Joggins Fossil Cliffs

2020 Conservation Outlook Assessment

SITE INFORMATION

Country: Canada
Inscribed in: 2008
Criteria: (viii)

The Joggins Fossil Cliffs, a 689 ha palaeontological site along the coast of Nova Scotia (eastern Canada), have been described as the “coal age Galápagos” due to their wealth of fossils from the Carboniferous period (354 to 290 million years ago). The rocks of this site are considered to be iconic for this period of the history of Earth and are the world’s thickest and most comprehensive record of the Pennsylvanian strata (dating back 318 to 303 million years) with the most complete known fossil record of terrestrial life from that time. These include the remains and tracks of very early animals and the rainforest in which they lived, left in situ, intact and undisturbed. With its 14.7 km of sea cliffs, low bluffs, rock platforms and beach, the site groups remains of three ecosystems: estuarine bay, floodplain rainforest and fire prone forested alluvial plain with freshwater pools. It offers the richest assemblage known of the fossil life in these three ecosystems with 96 genera and 148 species of fossils and 20 footprint groups. The site is listed as containing outstanding examples representing major stages in the history of Earth. © UNESCO

SUMMARY

2020 Conservation Outlook

Finalised on 02 Dec 2020

GOOD

Joggins Fossil Cliffs is a model of high quality performance within the World Heritage Convention, protecting geological values of global significance whilst providing benefits to local people. The site is robust, in good and stable condition and effectively managed. Threats are low, and there is highly effective and creative management that has built and maintains community support for the conservation and presentation of this site. Provided adequate resources are maintained to assure the capacity for effective site management, the future conservation of this site is highly positive. Model approaches in Joggins related to community-based management and education should be more widely disseminated within the World Heritage Convention, as well as improving fossil storage capacity in order to maintain the site’s current status as a centre of scientific excellence.
FULL ASSESSMENT

Description of values

Values

World Heritage values

- **Continued scientific research**
  
  The property has played a vital role in the development of seminal geological and evolutionary principles, including through the work of Sir Charles Lyell and Charles Darwin, for which the site has been referred to as the “coal age Galápagos” (World Heritage Committee, 2008).

- **Ex situ fossil record**
  
  Fossil material exposed by coastal erosion is available for study, and subject to regulated scientific collection and appropriate public and educational use. Important specimens are collected and curated to avoid losses to science (IUCN, 2008).

- **In situ fossil record of terrestrial life in the “Coal Age”**
  
  The "grand exposure" of rocks at Joggins Fossil Cliffs contains the best and most complete known fossil record of terrestrial life in the iconic “Coal Age”: the Pennsylvanian (or Carboniferous) period in Earth’s history. The site bears witness to the first reptiles in Earth history, which are the earliest representatives of the amniotes, a group of animals that includes reptiles, dinosaurs, birds, and mammals. The site offers the richest assemblage known of the fossil life in these three ecosystems with 96 genera and 148 species of fossils and 20 footprint groups (World Heritage Committee, 2008). Stratigraphy and fossil record in cliffs are in good condition, and available for study and subject to regulated scientific collection.

Assessment information

Threats

**Current Threats**

The current threats mostly derive from public access to the site, and are at low levels. All are well managed, with appropriate legal backing, and should continue to be so provided the site remains adequately resourced.

- **Other Activities**
  
  *(Fossil Collection)*

  Collection of fossils is subject to regulations that are effectively enforced, and there is no evidence of significant losses (IUCN, 2008).

- **Tourism/ visitors/ recreation**
  
  *(Visitor use )*

  Visitor use is well controlled and remains at relatively low levels (IUCN, 2008). The Joggins Fossil Institute Annual Report 2018-19 provides an estimated figure of 20,000 visitors, with around 14,000 paid entry guests.
**Housing/ Urban Areas**

(Conical development)

Unsustainable coastal development poses a threat to the values of the site. However, the site is largely unsuitable for coastal development and is legally protected from it, notably at the provincial level through the provisions of the Special Places Protection Act and at the municipal level by the Cliffs and Shoreline Setbacks and the Prohibited Uses and Structures legislation. A narrow buffer zone is also defined which separates the property from several private residences (IUCN, 2008). No up-to-date information is available on this, but it can be assumed that this threat has not increased from very low.

**Potential Threats**

There are few potential threats not already subject to the management of the property. To the extent they exist their impacts are not known, but appear to be likely to be low overall, given the site is already demonstrably robust. Climate change poses a high potential threat to the values of the property though sea level rise and it's effects on erosion rates. Whilst actions can be taken to mitigate these effects, the issue cannot be managed in its entirety on site.

**Temperature extremes, Storms/Flooding**

(Conical climate)

The scale of climate change impacts is not currently known, but the likely impact of rising sea level to the is sufficient to constitute a high potential threat to the values of the site. However, as a very active coastline this site is already relatively robust to potential impacts.

