitors by:**

a) supporting the training and involvement of local and regional students in the interpretation and study of the Joggins Fossil Cliffs;
b) ensuring the local schools are provided sufficient information and opportunities to incorporate the Joggins Fossil Cliffs into their curriculum;
c) providing knowledgeable beach interpreters during peak visitation periods;
d) providing group tours during peak periods and through special arrangement at other times;
e) incorporating cultural and industrial history components into interpretive and tourism planning for the region;
f) preparing an interpretation plan for the development and dissemination of information on the property and its fossils;
g) developing and posting interpretive material to inform visitors of the nature and extent of tides on the Fundy shore;
h) designing, developing and placing a series of interpretive panels offering key
5.2 Management Principles

The following principles will be applied to the management and operation of the nominated property. They will also be used, where appropriate, to support compatible planning and development in the surrounding community.

**Principle 1: Management of the property will meet or exceed World Heritage standards regardless of inscription.** The Joggins Fossil Cliffs Management Plan acknowledges that there is an adjudication interval following submission of the nomination. Regardless of inscription or its timing, the management of the property will meet the *Operational Guidelines for the Implementation of the World Heritage Convention* (2005).

**Principle 2: The primary focus of Joggins Fossil Cliffs Management Plan is to address issues directly related to management and conservation of the fossil heritage at the Joggins Fossil Cliffs.** The plan addresses those issues that flow from the Joggins Fossil Institute objectives. In relation to possible threats, the Management Plan concentrates on the conservation of values for which the property is designated as a “Protected Site” through provincial legislation and for which it may be inscribed for World Heritage Site status.

**Principle 3: The Joggins Fossil Cliffs Management Plan fully recognizes that the nominated property is set within a well-visited coastal area where people continue to live and work.** Unlike other natural sites with more fragile ecosystems, the cliffs and beach enjoy a strong natural defence from human habitation. People have lived immediately adjacent to the cliffs for several generations with little ecological impact or exploitation of the fossil resource. Nonetheless, inscription on the World Heritage List would have an impact on the community, so property management must respect local stakeholders.

**Principle 4: Management in relation to World Heritage guidelines will be locally driven and will include the participation and support of government agencies with regulatory responsibilities for the property.** World Heritage designation would augment the property’s profile and strengthen its long-term viability; existing legislative protections will continue regardless of inscription. The plan recognizes that regulatory control must include stakeholders including local managers, visitors and local citizens.
Principle 5: Management will be delivered through existing mechanisms, supplemented by new processes and procedures developed to accommodate a designated World Heritage site. The Joggins Fossil Cliffs Management Plan requires regular review by the Joggins Fossil Institute Board of Directors, as experience and other factors may influence the future direction of site management. Once implemented, the Management Plan review will be on a three-year cycle. Furthermore, components of the Management Plan will be reviewed and approved by the Nova Scotia Department of Tourism Culture and Heritage and Department of Natural Resources.
6.0 MANAGEMENT POLICIES, STRATEGIES AND ACTIONS FOR THE NOMINATED PROPERTY

6.1 Conservation and Protection

The priority of this management plan is to ensure the conservation and protection of the nominated property’s features of outstanding universal value. These include the geological section of sedimentary rocks, the adjacent beach, and the fossils – both in the bedrock and loose fossils on the beach.

This nominated property is currently protected by three Acts of the province of Nova Scotia: the Special Places Protection Act, the Beaches Act and the Mineral Resources Act. Under the Special Places Protection Act the nominated property is legally designated as a “Protected Site.” Moreover, a significant portion of the property, including the “Classic Section” (the Joggins Formation proper), is legally designated a “Protected Beach” under the Beaches Act. The property is also under a mineral exploration closure, in effect through the Mineral Resources Act. A new Municipal land use planning strategy developed expressly to reinforce the integrity of the property complements these provincially legislated protections.

The Special Places Protection Act (1989)

In 1970, the Government of Nova Scotia passed legislation, the Historical Objects Protection Act, to protect the province’s significant fossil resources. The Historical Objects Protection Act was superseded by the Special Places Protection Act which now provides for the preservation, regulation and study of archaeological and historical remains as well as palaeontological and ecological sites. The Special Places Protection Act is administered by the Minister of the Nova Scotia Department of Tourism, Culture and Heritage. As stated, the purpose of this Act that applies to the nomination of this property as a fossil site is:

- to provide for the preservation, protection, regulation, exploration, excavation, acquisition and study of archaeological and historical remains and palaeontological sites which are considered important parts of the natural or human heritage of the Province;
- to promote understanding and appreciation among the people of the Province of the scientific, educational and cultural values represented by the establishment of special places.

The protection under the Special Places Protection Act confers special conservation status to “heritage objects” which are defined as “an archaeological, historical or palaeontological object or remain....” Under the Special Places Protection Act, carrying out exploration or making excavations on any land (including land covered with water) for the purpose of seeking palaeontological objects requires a Heritage Research Permit. In 1972, the “Classic Section” of the Joggins Fossil Cliffs property was the first site in Nova Scotia that received “Protected Site” designation in recognition of its outstanding scientific significance. In July 2007, the province of Nova Scotia will have expanded the “Protected Site” boundaries to be consistent with the nominated property boundaries in recognition of the global scientific importance of the larger area.
The Beaches Act and Regulations (1989)

The Beaches Act is a provincial statute that preserves and protects the beaches of Nova Scotia. Under this Act, all beaches in Nova Scotia are dedicated in perpetuity for the benefit, education and enjoyment of present and future generations. The Beaches Act and associated Regulations are administered through the Minister of the Nova Scotia Department of Natural Resources. As stated, the purpose of this Act is:

a) to provide for the protection of beaches and associated dune systems as significant and sensitive environmental and recreational resources;
b) to provide for the regulation and enforcement of the full range of land-use activities on beaches, including aggregate removal, so as to leave them unimpaired for the benefit and enjoyment of future generations;
c) to control recreational and other uses of beaches that may cause undesirable impacts on beach and associated dune systems.

In this Act, a “beach” is defined as that area of land on the coastline lying to the seaward of the mean high-water mark and that area of land to landward immediately adjacent thereto to the distance determined by the Governor-in-Council. The Beaches Regulations, made under Section 13 of the Beaches Act, govern the preservation, control and management of protected beaches. These Regulations restrict human activities including, most importantly, the removal of fossils and beach aggregate.

The entire length of the nominated property is legally designated as a “Protected Beach” from the mean high-water mark seaward. In addition to this legal designation, in 1975, the province of Nova Scotia provided further protection of the Lower Cove Beach (extending 8.5 kilometres of the 14.7-kilometre length of the property) through a protected area landward of the mean high-water mark.

