

# Geoheritage in Nova Scotia

*J. H. Calder and G. J. DeMont*

## Introduction

Nova Scotia has long been recognized for its rich and diverse geology, a heritage that defines our landscape, is reflected in our industrial history, and has influenced some of the greatest ideas that have shaped human understanding of our place in the history of life. Lessons gleaned from the geological and fossil record at Joggins (Fig. 1) by Sir Charles Lyell and Sir William Dawson, for example, informed Charles Darwin (1859) in one of the great works of humankind, *On the Origin of Species by Means of Natural Selection*. Locally, communities across Nova Scotia commemorate the pride and sacrifice of its people in miners' museums. This discussion considers the need and means to recognize and celebrate this rich heritage.

While the economics of geotourism have values in their own right, the intrinsic values of geoheritage reach deeper. (The term 'value' is used here in a non-monetary sense.) As humankind has evolved increasingly technological and urban societies, our sensibility that we are 'of the Earth' – a core concept of indigenous peoples – is in danger of being lost (Calder and Badman, 2009). As global issues become ever more pressing and our population strains the Earth's resources and environment, the lessons of our shared past become ever more vital.

## The Concept of Geoheritage

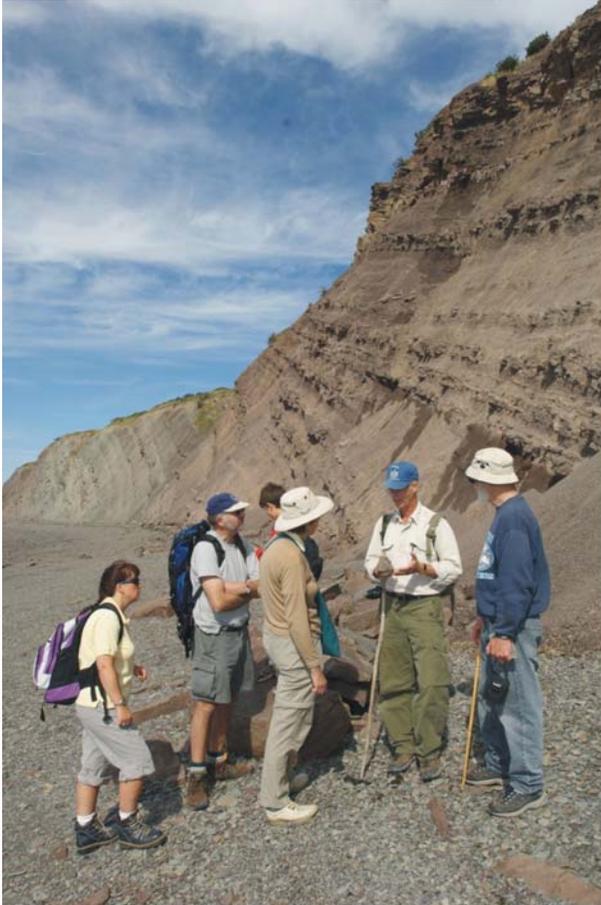
The protection and preservation of ecologically sensitive areas has become widely accepted by society. The importance of recognizing our shared geological heritage on Earth, however, is a comparatively recent concept as expressed in the Digne Declaration of 1991 (Anon, 1994). Dixon

(1996) described geoheritage as “those components of natural geodiversity of significant value to humans, including scientific research, education, aesthetics and inspiration, cultural development, and a sense of place experienced by communities.” *Geoheritage* can be defined succinctly as geological features that inform humanity of its relationship with the Earth. Relevance to humanity is an implicit, core value of geoheritage. Consequently, geoheritage can be divided into two categories: *cultural/social geoheritage*, wherein value is tied directly to our interaction with the site, including mine sites, stone works, stone monuments carved in place, and spiritual sites; and *physical geoheritage*, wherein the value of a site lies within its aesthetic qualities of landscape, or in its value in informing us of Earth history and Earth processes.

*Geotourism* refers to the marketing of visitation to geoheritage sites and its economic benefits. Challenges presented by geotourism are discussed below.