**Erosion and Siltation/ Deposition**

(Conical erosion)

Some factors, including coastal erosion through wind, water and storms, are both beneficial for the property because they reveal new fossils, and damaging as they can destroy fossils. These factors are being monitored by the Joggins Fossils Institute and important fossils can be collected before they get destroyed (State Party of Canada, 2013).

**Overall assessment of threats**

The current threats mostly derive from public access to the site, and are at low levels. All are well managed, with appropriate legal backing, and should continue to be so provided the site remains adequately resourced. There are few potential threats, not already subject to the management of the property.

**Protection and management**

**Assessing Protection and Management**

**Management system**

Highly Effective

Clear and effective management system is in place which can serve as a model of local engagement (IUCN, 2008; State Party of Canada, 2007). Management is implemented through the Joggins Fossil Institute, a non-for-profit society. It is governed by an Advisory Board of Directors and advised by a Scientific Advisory Committee which provides important relationships with scientists from the Nova Scotia Department for Natural Resources (IUCN, 2008).

**Effectiveness of management system**

Highly Effective

Management was evaluated as highly effective at the time of inscription (IUCN, 2008). The continued
Boundaries

Boundaries of the property are clearly defined and include all areas necessary to fully display the fossil record of Joggins (World Heritage Committee, 2008). The landward and seaward boundaries are tied to the natural process related to the values of the property (IUCN, 2008). The boundaries are well known by local residents and landowners (State Party of Canada, 2013).

Integration into regional and national planning systems

Data Deficient

Relationships with local people

Highly Effective

The nomination for inscription on the World Heritage List had been developed with very strong local support (IUCN, 2008; State Party of Canada, 2007) and the property continues to have very positive relationships with local people through strong relationship-building and engagement processes (Joggins Fossil Institute, 2019). In addition, a Director of Development and Strategic Engagement position was created and filled in 2018 whose role is to forge relationships with governmental organizations, businesses, non-profits and local volunteers to help further the Joggins Fossil Institute’s mission (Joggins Fossil Institute, 2019).

Legal framework

Highly Effective

Adequate legislation is in place, with some continuing needs to maintain effective balance of legal protection of fossil remains, with adequate enforcement and assurance of collection and curation of important specimens. The property is protected under a range of provincial and municipal laws and regulations, including the Provincial Special Places Protection Act, Beaches Act, Minerals Act and the land-use planning and zoning by laws of the Municipality of Cumberland (IUCN, 2008; State Party of Canada, 2007).

Law enforcement

Mostly Effective

The most recent periodic report (2013) noted that there was acceptable capacity and resources to enforce legislation, although some deficiencies remained (State Party of Canada, 2013). However, no detailed and more up-to-date information is available.

Implementation of Committee decisions and recommendations

Highly Effective

The only Decision taken by the World Heritage Committee on this property was the one inscribing it on the World Heritage List which included only one recommendation, namely that “the State Party widely publicise the results of its monitoring of fossil resources produced by natural erosion and the development of educational and research collecting policies, which could serve as a model for such management elsewhere” (World Heritage Committee, 2008). Grey and Skilliter (2011) speak to some of this fossil management structure (IUCN Consultation, 2020). This request has also been achieved through the excellent visitor engagement which revolves around the centre run by the Joggins Fossil Institute, and ongoing outreach through the available channels, including the local newspaper, radio stations and educational tours etc. (Joggins Fossil Institute, 2019).

Sustainable use

Highly Effective

The site manages sustainable use of the fossil resource, and in addition its visitor services model wider approaches to environmental sustainability. The main visitor facilities are LEED certificated with on site renewable energy in use, and local produce used in the visitor centre (IUCN, 2008; State Party of Canada, 2007).

Sustainable finance

Mostly Effective

Consistent funding has been achieved but requires regular renewal of support (IUCN, 2008; State Party...
of Canada, 2007). In 2018-2019 the site reported a total revenue of 520,634 Canadian dollars, with provincial funding remaining the main source (Joggins Fossil Institute, 2019), which outweighed the expenses of the site and remained stable compared to previous years.

► **Staff capacity, training, and development**  
Highly Effective

Highly effective professional team oversees the management of the property (IUCN, 2008; State Party of Canada, 2007). The science-led educational approach to the management of the site lends itself well to training and development from the Scientific Advisory Committee to the field staff to the local volunteers who are all integral to the management of the site. There has been some concern noted regarding the

► **Education and interpretation programs**  
Highly Effective

Strong educational programmes are in place and a number of activities are being offered, including educational group visits and day camps for children and the 'Fossil Finders' exhibit opened in 2015. The exhibit is participatory and will be updated as new fossils get discovered and the visitors would be able to see their finds on display (Joggins Fossil Institute Annual Report 2015-2016). The staff of the Institute also deliver talks and presentations to community, school and professional groups.