The Lower Cove Beach runs from the old Government Wharf at Joggins (approximate location 45° 41’ 40” N, 64° 27’ 5” W) to Downing Head (approximate location 45° 44’ 50” N, 64° 22’ 26” W), including the area 100 feet (30.48 metres) landward and perpendicular to the mean high-water mark. Under the Beaches Act, the designation of areas landward of the mean high-water mark further supports the conservation and integrity of the property as the protection includes areas adjacent to the property and may be considered as a buffer.


In accordance with the Municipal Government Act of the province of Nova Scotia, the Municipality of the County of Cumberland has developed a Secondary Municipal Planning Strategy and a Land Use Bylaw for the Joggins Planning Area. The Municipal Government Act permits a municipality to establish planning advisory committees to undertake research and public consultation and provide advice to a municipal council with respect to the adoption of planning policies and bylaws. In developing the strategy and bylaw for the Joggins area, The Joggins Area Planning
Advisory Committee was formed and included members of the public, elected officials and Municipal staff. Committee meetings were publicized and were open to the general public. Additional public consultation events provided a forum for members of the community to express their ideas and concerns for the future, and to comment on the committee’s proposed planning documents. Once the committee made its final recommendation to County Council, a public hearing was advertised and held as part of a regular Council meeting. The final planning documents were approved by the Province in August 2006.

The Strategy addresses planning for future development of the communities of Joggins and Lower Cove and supports the protection of the nominated property through land use policies. The importance of the Joggins Fossil Cliffs is reflected in this Planning Strategy and Land Use Bylaw. The overriding goal was:

…to support healthy and sustainable community development by ensuring that future growth and development throughout the Joggins Area will support the goals and priorities of local community members and maximize the benefits and minimize any adverse effects of the development of the Joggins Fossil Cliffs on the community and by ensuring that future land uses and forms of development in the vicinity of the Joggins Fossil Cliffs will protect and enhance their fossil resources and valuable features and be appropriate and compatible with the nominated UNESCO World Heritage Site and Centre.

The Mineral Resources Act (1990)

Under the authority of the Mineral Resources Act of the province of Nova Scotia, “closures” are created when land is withdrawn by the Minister of the Department of Natural Resources from general application of the Act under Section 22. Therefore, the principles regarding acquisition of a mineral exploration licence do not apply to areas withdrawn (“closed”). This same provision is accorded to areas that are designated “protected” under the Special Places Protection Act. The issuance of a mineral exploration licence in such areas would require approval of the Minister and the Governor-in-Council (Cabinet of the provincial government).

In 2006, all lands of the nominated property, the buffer zone, and some adjacent lands were placed under closure by the Registrar of Mineral and Petroleum Rights, Nova Scotia Department of Natural Resources.

6.1.1 Means of Implementing Protective Measures

Management and conservation of the nominated property is exercised locally through the Joggins Fossil Institute (JFI). The Joggins Fossil Institute is a registered not-for-profit society under the Societies Act of Nova Scotia. The objectives of the Joggins Fossil Institute are to:

a) manage the Joggins Fossil Cliffs property and Joggins Fossil Centre, a place where global heritage values are protected, respected, understood and presented, so that the story of these values and other cultural and natural values can be told to the world, and to future generations;
b) hold and manage, for the benefit and education of humanity, a palaeontological collection representative of the Carboniferous Period alongside its native geographic property;

c) ensure that the property and collection are conserved, safely studied and exhibited and to provide for the advancement of scientific research;

d) acquire by way of grant, gift, purchase, bequest, device or otherwise real and personal property to use and apply such property to the realization of the objects of the Joggins Fossil Institute;

e) buy, own, hold, lease, mortgage, sell and convey such real and personal property as may be necessary or desirable in the carrying out of the objects of the Joggins Fossil Institute; and

f) do all such other things as may be provided by the Societies Act (1989).

The Joggins Fossil Institute has the principal role in setting policy and coordinating management for the nominated property. Management of the property is conducted through agreements between provincial and municipal government departments and the Joggins Fossil Institute. The government agencies that are working with the Institute are the:

i) Nova Scotia Department of Tourism, Culture and Heritage (DTCH);

ii) Nova Scotia Department of Natural Resources (DNR);

iii) Municipality of the County of Cumberland (MCC); and

iv) Cumberland Regional Economic Development Association (CREDA).

### Nova Scotia Department of Tourism, Culture and Heritage

The Nova Scotia Department of Tourism, Culture and Heritage will work collaboratively with the Joggins Fossil Institute to carry out appropriate functions, including, but not limited to:

a) housing a working scientific collection of fossils and palaeontological material;

b) issuing “collecting permits,” as defined by regulation under the Special Places Protection Act, to both scientific/excavation and stewardship/avocational collectors;

c) screening and releasing appropriate specimens for public consumption; and

d) making such policies and implementing such practises to properly conserve the nominated property’s natural resources and manage the public entering the property.

### Nova Scotia Department of Natural Resources

An agreement with the Department of Natural Resources has been reached in order to permit the Joggins Fossil Institute to proceed with the conservation and management of the nominated property.

The Minister of DNR, pursuant to Section 4, Subsections (3) and (4) of the
Beaches Act, has entered into an agreement whereby the Joggins Fossil Institute will have authority to administer, manage and control the beach at the nominated property. Under this agreement, the Joggins Fossil Institute is authorized to:

- provide safety and interpretive services,
- conduct studies and carry out research, and
- promote educational programs that emphasize the importance of conserving beaches and using the beach for recreational purposes in a manner to maintain their environmental integrity.

Municipality of the County of Cumberland

The Municipality of the County of Cumberland owns the land and building for the new Joggins Fossil Centre that is under construction adjacent to the nominated property. The Municipality has delegated control of the Centre and associated lands to the Joggins Fossil Institute. The Municipality will also monitor all development in the Joggins Planning Area (which includes the nominated property and adjoining communities) to ensure compliance with the Secondary Municipal Planning Strategy and the Land Use Bylaw for the Joggins Planning Area.

Development Control and Building Inspection Officers will reject any noncompliant development proposals and will ensure all developments have complied with the permitting and approval process required by the bylaw. The bylaw can be enforced by prosecution and court orders if necessary.

Cumberland Regional Economic Development Association

The Cumberland Regional Economic Development Association provided all administrative and staffing support to the Joggins Fossil Cliffs Advisory Board from 1990 - 2006. As the Joggins Fossil Institute is a new entity (established in 2006 from the Joggins Fossil Cliffs Advisory Board), CREDA will continue to act in a supportive capacity until 2010 at which time the agreement between CREDA and the JFI will be re-evaluated. Although the Joggins Fossil Institute is incorporated as a separate legal entity from CREDA, it will initially operate as a sub-committee of CREDA and in addition to its own bylaws, also comply with the policies and bylaws of CREDA. The Cumberland Regional Economic Development Association shall ensure that, as it relates to the Joggins Fossil Cliffs project, liability insurance shall be extended to the JFI and its directors.