## Recognition of Geoheritage

Geoheritage can be commemorated at levels ranging from interpretive signs at scenic vantage points to the ultimate designation of UNESCO World Heritage. This full spectrum of formal recognition makes geoheritage accessible and relevant both locally and globally (Tables 1 and 2). Nova Scotia has the potential to celebrate a particularly rich geological heritage (see Fig. 2 and Table 3). In Nova Scotia, geoheritage has been interpreted and promoted by government agencies and institutions, including the Nova Scotia Department of Natural Resources, the Nova Scotia Department of Tourism, Culture and Heritage



**Figure 1.** The Joggins Fossil Cliffs, a UNESCO World Heritage Site.

through the Nova Scotia Museum of Natural History and Fundy Geological Museum, by societies like the Atlantic Geoscience Society, by universities and by individuals.

## UNESCO World Heritage

Inclusion on the UNESCO World Heritage list is considered the highest accolade for commemorating the significance of the Earth's natural and cultural heritage. The core principle of World Heritage is the concept of outstanding universal value to all humanity. Of the criteria for inscribing a site on the list of World Heritage, criterion viii applies specifically to geoheritage,

requiring that sites so recognized “be outstanding examples representing major stages of earth’s history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features” (UNESCO, 2007).

Only ten per cent of World Heritage sites have been inscribed, even in part, on the basis of criterion viii, and a mere 14 have been inscribed solely on that basis (Calder and Badman, 2009). The Joggins Fossil Cliffs (Fig. 1), inscribed on the list of the world’s heritage in 2008, is one of these 14 sites.

## UNESCO Geoparks

The Global Geoparks Network is an innovative initiative under the auspices of UNESCO to integrate geoheritage protection and education with sustainable economic development (UNESCO, 2007). Geoparks are considered to be sites of international importance that reflect a region’s geological history. The initiative is seen as complementary to the World Heritage initiative, and acknowledges the need for recognizing the full spectrum of geological diversity beyond the exclusive and highly selective World Heritage list (Dingwall et al., 2005).

## IUGS Geosites

The initiative of the International Union of Geological Sciences (IUGS) to recognize important geological sites around the world as Geosites has potential to establish a global list for geoheritage. This potential has yet to be fully realized, however. Embraced in Europe and in China, the identification of Geosites has lagged behind in other regions, notably North America. The attempt to achieve universally comprehensive criteria for identification of geosites has led to an onerous process that may have acted as a deterrent to the undertaking. The criteria for identification of Geosites include representativeness, uniqueness, suitability for correlation, complexity and geodiversity, degree of research/study and site availability and potential (Wimbledon et al., 2000).

**Table 1.** Categories of recognition for geoheritage.

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UNESCO World Heritage
UNESCO GeoParks
National parks
State/Provincial parks
Municipal parks
Protected areas (by legislation or community stewardship)
Scientifically recognized areas (without legislative protection)
Privately managed geotourism sites (geoheritage values may vary)
Interpreted vantage points

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**Table 2.** Recognized geoheritage sites in Nova Scotia.

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UNESCO World Heritage
Joggins Fossil Cliffs
Provincial Park*
Arisaig Provincial Park
Five Islands Provincial Park
Cape Chignecto Provincial Park
Preservation Area*
Peggys Cove
Special Place
Point Aconi
Wassons Bluff