► **Tourism and visitation management**  
Highly Effective

Creative approaches are being used, centred on the visitor centre that was constructed to support the site on inscription. A new, rotating exhibit highlighting the current research at the site on coprolites was opened in May 2018 alongside existing 'Fossil Finders' exhibits and more. An estimated 20,000 visitors come to Joggins Fossil Cliffs annually (Joggins Fossil Institute 2014-2015; 2015-2016; 2019) and are well managed with high levels of engagement in tours of the site.

► **Monitoring**  
Highly Effective

Monitoring was evaluated as highly effective at the time of inscription (IUCN, 2008). Given the strong emphasis on research and science within the activities of the management authority, as well as engagement from local communities in supporting these activities (Joggins Fossil Institute, 2019), monitoring of the site's values continues to be highly effective.

► **Research**  
Highly Effective

A Scientific Advisory Committee (SAC) is part of the management structure of the property and there is an ongoing research interest (IUCN, 2008). The members of the SAC come from two government departments and four universities. A Research Associate Programme was created to support ongoing research at the site. Formal research cooperation remains established between the Joggins Fossil Institute, Acadia University and Mount Allison University (Joggins Fossil Institute Annual Report 2014-2015). Recent scientific papers based on the research undertaken at the site include, for example, Carpenter et al. (2015) and Prokop et al. (2017). In addition, new coprolite research is also underway in collaboration with the Geological Survey of Canada and Acadia University (Joggins Fossil Institute, 2019), whilst the publication of Kelly & Wach, 2019 shows that the site remains at the forefront of methodological innovation in the wider geological field (Kelly & Wach, 2019). Ensuring fossil storage capacity to maintain the site's ex situ fossil record enhance scientific research in the future.

**Overall assessment of protection and management**  
Highly Effective

The management of Joggins Fossil Cliffs is highly effective, with a dedicated and creative local team responsible for this work, supported by regional and national expertise and local volunteers. Examples of good practice include the strong community processes that are the hallmark of the management of this site, and its major commitment to education, including the demonstration of this WHS as a model for sustainable development and the provision of social and economic benefits to the local community, alongside the protection and presentation of the site. Ensuring fossil storage capacity to maintain the site's ex situ fossil record will secure the capacity to continue the scientific research
which, to date, has served in the development of seminal geological and evolutionary principles.

**Assessment of the effectiveness of protection and management in addressing threats outside the site**

Highly Effective

There is both adequate legal protection extending beyond the site, and integrating its conservation into local land-use planning, and a strong outreach programme from the site at local and regional levels. The appointment of the Director of Development and Strategic Engagement will aid in the integration of the site's missions into wider planning frameworks through improved relationships with local and regional government, NGOs, businesses etc.

**Best practice examples**

- a) Community led processes
- b) Boundary design tied to values
- c) Interpretive and educational offer modeling the role of WHS as beacons for promoting sustainable development approaches.

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**State and trend of values**

**Assessing the current state and trend of values**

**World Heritage values**

**Continued scientific research**

Good

Trend: Stable

The good status of this value is evidenced by the continuing scientific use of the site with recent scientific publications, and professional expertise supporting the site (Joggins Fossil Institute Annual Report 2015-2016; 2019).

**Ex situ fossil record**

Low Concern

Trend: Stable

Ex situ fossil record was evaluated as well preserved at the time of inscription (IUCN, 2008) and this has not changed since. There is some concern noted that coordination and collection space could be improved in recording and storing fossils, such that the ex situ fossil record can continue to support research (IUCN Consultation, 2020).

**In situ fossil record of terrestrial life in the “Coal Age”**

Good

Trend: Stable

Naturally maintained coastline of the site containing its fossil record remains well preserved with adequate and effective management in place. The fossil record is maintained by active natural coastal processes and is in good condition and available for scientific and educational use.

**Summary of the Values**

**Assessment of the current state and trend of World Heritage values**

Good

Trend: Stable

Joggins Fossil Cliffs protects a coastal fossil record from the Coal Age of global significance. This fossil record is maintained by active natural coastal processes and is in good condition and available for the most part for scientific and educational use, although storage space could be increased to greater facilitate this.
Additional information

Benefits

Understanding Benefits

► Cultural and spiritual values, History and tradition

The site celebrates the local heritage of the communities of Joggins, and is deeply integrated into the life of the community. It provides an important focus for local heritage and history.

► Health and recreation, Outdoor recreation and tourism

The site has a notable tourism role in the local community, though is not a mass tourism venue.

► Knowledge, Importance for research

The knowledge produced by the site, in relation to the history of life on Earth is of the highest global significance, and helped inform major developments in geological ideas.

Summary of benefits

The site performs strongly in providing benefits to the local community in relation to direct and indirect economic and social contributions. It provides a global benefit by protecting an irreplaceable site of the highest importance for our understanding of the history of Life on Earth.

Projects

Compilation of active conservation projects

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<th>Brief description of Active Projects</th>
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<td>1</td>
<td>Joggins Fossil Cliffs</td>
<td>The principal actor in the conservation of the property.</td>
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REFERENCES

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