6.1.2 Joggins Fossil Institute policies related to the conservation and management of the paleontological heritage at the Joggins Fossil Cliffs

The following policies and strategies are intended to achieve this purpose.

Fossil Collecting

The fossil heritage at Joggins requires active management to ensure that important specimens are not lost and that fossils are accessible at any given
time for study by scientists and for viewing by visitors. Ongoing steady erosion of the cliffs will continue to reveal new fossil specimens, and some of these will have significant interest to science. Visitors to the site should have an opportunity to view these fossils, gain an understanding of their significance, and contribute to the long term study of the site.

The fossil collecting policy for the nominated property is governed by the provisions of the Special Places Protection Act and the Beaches Act and associated Regulations. This legislation regulates all fossil collecting in the province, reflecting the richness and scientific value of the resource. Collecting is authorised by permit only, and bedrock excavation is restricted to scientists who are conducting approved research.

Fossil collecting has been an important part of the visitor experience at Joggins. Many significant specimens have been discovered by fossil enthusiasts as well as scientists. The existing local and independently operated fossil centre displays an excellent collection gathered over the years by local residents. Cooperation between collectors and scientists has been beneficial to both parties, and this points the way to future management of fossil collecting at the site.

Ongoing scientific research has been undertaken through the Heritage Research Permit system as administered through the Special Places Protection Act of the provincial government. Only qualified scientists with a defined research plan are eligible to receive permits that allow excavation from bedrock. Specimens and reports are submitted to the Joggins Fossil Institute and Provincial repository as part of the permit requirements. This reporting practice will continue for the foreseeable future.

The planned development of the Joggins Fossil Cliffs Centre, scheduled for completion in the summer of 2007, will provide an on-site management presence that will assist in coordinating, monitoring and enforcing the fossil collecting policy. The pressure of an anticipated increase in visitation to the site and support for the research agenda means that an effective and manageable policy must be put in place to ensure the protection of World Heritage Values.

The fossil collecting policy for the site has been established. This policy respects the limits of the Special Places Protection Act and the Beaches Act and associated Regulations while continuing to encourage public participation in the larger research goals of the nominated property.

The policy sets out the following limits on fossil collecting at the site:

1. Only persons with approved Heritage Research Permits may remove fossils from the bedrock, and then only with permission of the landowner. Excavation and removal is permitted for explicit scientific, educational or awareness building purposes. These permits are issued under the authority
of the Minister of Tourism, Culture & Heritage through the Joggins Fossil Institute, to qualified, accredited experts only.

2. Heritage Stewardship Permits will be issued to qualified individuals working in association with accredited experts. These permits will permit the removal of loose fossils from the beach for explicit scientific, educational or awareness building purposes.

3. All fossils belong to the Province of Nova Scotia with the exception of those which have been screened and released by the Nova Scotia Museum or Joggins Fossil Institute.

4. Information regarding fossils collected from the bedrock or the beach will be documented according to provincial and site guidelines.

5. Visitors to the site may not break open rocks while looking for fossils, whether by hammer, chisel or any other means, except for those granted such permission through the specific provisions of a Heritage Research Permit or Stewardship Permit.

6. Information on this collecting policy will be freely available to visitors to the Joggins Fossil Cliffs.

6.1.3 Curation, study and display of fossils

Under the Special Places Protection Act, collected specimens remain the property of the province of Nova Scotia. Type specimens (those used as the basis for naming a new species or higher taxon) normally are accessed at the Nova Scotia Museum, in keeping with its Collections Management Policy, but may be provided on permanent loan to the Joggins Fossil Institute for reference, study, and educational purposes.

Excavations of the nominated property are carried out rarely, and exclusively under the aegis of provincial legislation, employing the Heritage Research Permit system administered through the Heritage Division of the Nova Scotia Department of Tourism, Culture and Heritage. Collected specimens will be recorded relative to their stratigraphic horizon in the standard reference section and geographic location along the section to preserve important information pertaining to their paleoecological context and relative age. Fossil specimens will be curated, catalogued and displayed in Joggins at the Joggins Fossil Centre and in Halifax at the Nova Scotia Museum of Natural History, to international museum standards.

Exhibition of fossils at the Joggins Fossil Centre, immediately adjacent to the nominated property, is important as the Centre will be an active research facility and the main starting point for visitor excursions to the Joggins Fossil Cliffs. This facility is staffed full time and provides facilities for interpretation, collections management and visiting scientists. This Centre will be complemented by curatorial and preparation facilities of the Nova Scotia Museum, Halifax and Fundy Geological Museum, Parrsboro, Nova Scotia.
6.2 Development within the Nominated Site

The cliff face at Joggins is subject to continuing erosion. Consequently, there is little development, and limited development potential, of the property. The shoreline itself is not suited to development because of the extreme tides and active surf. Much of the land adjacent to the top of the cliffs is too unstable to support normal infrastructure development. Most nearby residents have built their homes and other structures well back from the cliff edge in recognition of the dangers posed by natural erosion.

There are a few instances of built property within or near the nominated property either on the cliff face or foreshore or on Crown lands atop the cliff. Most of these developments are remnants of 19th century coal mining or stone quarrying. They include:

i) remnant pilings from the wharf on the shore that served as a loading facility for the Joggins (Main) coal mine since the mid-19th century. The landward approach to the wharf follows an excavated area of the cliff top known as the ‘dugway’ which facilitated transport of coal cars to and from the wharf (Figure 11).

ii) pit props from abandoned coal mines have been exposed by erosion on the cliffs at three localities; the Fundy, Forty and Joggins Seams (Figure 12).

iii) remnants of an old quarry at Lower Cove, known as the “Grindstone Quarry” comprise pilings of a wharf, abandoned grindstones on the foreshore, foundations of the mill-house at the edge of the shore and small quarries landward of the shore (Figure 13).

iv) at MacCarron’s River, remnant bridge footings or concrete abutments at the site of a former bridge and concrete boat ramp is present at the foot of the road leading to the beach (figure 14).

v) The road at Lower Cove near Little River is protected by a breakwater comprised of boulders. The breakwater includes a ramp to provide access to the shore (Figure 15).

vii) A stairway has been constructed at the mouth of Coal Mine Brook (Bell’s Brook) to facilitate access to the shore. The lower component has been re-built several times due to damage caused by high tides and winter ice (Figure 16).

A new access point is proposed to be located in the vicinity of the existing dug-way. This structure will facilitate secure, regulated access to the beach along the cliffs.