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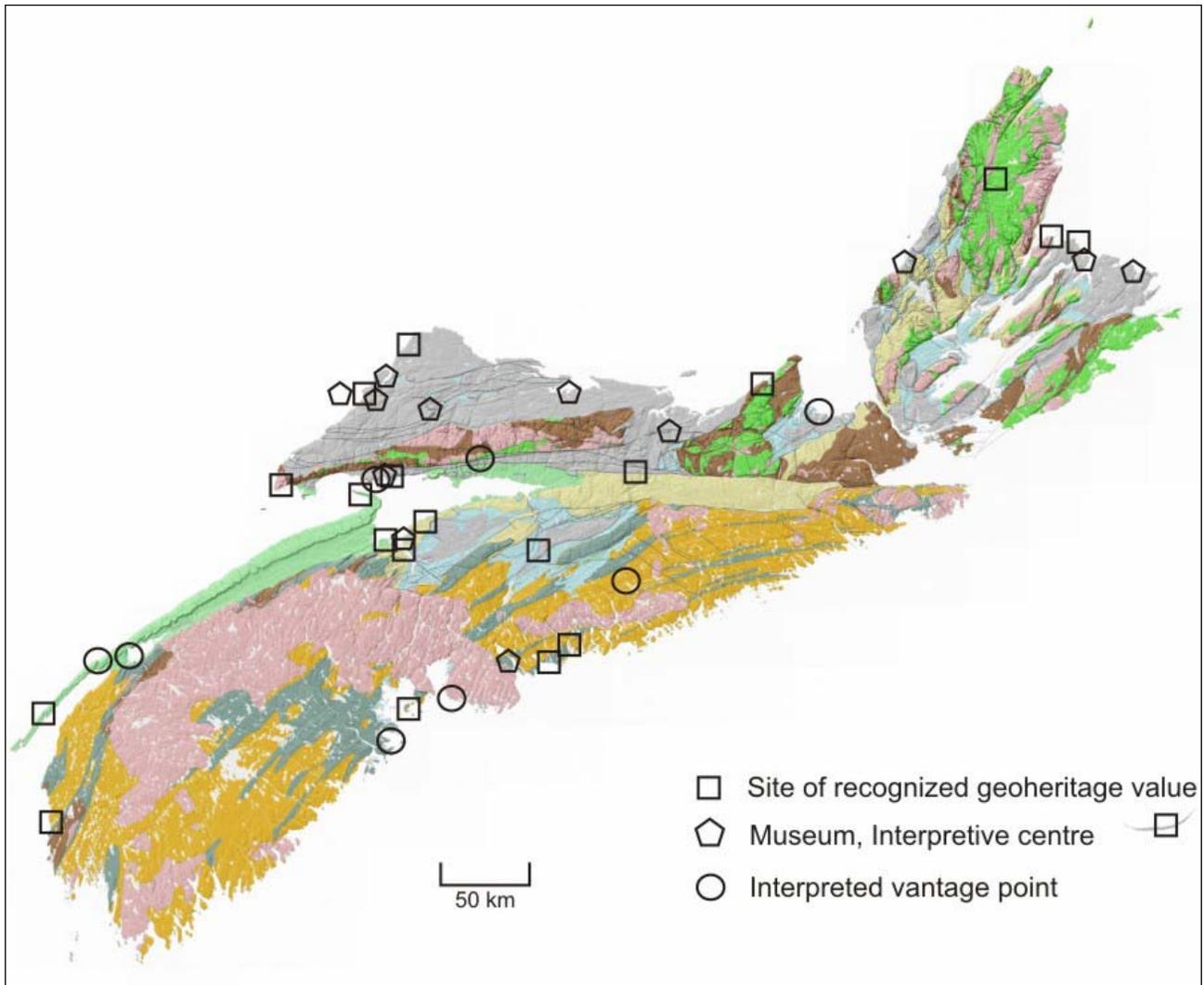
\* where geology figures prominently in interpretation

## Special Places

In Nova Scotia, the *Special Places Protection Act* permits sites to be identified that are of strategic scientific or cultural value. Geoheritage sites in Nova Scotia that are singled out include the Joggins Fossil Cliffs and ‘fossil cliffs of Parrsboro’, which includes the early dinosaur site of Wassons Bluff.

## National and Provincial Parks

Although no National or Provincial park in Nova Scotia has been designated specifically to protect geoheritage, each park has a characteristic landscape shaped by the underlying geology. The beachscape of each of the province’s many beach parks, for example, is very much a geological phenomenon. Certain parks, such as Five Islands



**Figure 2.** Map illustrating geoheritage sites and interpretation across Nova Scotia.

Provincial Park and Arisaig Provincial Park, include significant geological features or fossil sites.

### Municipal Parks

Similarly, Municipal Parks have not been designated solely on the basis of geoheritage, but may include geological sites of interest, such as glacial features in Point Pleasant Park in Halifax Regional Municipality, or the exposures at Victoria Park in Truro.