Once the Joggins Fossil Centre has been completed, further development is unlikely to take place. Any development that may be proposed will be in keeping with, and in support of, the principles outlined in this management plan.
**Quarrying and Gravel Extraction**

A Grindstone Quarry had operated historically in the Boss Point Formation between Lower Cove and Boss Point. The Grindstone quarry has been abandoned for many decades, and there is has not been any interest recently in re-activating them.

There is some potential for these strata to be quarried for ornamental or building stone. The province’s environmental assessment process (*Environment Act*) would preclude any operation that was connected to the sea coast. An inland quarry could access the same strata without interfering with the site operations or jeopardising the site’s World Heritage values. The beach at Joggins, due to the high energy of the shoreline, has coarse and poorly sorted aggregate of little interest to commercial ventures.

**Potential Contamination from Oil or Chemical Spills**

The Joggins coast is distant from most potential sources of large-scale oil and chemical pollution. It is located near the head of the Bay of Fundy, well-removed from the sea lanes to ports at Saint John (New Brunswick), Digby, Parrsboro and Hantsport (Nova Scotia). This suggests that it is unlikely that any sort of spill will threaten the shore. This threat is further mitigated by its position near the mouth of Chignecto Bay and the Petitcodiac River, as flow from these bodies would work against any pollution carried by the tide.

**Port Activity**

This part of the rugged Fundy coast does not have many large commercial harbours or ports. The power of the tides makes it difficult and expensive to maintain wharf facilities. The government wharf and breakwater that serviced the Joggins Coal mines has all but disappeared since the mines closed in the early 1960’s. No trace remains of the shipping facilities at the long-abandoned Lower Cove grindstone quarry.

The only nearby wharf is just south of the nominated site at Two Rivers. This is a small wharf that is used to support local fisheries. Currently there are just two small fishing boats that dock at the Two Rivers Wharf.

**Off-Highway Vehicles**

The beach at Joggins is rarely used by off highway vehicles. On occasion, fishermen use their vehicles to access the water’s edge to retrieve fishing gear. Use of recreational vehicles could have an impact upon the fossil resource by allowing quick entry and removal of fossils by unlicensed collectors. Vehicles may also annoy and endanger site visitors.

Off highway vehicles may be useful for management purposes, especially during emergencies or when large specimens are being collected from the beach under permit. The only reasonable access points are at Lower Cove and MacCarron’s
River.

The *Beaches Act* and associated *Regulations* (and recent amendments to the province’s *Off Highway Vehicles Act*) prohibit the use of off highway vehicles on beaches. Through an agreement with the Nova Scotia Department of Natural Resources, the Joggins Fossil Institute staff is permitted to use of off-highway vehicles for management purposes (collecting large fossils and for emergency response).

### 6.3 Science and Research

The role of Joggins in the early development of the sciences of geology and palaeontology has been a significant one. The work of Sir Charles Lyell, Sir William Logan and Sir William Dawson has been of major influence in Canada and around the world.

As a site that constantly generates fresh exposures, opportunities for new discoveries are abundant. Scientific research on the site has been ongoing since the early 19th century. Designation of the Protected Site, development of visitor infrastructure and potential inscription as a World Heritage Site can only increase the pace of research.

Establishing an on-site management and research presence will facilitate new field research by providing a work space for students and visiting researchers. The presence of a geoscientist on staff and on site will allow implementation of a collecting policy that encourages new research and discovery by professional scientists and associated “stewards”.

The science and research agenda will focus on the following priorities:

- encouraging the funding of new research;
- continuing the development of a database of Joggins fossils held in worldwide collections;
- developing a research strategy to guide long-term research at the site;
- establishing authority to issue and manage the collection permit system on-site to ensure that it provides efficient support for the on-going research priorities of the site;
- ensuring that all holders of collection permits record basic information (location, date, collector, preliminary identification, etc.) for each fossil at the time of collection (Figure 17);
- maintaining and disseminating a bibliography and research register of scientific work that has been done on the site.

Future research possibilities and priorities are best identified by researchers working in concert with site managers. Site staff will participate in additional meetings, symposia, etc. where feasible in order to promote and support an active and vibrant research effort.
6.4 Presentation and Interpretation of the Nominated Property

6.4.1 Main Interpretive Themes

The interpretive Master Concept for the Joggins Fossil Cliffs focuses on the “Power of the Cliffs” as representative of the power of nature, life, time and knowledge. This Master Concept serves as the inspiration for the development of site interpretation and the overall visitor experience.

The main themes and their relative importance include:
- **The “Coal Age” Ecosystem at Joggins**: This theme will comprise approximately 50% of the interpretive material. It includes coverage of the biodiversity and ecology of the Carboniferous Period at Joggins, special reference to the “Hollow Tree Fauna”, and modules on how fossils are formed and how to look for fossils in the cliffs and rocks (Figure 19).
- **Science and Big Ideas**: This section will include 20% of the material, and will
deal with the seminal role the Joggins site had in the development of key geological and evolutionary ideas and debates. It will feature discussion of the work of 19th century geologists Sir Charles Lyell, and Sir William Dawson, as well as the role of Joggins in the great debate over evolution and creationism (Figure 20).

- **The Times**: This will include 10% of the interpretation and will address issues related to geological time and the changing world (Figure 21).

![Figure 19](image1)

![Figure 20](image2)
The remainder of the interpretation will focus on the themes including; the Bay of Fundy Natural Ecosystem, Site Stewardship and Safety, heritage values, cultural history, and associated tourism information.

6.4.2 Visitor Centre

A visitor centre is currently under development within the nominated site. This facility will provide visitors with an exceptional learning experience that is consistent with UNESCO goals. The centre will feature information and fossil specimens that demonstrate the rich geological history of the site, the history of scientific discovery at Joggins, and the history of coal mining that shaped the local community (Figures 22 and 23).
The new Joggins Fossil Centre will be located in the community of Joggins, overlooking the cliffs and Bay of Fundy just south of Coal Mine Point. The centre will welcome visitors and provide an orientation to the site, and serve as the departure point for tours of the cliffs. The centre will also house the offices of the site staff.

6.4.3 On-Site Interpretation

Guided tours of the fossil cliffs will be conducted by trained staff to enrich the visitor experience. Interpretive guides will be trained about the nature of the cliffs, the fossils they contain, and their significance to our understanding of earth history. The guides will also fill a monitoring and compliance role by ensuring that collecting procedures are followed. They will also be trained to address safety issues with visitors.

Interpretive exhibits will be located at several locations adjacent to the nominated site to provide self-guided learning opportunities for visitors. Some of the site’s major themes will be interpreted at the Grindstone Quarry, Lower Cove, Coalmine Point, and the Dugway access adjacent to the interpretive centre. On-site signage will be augmented by interpretive brochures that elaborate on the major themes.

6.4.4 Off-Site Interpretation and Outreach

Off-site interpretation will be provided through a comprehensive web site. The web site will include information on the geology, fossils, exploration history and current research relevant to the Joggins section.

Outreach education will be pursued through developing modules to incorporate into local and regional public school curricula.

Cooperation with other, related institutions in the region, such as the, Fundy Geological Museum and the Nova Scotia Museum of Natural History, will allow cross-interpretation and promotion. Relationships will be fostered with international institutions and other World Heritage fossil sites.

6.5 Visitor Facilities and Access

6.5.1 Community Access to the Nominated Property

The beach at Joggins has been used by members of the community for generations for passive recreational use such as walking, fishing, swimming, parasailing and sight-seeing. These activities have no impact on the fossil resource or World Heritage values of the site. Traditional community access and use of the site will continue so long as it does not endanger other visitors or affect the management of the site or fossil resources.
6.5.2 Public Access to the Nominated Property

At present, there is one developed access point to the fossil cliffs at the mouth of Coal Mine Brook (Bell’s Brook). Two other informal access points, at Lower Cove and MacCarron’s River, are used on occasion by knowledgeable visitors but cannot currently support significant visitor use due to parking constraints.

The new Joggins Fossil Centre development includes a new visitor access that will be constructed in the vicinity of the Dugway. Moreover, at Lower Cove, the Grindstone Quarry property will permit access to the property for visitors with physical limitations. This area will also provide interpretive and safety information. Theses facilities will be developed with care and according to existing legislation to ensure that they do not affect site conservation objectives negatively.

Future plans may involve the development of other access points. An area of Crown lands to the north of Lower Cove at Boss Point has been identified. It would provide access to the northern part of the designated site, plus provide for additional interpretive and recreational opportunities that are not tide dependent. A proposed hiking trail and rough camping sites are also proposed for the northern portion of the nominated property. This trail would run along the coastal headlands between Lower Cove and Downing Cove, including Boss Point.

6.5.3 Public Safety and Risk Management

The physical nature of the nominated property presents several inherent risks including steep cliffs, falling rocks, slippery and uneven terrain for walking, and high tides that could strand beach goers. The extreme tidal range of the Bay of Fundy and the irregular shape of the shoreline increase the risk of stranding.

Additional environmental risks include hurricanes, extreme storm surges and tsunamis. Hurricanes and storm surges can be reasonably predicted and the beach evacuated well in advance of any event. Tsunamis are less predictable, but the risk is low given the relative tectonic stability of the Bay of Fundy region.

The following actions have been taken to minimize risks and promote public safety within the nominated property:

- An Emergency Response Plan has been prepared in consultation with local emergency measures officials. This plan identifies all foreseeable risks and provides a response plan to address those risks. Implementation of the plan will be carried out by the Joggins Fossil Institute in collaboration with the local community. The Royal Canadian Mounted Police (RCMP) is the primary organization charged with responding to on-site emergencies (Figure 24).

- Comprehensive safety signage has been posted and maintained at all official access points. Safety messages will also be provided within the visitor centre and in the interpretive brochures and educational materials prepared for the site.
• The new Dugway access to the beach has been designed to permit the elevation of an immobilized injured person to the top of the cliffs.

• Visitors to the property will be encouraged to adhere to site rules that restrict visitation to areas of the property where there are beach attendants. Furthermore, visitors desiring to access the extreme south (MacCarron’s River to Ragged Reef Point) and north (Grindstone Quarry to Downing Cove) will be encouraged to register their trip with JFI staff prior to departure.

6.6 Marketing and Promotion

Targeted marketing and promotion efforts will be critical to attracting the right audiences to the nominated property. If the site is inscribed on the World Heritage list, then promotional materials will highlight the outstanding universal values of the site and UNESCO World Heritage messages. It will be particularly important to ensure that local communities and the regional tourism industry are aware of the importance and implications of the UNESCO designation.

A regional tourism promotion and development endeavour (the Bay of Fundy Tourism Partnership) between Nova Scotia and New Brunswick is already focusing significant effort on the tourism products along the Bay of Fundy. If this nomination is successful, the Bay of Fundy Tourism Partnership will utilize the UNESCO designation as part of its regional tourism strategy.

6.7 Sustainable Tourism

6.7.1 Visitation Projections
Current visitation to this relatively remote region of Nova Scotia is quite low. Although no formal census has been conducted it is estimated that for the last five years, visitation is in the range of 15 - 20,000 visitors per year.

The development of the site, the new Joggins Fossil Centre and potential inscription on the World Heritage list is expected to bring about a substantial growth in visitation to the site. Attendance projections estimate approximately 38,000 visitors for the first year of operation of the interpretation centre. This figure is projected to rise to more than 48,000 in the fifth year, with strong potential for further growth in the future. Most of the visitors would arrive during the peak tourist season of July-August, but shoulder season visitation is increasing, particularly among the demographic who visit sites of this type and stature.

The new facility and associated site infrastructure has been designed to accommodate this increase. Further, the physical nature of the site, including rocky shorelines and high tidal action means that the site can easily accommodate the increase in visitation without negative impacts. The fossil collecting policy and procedures outlined in this plan will ensure that increased visitation does not adversely affect the outstanding universal values of the site.

6.7.2 Carrying Capacity of the Site

The site is in an area that traditionally has drawn relatively few tourists and has little infrastructure to support visitation, either on-site or in the surrounding communities. Development of the site and associated facilities can be expected to bring about a substantial growth in tourist numbers and these will have to be carefully managed. Natural erosion of the cliff-face reveals the fossils and eventually removes them with the tide. The greatest potential threat to the fossil heritage, however, is the human impact through unauthorized fossil collecting. Although the rocky, high-energy shoreline is not highly vulnerable, management of the site will assure that the anticipated increased visitation at the site will have limited impact the coastal, inter-tidal ecosystem.

Carrying capacity at the Joggins Fossil Cliffs is defined as “an acceptable level of visitor density that the property can sustain without causing destructive effects to the physical environment or decreasing the quality of the visitor experience.” Although this definition excludes the assessment and monitoring of impacts on the economic and socio-cultural environment of adjacent communities, the Joggins Fossil Institute will participate in community development and monitoring initiatives as increased visitation has potential to have both positive and negative impacts on the nearby communities. Carrying capacity can be assessed to best protect the fossil resource; the two important factors in assessing carrying capacity for the management of the nominated property are natural heritage capacity and perceptual capacity. The assessment of these factors requires separate approaches.