### Museums and Interpretive Centres

Museums and interpretive centres (Table 4, Fig. 2) play an important role in conveying the relevance of geoheritage. Provincial museums that celebrate our physical geoheritage include the Fundy Geological Museum, Parrsboro, and Nova Scotia Museum of Natural History, Halifax, whereas the Joggins Fossil Centre draws connections between the geological record of Joggins and its

**Table 3.** Examples of physical geoheritage in Nova Scotia.

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*Late Proterozoic-Early Phanerozoic*

Cape Breton Highlands (Inverness and Victoria Co.): oldest rocks in Nova Scotia

*Cambrian*

High Head (Yarmouth Co.): trace fossil Lagerstätten (fossil site of exceptional preservational quality)

Tanook Island (Lunenburg Co.): oldest body fossils (trilobites) in Nova Scotia

*Silurian*

Arisaig (Antigonish Co.): Silurian seascape

*Late Paleozoic*

Cobequid Fault (Cumberland-Colchester-Pictou-Guysborough Co.): Pangean terrane boundary

Rainy Cove (Hants Co.): spectacular deformation of sedimentary beds and Triassic unconformity

*Devonian to Carboniferous*

Peggys Cove (Halifax Co.): granite batholith

*Mississippian*

Cape Dauphin (Victoria Co.): shallow marine carbonate mounds and reefs

Blue Beach (Kings Co.): rare record of early terrestrial amphibians

*Pennsylvanian*

Joggins Fossil Cliffs World Heritage Site (Cumberland Co.): fossil forests of the 'Coal Age' and earliest reptiles

New Glasgow (Pictou Co.): dramatic exposure of folded and faulted coal-bearing rocks

Sydney Mines (Cape Breton Co.): superlative fossil forests of the later 'Coal Age'; ancient response to global change

*Permian to Carboniferous*

Brule (Colchester Co.): Walchian forest and earliest group behaviour by tetrapods

*Triassic*

Wassons Bluff (Cumberland Co.): early dinosaurs and their landscape

Cape Split (Kings Co.): flood basalts of Pangea's breakup; viewscape of Bay of Fundy

Brier Island/Tiverton (Digby Co.): columnar basalt

*Jurassic*

Clarks Head (Cumberland Co.): prosauropod dinosaur site

*Quaternary*

Cape Chignecto (Cumberland Co.): raised beach

Lawrencetown (Halifax Co.): drumlins

Parrsboro Gap (Cumberland Co.): depositional glacial landscape

Prospect/Peggys Cove (Halifax Co.): erosional glacial landscape

Point Pleasant Park (Halifax Co.): features of glacial movement

Rocking stones (Halifax Co.): glacial erratics

*Recent*

Pomquet Beach (Antigonish Co.), Lawrencetown (Halifax Co.): barrier island, beach

Bay of Fundy tidal system (Cumberland, Colchester, Hants, Kings, Annapolis, Digby and Yarmouth Co.): world's highest tides, tidal bore, tidal rivers

Chezzetcook (Halifax Co.): salt marsh

Tantramar Marshes (Cumberland Co.): reclaimed salt marsh

Peat bogs (province-wide): millennia-scale history of peat and climate change

Sable Island: offshore sand bank and dune system

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## 6 Mineral Resources Branch

**Table 4.** Museums and centres that interpret geoheritage in Nova Scotia.

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*Natural Geoheritage*

Blue Beach Fossil Museum, Hants Co.  
Cape Chignecto Provincial Park, Cumberland Co.  
Creamery Square Heritage Centre (Brule fossil site), Colchester Co.  
Fundy Geological Museum, Cumberland Co.  
Joggins Fossil Centre, Cumberland Co.  
Nova Scotia Museum of Natural History, Halifax Co.  
Ovens Natural Park, Lunenburg Co.

*Cultural Geoheritage*

Amos Seaman School Museum (Lower Cove grindstone quarries), Cumberland Co.  
Cape Breton Miners Museum, Cape Breton Co.  
Inverness Miners Museum, Inverness Co.  
Moose River Gold Mines, Halifax Co.  
Museum of Industry, Pictou Co.  
River Hebert Miners Memorial Museum, Cumberland Co.  
Springhill Miners Museum, Cumberland Co.  
Stellarton Miners Museum, Pictou Co.  
Sydney Mines Heritage Museum, Cape Breton Co.