Natural Heritage Carrying Capacity
The nominated property is able to sustain and significantly surpass current levels of visitation with little adverse impacts on the fossil resource or the local ecology. The absence of an immediate management presence at the property in the past has compromised formal record keeping, and visitor statistics have been difficult to maintain and track. Nonetheless, the generous estimate of past visitation and the conservative estimate of projected traffic find the Joggins Fossil Institute capable of handling nearly double the current level of visitation, with staffing, infrastructure, fossil collecting policies and legislation and visitor traffic management plans ready for both increased and changeable visitation levels.

The largest historic threat to the Joggins Fossil Cliffs prior to the inception of the Joggins Fossil Institute and permanent staffing at the site was the unauthorized, hence illegal, removal of fossils. Illegal removal refers to the casual pilfering of exposed smaller fossils and, far less likely, the unauthorized excavation of fossils from the cliffs and reefs. The most significant fossil resources are located within the cliffs along segments of the nominated property where interpreters will be vigilant and are therefore relatively secure. Although these fossil-rich segments of the property will be monitored by Joggins Fossil Institute staff and visitors will be discouraged from traveling to the remote southern and northern extents of the property, public education through interpretive programs and print media describing the fossil collecting legislation and policies and rationale is the principal conservation tool. Moreover, neighbouring residents continue to act as stewards of the property and will assist managers by reporting suspicious activities and by controlling access. The new Joggins Fossil Centre and staff of the Joggins Fossil Institute will facilitate visitor control, serving as the focal point of visitor education and experience at the site, controlling access to the beach, and minimizing impact of automobile traffic. Visitors are informed and educated about the fossil collecting legislation and policy in the site literature, on interpretive signs, and through verbal communications.

Heavy foot traffic resulting from increased visitation is not expected to significantly affect the exposed fossils of the cobble beach as the beach stones already experience continuous high wear from the powerful tides. Similarly, it is expected that elevated foot traffic levels will have little to no effect on the beach fauna (including barnacles and periwinkles) in the short term. Sensitive areas will be protected by congestion management and visitor dispersal, education on preserving the beach ecology, and possible path arrangements.

Perceptual Carrying Capacity

While projected visitation to the property is not anticipated to adversely affect the fossil resource or the local ecology, visitor impact will be persistently monitored and evaluated to protect them both and to maximize the quality of visitor experience. The management and marketing policies outlined in a separate communication and marketing plan anticipate increased visitation for recreational, educational and scientific purposes.

The practical and legal management of the Joggins Fossil Institute is designed to adapt positively to increased visitation. A simple increase in staffing commensurate
with increased visitation will ensure excellence in visitor experience while simultaneously protecting the fossil resource and local ecology. Should visitation significantly exceed predictions or should fragility within the fossil resource be observed, alternate visitor management is available to the Joggins Fossil Institute. Possible strategies for high visitation management include: prioritizing reservations for groups and individuals, encouraging visits during non-peak seasons (especially for schools and other large groups), timing special activities with visiting scientists, and co-operative marketing with other spring and fall activities in the area, including festivals and seasonal events.

6.7.3 Sustainability Initiatives

The development and management of the Joggins Fossil Cliffs nominated property will adhere to the UNESCO Principles for Tourism in Natural World Heritage Sites (1993). Key initiatives include:

1. Tourism development considers and respect ecological and socio-cultural values of the Site and is consistent with the World Heritage concept;
2. A management plan, considering the regional context and addressing the tourism component is established and regularly updated;
3. Environmental assessments, inclusive of cumulative impacts, are carried out on recreational and commercial facilities and activities before approvals are granted;
4. Monitoring programs based on appropriate and updated indicators are in place and their outcomes are taken into account into the planning and decision taking process;
5. Local populations, in and around the site, are involved in order that they take pride in their heritage and gain benefits from tourism;
6. Co-operation with the different stakeholders involved in tourism development is sought and co-ordination of the promotion of the Site is ensured;
7. All site staff are aware of the World heritage values and are well trained in visitor management;
8. Relevant information and education programmes are in place to ensure that visitors and local people understand and have respect for the Site and its values;
9. A substantial proportion of the income generated through entrance fees is directly allocated to the Site for its improvement and management;
10. The Site participates in the World Heritage concept through all appropriate means.

An Environmental Sustainability and Resource Utilization Policy has been adopted for the site. This policy will guide all activities and decisions of the Joggins Fossil Institute. The new Joggins Fossil Centre has been designed using the principles of “Leadership in Energy and Environmental Design” (LEED) Green Building Rating System. Renewable wind power and geothermal energy is being explored as alternative energy sources for the site.

7.0 MONITORING AND REVIEW

A monitoring program will be established to collect data on the state of conservation of the nominated property and the quality of the visitor experience. Key indicators
have been identified which will serve as a basis for the monitoring program.

7.1 Indicators of state of conservation of paleontological heritage

Key indicators of the state of conservation of the paleontological heritage at Joggins have been identified which will serve as a basis for monitoring and the subsequent annual report. The indicators are set out in the table below.
Table 1. Indicators of conservation of paleontological heritage

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Indicator</th>
<th>Periodicity</th>
<th>Location of Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain integrity of the classic fossil cliffs</td>
<td>Assessment of sedimentary succession and contained fossil beds related to collecting and natural processes of erosion.</td>
<td>Monthly (May – October)</td>
<td>Joggins Fossil Institute</td>
</tr>
<tr>
<td>Review of human impacts in buffer zone</td>
<td></td>
<td>Annual</td>
<td>Joggins Fossil Institute, Municipality of the County of Cumberland, &amp; Nova Scotia DNR</td>
</tr>
<tr>
<td>Stakeholder engagement (community/government etc)</td>
<td></td>
<td>Annual</td>
<td>Joggins Fossil Institute</td>
</tr>
<tr>
<td>Incidences of illegal fossil collecting/excavation</td>
<td></td>
<td>Monthly</td>
<td>Joggins Fossil Institute, Nova Scotia Department of Natural Resources, &amp; RCMP</td>
</tr>
<tr>
<td>Continued strong level of scientific interest in the property</td>
<td>Number of peer reviewed papers in scientific journals</td>
<td>Annual</td>
<td>Joggins Fossil Institute with Scientific Advisory Committee</td>
</tr>
<tr>
<td></td>
<td>Number of conference/workshop field trips hosted</td>
<td>Annual</td>
<td>Joggins Fossil Institute</td>
</tr>
<tr>
<td></td>
<td>Frequency and duration for hosting visiting scientists</td>
<td>Annual</td>
<td>Joggins Fossil Institute with Scientific Advisory Committee</td>
</tr>
<tr>
<td></td>
<td>Report of research conducted by visiting scientist</td>
<td>Annual</td>
<td>Joggins Fossil Institute, Scientific Advisory Committee</td>
</tr>
<tr>
<td></td>
<td>Number of research projects</td>
<td>Annual</td>
<td>Joggins Fossil Institute with Scientific Advisory Committee</td>
</tr>
<tr>
<td></td>
<td>Number of Scientific Heritage Research Permits Issued</td>
<td>Annual</td>
<td>Joggins Fossil Institute &amp; Nova Scotia Department of Tourism, Culture and Heritage</td>
</tr>
<tr>
<td></td>
<td>Number of Stewardship Heritage Research Permits Issued</td>
<td>Annual</td>
<td>Joggins Fossil Institute &amp; Nova Scotia Department of Tourism, Culture and Heritage</td>
</tr>
<tr>
<td>Attribute</td>
<td>Indicator</td>
<td>Periodicity</td>
<td>Location of Records</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Conservation of the fossil record of biodiversity</td>
<td>Report on fossil specimens accessioned to formal museum collections</td>
<td>Annual</td>
<td>Joggins Fossil Institute &amp; Nova Scotia Department of Tourism, Culture and Heritage</td>
</tr>
<tr>
<td>Status of type specimens in world collections</td>
<td>Annual</td>
<td></td>
<td>Joggins Fossil Institute &amp; Nova Scotia Department of Tourism, Culture and Heritage</td>
</tr>
</tbody>
</table>