*Interpreted Vantage Points*

Annapolis Valley Look Off, Digby Co.  
Londonderry, Colchester Co.  
Partridge Island, Cumberland Co.  
Peggys Cove, Halifax Co.  
Pomquet Beach, Antigonish Co.

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significance to the community and to humanity. Miners' museums at Springhill, Glace Bay and elsewhere have particularly close ties to community and are uniquely poised to establish links between culture and geology, as are First Nations interpretation centres that draw links between the Earth and spiritual traditions.

## The Role of Geotourism Sites

Privately run centres and geotourism sites can fulfill an important role in advocacy and by providing access to the public. Such sites often are managed by individuals who recognize the

significance of the site and are prepared to act as its steward. This is particularly so when the owner collaborates with a mentoring geoscientist, as has been the case at Joggins and the Early Carboniferous fossil site of Blue Beach, near Wolfville.

## Natural Sites Showcasing Geological Processes

In addition to geoheritage sites that showcase the geologic past, Nova Scotia contains sites that act as 'natural laboratories' – places where the constant geological evolution of the landscape can be seen and studied. This is perhaps the most under-recognized aspect of geoheritage in Nova Scotia. One such example is the Bay of Fundy tidal system, a natural laboratory for viewing sedimentary and hydrodynamic processes in a showcase that is unrivalled. Several sites interpret

and showcase the tidal bore at various vantage points.

## Type Sections

The recognition of geological units and their stratigraphic relationships is a fundamental underpinning of unravelling earth history. The identification of type sections that are used as the reference for a particular geological unit are of singular importance to geoscientists, but there are few measures in place in most jurisdictions to acknowledge their importance (see for example, Miller, 2009). If we as geoscientists do not advocate for recognition and protection of type sections, can we expect others to appreciate their significance? Type sections require assurance of long term access. Where these are fossiliferous or bear exotic mineral specimens, protection from unscrupulous collecting is also required.



**Figure 3.** The Joggins Fossil Centre at the Joggins Fossil Cliffs World Heritage Site.



**Figure 4.** The geological landscape of Peggys Cove.

## Examples of Geoheritage Recognition in Nova Scotia

The World Heritage Site at Joggins and Peggys Cove Preservation Area offer two different approaches to geoheritage recognition. The Joggins Fossil Cliffs are visited primarily for their geoheritage values, particularly since inscription on the list of the world’s heritage. Peggys Cove, on the other hand, is the most visited tourism destination in Nova Scotia known primarily for its aesthetic seascape. The exposures of granite that define this seascape provide the opportunity to serve as a natural classroom for the large number of visitors drawn to the site for its aesthetic values.

At Joggins (Fig. 1), the cliffs are used as a natural classroom and opportunity for discovery, whose significance is conveyed in the innovative Joggins Fossil Centre (Fig. 3). The visitor is introduced to the Coal Age ecosystem, but also to the role that

the geology and fossil record of the site played in some of the great ideas of humankind, including evolution and its cameo in Darwin (1859) (see Calder, 2006). At Peggys Cove (Figs. 4 and 5), interpretive signs at key vantage points introduce the visitor to the origin of the granite rocks as an exhumed batholith and the geological features that have contributed to the formation of the seascape, including the sculpting of the granites by glacial movement.

## Issues in Recognizing Geoheritage

Recognition of a site’s value brings increased public awareness and attention. Such attention may be a catalyst for geotourism and economic development, which is usually supported by local communities, but it can also bring with it issues of preserving a site’s integrity. Integrity can be

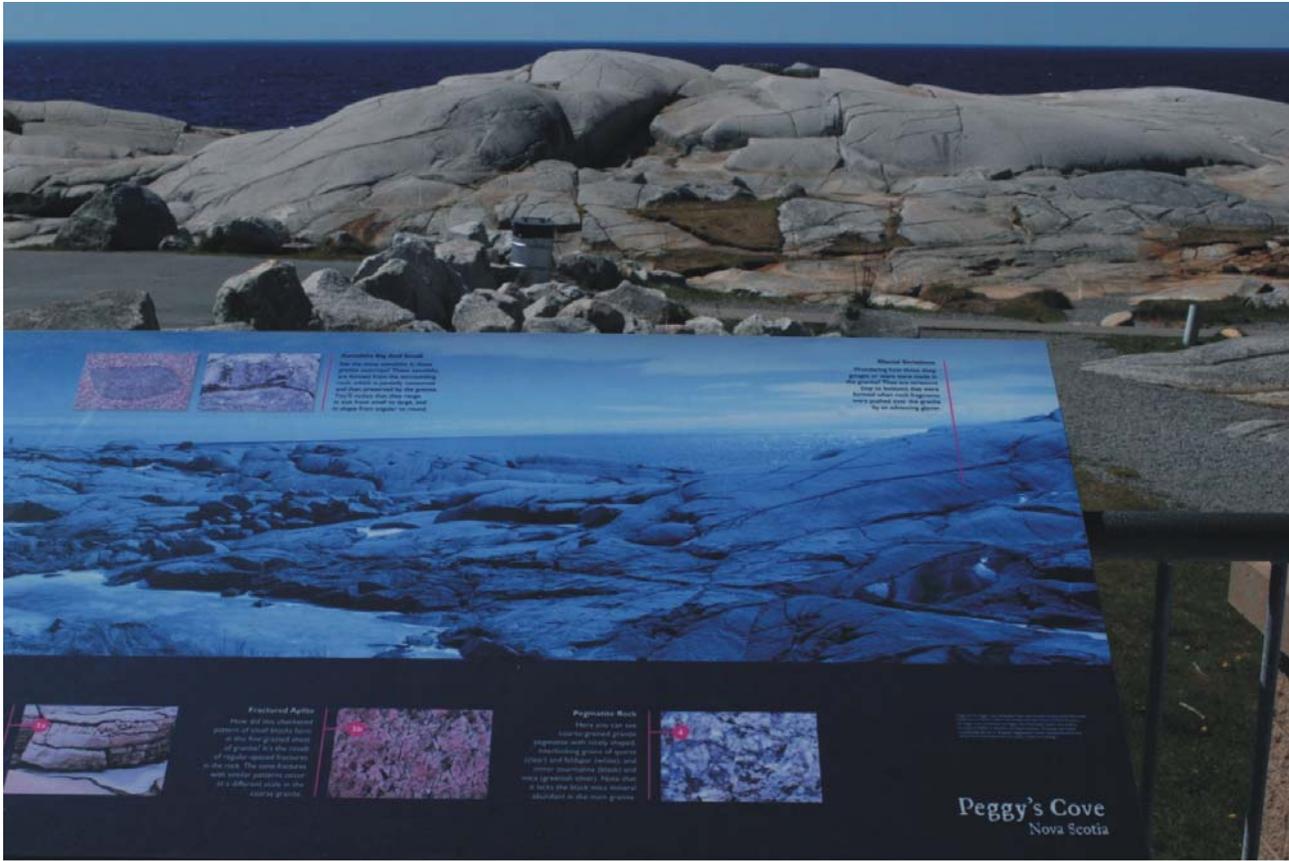


Figure 5. Interpretive sign at Peggys Cove.

defined as the characteristics of a site that are necessary for it to maintain its value. Integrity can be especially problematic for sites whose value can be diminished by the collecting of specimens, either fossil or mineral. This issue can be addressed if a site has sufficient interpretive staff, but this requires dedicated funding. Pressures on maintaining integrity, obviously, are greater at sites with ease of public access. Sites that are scientifically important, but that cannot be adequately protected or monitored, may not be ready or suitable for geoheritage promotion. Geoheritage sites that have their value largely tied to geological landscapes are at generally lower risk of having their integrity compromised, but consideration must be given to protection of their ecology.

## Conclusions

The recognition of our collective geoheritage is

increasingly important as society faces an ever-increasing need to understand our place on the Earth. While the tangible benefits of geotourism have value in their own right, the importance of geoheritage reaches deeper. Nova Scotia, with its rich heritage of scientific exploration, its varied geology, and its dramatic coastline, has both an opportunity and responsibility to celebrate that heritage across the full range of geoheritage recognition. Identifying the legacy of the Earth's history across the province is the first step in realizing this opportunity.

## Acknowledgments

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