7.2 **Indicators of ecosystem health**

The Bay of Fundy Ecosystem Partnership (BoFEP: http://www.bofep.org/), a “virtual”, web-based institute comprising academic institutions, coastal communities, ecotourism groups, environmental and conservation groups, fishery organizations and government agencies, promotes the ecological integrity, vitality, biodiversity and productivity of the Bay of Fundy ecosystem. The Bay of Fundy Ecosystem Partnership (Figure 25) also facilitates and enhances communication and co-operation among citizens interested in stewardship of the Bay of Fundy, including its habitats and ecological processes.

![Figure 25](image)

The Joggins Fossil Institute is a member of the Bay of Fundy Ecosystem Partnership and will collaborate with other member organizations to help identify, study, prevent and treat environmental pressures affecting the Bay of Fundy ecosystem, particularly in the Joggins area. Assessments of wildlife populations and beach conditions (e.g., litter and pollution) will be conducted annually and reported by the Joggins Fossil Institute.

7.3 **Indicators of sustainable administrative practices**

The low-impact infrastructure necessary to enhance the property and enable its pursuit of the Joggins Fossil Institute goals (e.g. fossil protection, safe visitation, promotion of heritage values, interpretation and education) will respect the inclusive, prudent and conservational principles. Furthermore, any future
development of the property and adjacent lands will be controlled through federal and provincial legislation and through municipal land-use bylaws.

Monitoring of visitor services and experiences will be conducted primarily by the Joggins Fossil Institute. Indicators of site visitation will include the following:
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Indicator (units of measurement)</th>
<th>Ideal Status</th>
<th>Report by</th>
<th>Report frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visitors to Nominated Site</td>
<td>Number of visits to Website</td>
<td>Stable or increasing</td>
<td>Joggins Fossil Institute (JFI)</td>
<td>Annual</td>
</tr>
<tr>
<td>Visitor Numbers to Joggins shoreline</td>
<td>Visitor Numbers to Joggins shoreline</td>
<td>Stable or increasing</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>Number of guided tourists on Joggins</td>
<td>Number of guided tourists on Joggins beach</td>
<td>Stable or increasing</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visitor Numbers to Interpretive Centre</td>
<td>Visitor Numbers to Interpretive Centre</td>
<td>Stable or increasing</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>Seasonal distribution of visitors</td>
<td>Seasonal distribution of visitors</td>
<td>Wider, within site capacity</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>Visitor Experience</td>
<td>Visit satisfaction of visitors to the Protected Site</td>
<td>Stable or increasing</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>Educational Use</td>
<td>Number of educational visits</td>
<td>Stable or increasing</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>Tourism Impact of World Heritage Site</td>
<td>Number of overseas visitors</td>
<td>Stable or increasing</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>Seasonal distribution of visitors</td>
<td>Seasonal distribution of visitors</td>
<td>Wider, within site capacity</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>Safety</td>
<td>Number of incidents requiring emergency response</td>
<td>Decrease</td>
<td>Emerg. Response Planning Grp.</td>
<td>Annual</td>
</tr>
<tr>
<td>Use of World Heritage Logo</td>
<td>Use of logo outside of UNESCO guidelines</td>
<td>No instances</td>
<td>JFI – Parks Canada</td>
<td>Annual</td>
</tr>
<tr>
<td>Inappropriate promotion of world</td>
<td>Inappropriate promotion of world heritage in tourism</td>
<td>No instances</td>
<td>JFI</td>
<td>Annual</td>
</tr>
<tr>
<td>literature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Whereas the coal deposits that lent their name to the period of earth history for which Joggins is the outstanding example in the world both fuelled the Industrial Revolution and are today implicated in issues of global change, the Joggins Fossil Institute has made a concerted effort to attain the highest standards of energy conservation and ecological stewardship. Specifically, the Joggins Fossil Institute has strived to ensure that the Joggins Fossil Centre achieves a silver rating in Leadership in Energy and Environmental Design (LEED: accreditation in Green Building Rating System). The independently powered Centre will house and promote fossils from the Carboniferous Period while releasing a minimum of greenhouse gases and capitalizing on the Bay of Fundy’s rich wind resources. Moreover, the Joggins Fossil Institute will undergo an annual International Standards Organization 9001:2000 audit through the Cumberland Regional Development Association.

7.4 Administrative Arrangements for Monitoring the Property

The conservation goals of the Joggins Fossil Institute can only be demonstrated by monitoring its implementation. The responsibility for coordinating the monitoring of the nominated property will be undertaken by the Joggins Fossil Institute. Monitoring data is available through the Director of the Joggins Fossil Institute at:

Joggins Fossil Institute
35 Church Street, P.O. Box 546
Amherst, Nova Scotia
Canada B4H 4A1
902-667-3638

Monitoring results will provide input for an annual progress report on the implementation of the management plan. The progress report will be reviewed by the Scientific Advisory Committee, the Emergency Planning Advisory Group and the Joggins Fossil Institute, and will be made available to the public.

The World Heritage Convention requires State Parties to report on the state of conservation of their World Heritage properties on a six-year cycle. If the nominated property is inscribed on the World Heritage List, the Joggins Fossil Institute will provide to Parks Canada information on the state of conservation, interpretation and visitor experience of the Joggins Fossil Cliffs for inclusion in Canada’s report to the World Heritage Committee.

This management plan will also be reviewed periodically to ensure that it provides relevant direction for the conservation and presentation of the site. Plan reviews will also allow the Management Association to respond to the results of ongoing monitoring and the data presented in annual progress reports, and to make any adjustments that may be required to ensure the protection of the site’s outstanding universal values.

8.0 IMPLEMENTATION OF THE MANAGEMENT PLAN

This management plan will be implemented by the Joggins Fossil Institute Board of Directors through site managers and staff. In order to fulfil its essential
conservation, management, scientific and education mandate and to maximize the tourism potential and economic benefit of the property to the local community, The Joggins Fossil Institute will employ the following staffing complement (Figure 26).

**Director**
Reporting directly to the Joggins Fossil Institute Board of Directors, the Director is responsible for overseeing all aspects of the Joggins Fossil Centre and property operations. The Director recommends policies and plans to the Board, implements policies and plans approved by the board and reports on the outcome of these plans and policies. The Director has overall responsibility for human resources management, occupational health and safety and management of the operations of the Centre and property through the staff. The Director is responsible for financial management and seeking out sources of ongoing funding, including both private and public sources. The Director serves as the liaison with all levels of government and the local community, and develops strategies to promote the property locally, nationally and internationally. The Director is also responsible for ensuring compliance with the World Heritage Convention and liaising with Parks Canada.

**Scientist**
The Scientist is responsible for the security, preservation, documentation and interpretation of the palaeontological heritage at the property. The Scientist carries out and facilitates property specific research solely and cooperatively with international researchers, makes that research available to the public and liaises with other researchers and institutions in the scientific community. The Scientist provides curatorial input into the development of exhibitions, advises on content of educational programs and is in part, responsible for the training of interpretive and collections staff. The Scientist leads tours and other educational programs for post-secondary and professional groups. To enhance the visibility of the property with the larger scientific community and to further scientific research, the Scientist publishes scientific papers, attends conferences and conducts lectures on a regular basis.

**Manager of Programs**
The Manager of Programs is responsible for the development, scheduling, delivery and evaluation of educational programs for visitors to the property, as well as outreach programs and extension programs. The Manager of Programs develops educational materials to accompany exhibitions and provides input into the development of new and/or temporary exhibitions.

**Interpreters**
Interpreters are responsible for advancing the educational goals of the Joggins Fossil Institute, for monitoring the site, and enhancing the visitor experience by conducting guided tours of the cliffs and centre. Interpreters will lead workshops and facilitate other educational programs for visitors and groups. Interpreters will help to advance the scientific and research mission of the Joggins Fossil Institute by assisting in the preliminary identification, cataloguing and preparation of fossil specimens. Interpreters assigned to coastal patrol will play a role in ensuring safe beach visitation and compliance with the fossil collecting policy.
Manager of Visitor Services and Marketing
The Manager of Visitor Services and Marketing is responsible for the overall quality of the services offered at the Centre and for ensuring that high standards of customer care are met. The Manager of Visitor Services and Marketing recruits and manages customer service staff (admissions and retail), develops and implements the strategic marketing plan for the Joggins Fossil Cliffs and Centre in conjunction with the director and ensures that the Joggins Fossil Institute responds to multiple markets and changing visitors demands. The Manager designs and implements visitor use monitoring systems and social science research related to visitor satisfaction, expectations and trends. The Manager of Visitor Services and Marketing is responsible for overseeing revenue-generation including the gift shop, food-service concession, internet café and rentals.

Customer Service Assistants
Customer Service Assistants are responsible for greeting visitors, answering general enquiries and introducing visitors to the menu of activities and experiences that can be enjoyed at the Centre and property. Customer Service Assistants process admissions, gift shop transactions and fossil exploration permit purchases, and maintain gift shop and information displays.

Administrative Assistant
The Administrative Assistant provides support services for the Centre and property operations. Responsibilities include: bookkeeping; clerical and filing duties; processing payment for workshops and programs; maintaining a database mailing list; program administration including course registration.

Maintenance Manager
The Maintenance Manager is responsible for overseeing all aspects of facility and property maintenance of the physical plant and grounds of the Centre. Through an ongoing system, the Maintenance Manager will determine the need for repairs and preventative maintenance and will carry out necessary maintenance and repairs or will oversee the procurement and delivery of contracted services as necessary.
In addition to the positions directly associated with the management and operation of the property, managers and staff will have additional support through two advisory groups, a Scientific Advisory Committee and an Emergency Response Planning Group.

**Scientific Advisory Committee**
The role of the Scientific Advisory Committee is to report on the state of conservation of the nominated property and to support the advancement of scientific research at the Joggins Fossil Cliffs. The Scientific Advisory Committee advises the Joggins Fossil Institute on scientific matters relevant to managing the nominated property. Members of the scientific community nominate representatives for the committee and are appointed by the Joggins Fossil Institute Board of Directors every three years. The committee meets several times a year to identify and evaluate research needs in all areas of science including the social, geological and biological sciences. The committee also examines and advises on development proposals and perceived threats to the nominated property.

**Emergency Response Planning Group**
The Joggins Fossil Cliffs Emergency Response Planning Group is committed to the planning, preparation, review and reporting of an emergency response for The Joggins Fossil Cliffs. This group acts in an advisory capacity and reports to the
Director of the Joggins Fossil Institute. The group membership includes representative from the following organizations:

- Emergency Measures Organization of the County of Cumberland;
- Emergency Health Services of Nova Scotia;
- Joggins Fire Department;
- Royal Canadian Mounted Police;
- Springhill Ground Search and Rescue; and
- Nova Scotia Department of Natural Resources.

Community volunteer groups, including the River Hebert and Joggins Development Association, and the planned stakeholder group, the “Friends of the Joggins Fossil Cliffs,” also play a significant role in the promotion and presentation of the property. Furthermore, provincial and federal government employees have an existing role in providing advice on property management, earth science conservation, reporting and monitoring.

Shared Staffing Opportunities
There are opportunities for shared staffing between Joggins Fossil Cliffs (JFC) and nearby Cape Chignecto Provincial Park (CCPP). The shared staffing positions are envisaged as follows:

- Property and Maintenance Manager: 50% JFC - 50% CCPP
- Manager of Visitor Services and Marketing: 70% JFC - 30% CCPP
- Manager of Programs: 70% JFC - 30% CCPP
- Director: 80% JFC - 20% CCPP
- Scientist: 90% JFC – 10% CCPP

In addition to the 3.9 full-time equivalent management and administrative positions, six full-time seasonal Interpreters and two Customer Service Assistants are employed to provide resources solely for the Joggins Fossil Cliffs property. This staffing complement and commensurate levels of remuneration, ensures that there will be a highly qualified scientific and educational team in place at Joggins, as befits the nominated property’s outstanding scientific and educational importance. The structure also puts in place a strong management team, which will be required to oversee the daily operations of the Centre and property, to work closely with the governing board, to work toward ensuring that World Heritage goals are paramount, and toward promoting this property as a world-class destination.