Cliffs of Fundy Geopark

Interpretation Strategy

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Contents

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Preface

This document provides an interpretive strategy for the Cliffs of Fundy UNESCO Global Geopark. It specifically addresses recommendations and requirements of UNESCO in their formal Evaluation Report (2019) and in their Letter of Acceptance (2020).

The strategy is presented in two parts.

Sections 1-3 – provide guiding principles of interpretation not only to explain the approach taken, but also for the benefit of future interpreters.

Sections 4-15 – delve into the specific interpretation of the Cliffs of Fundy Geopark.

Appendices – provide supporting elements.

A **key element** of this strategy is how to approach the interpretation of Mi'kmaw heritage, which holds equal standing with geoheritage.

The strategy provides a concise storyline to inform not only interpretation, but also branding and marketing of the Geopark. Although the interpretive strategy focuses on the geological heritage of the Cliffs of Fundy, it draws reference to cultural heritage and other natural history elements, as required of a Global Geopark.

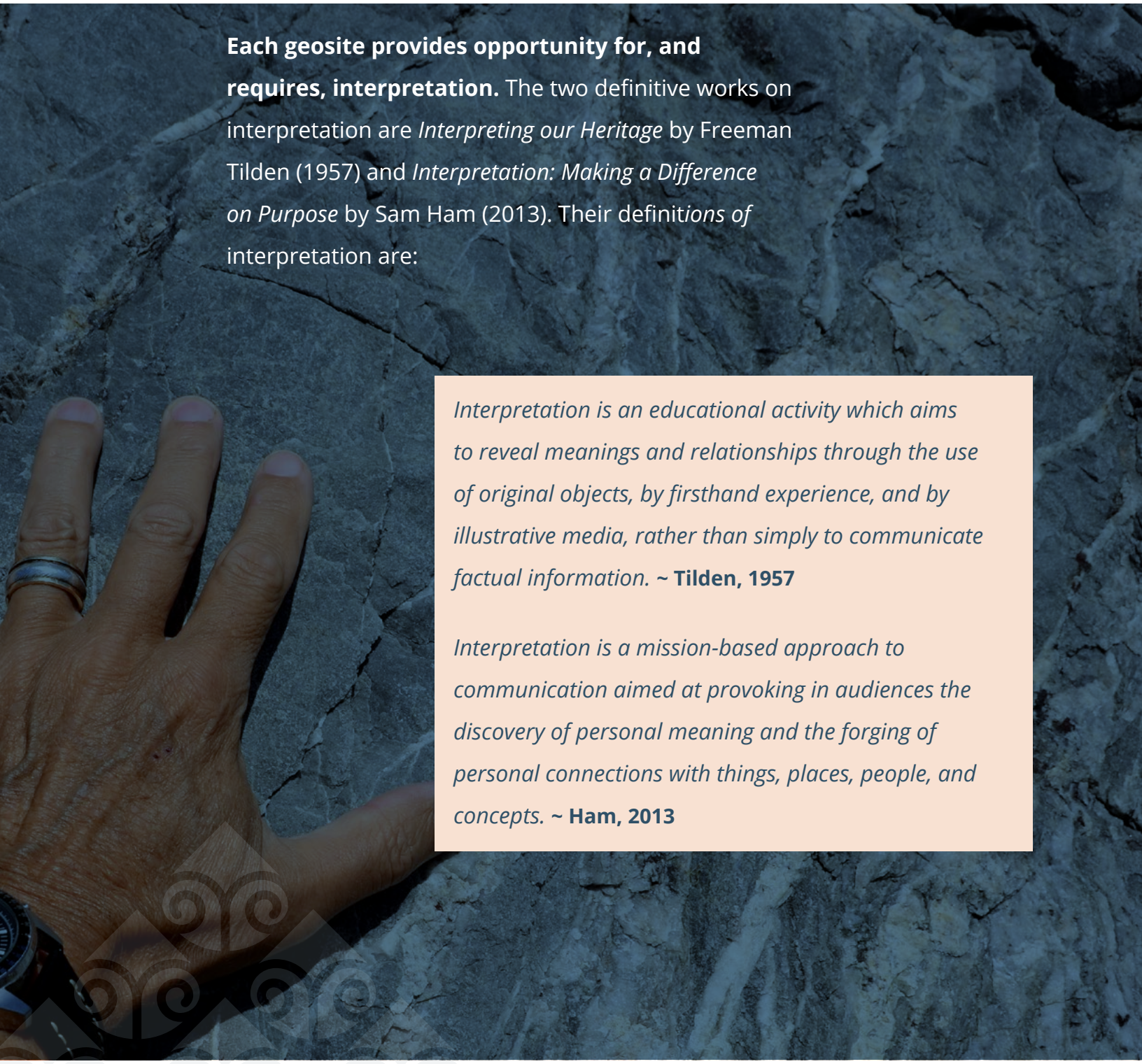
Cliffs of Fundy Geopark

Our logo: communicating the Geopark's identity

The double curve motif is a symbol long cherished by the Mi'kmaq in design, shared with us by Mi'kmaw artist and interpreter Gerald Gloade. By adapting it in our logo, we acknowledge that rich heritage and how it evokes the waves and waters of the bay. It proclaims that the Cliffs of Fundy is part of Mi'kma'wi.

Introduction to Interpretation

01



Each geosite provides opportunity for, and requires, interpretation. The two definitive works on interpretation are *Interpreting our Heritage* by Freeman Tilden (1957) and *Interpretation: Making a Difference on Purpose* by Sam Ham (2013). Their definit*ions of* interpretation are:

> *Interpretation is an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information.* **~ Tilden, 1957**

> *Interpretation is a mission-based approach to communication aimed at provoking in audiences the discovery of personal meaning and the forging of personal connections with things, places, people, and concepts.* **~ Ham, 2013**

Dr. Tim Fedak, Nova Scotia Museum, sharing his interpretation of a vertebrate fossil from Wasson Bluff.

Ham makes the point that interpretation differs from education in a classroom, which tends to be fact-based with a captive audience. Interpretation on the other hand is experiential and the audience is not captive; rather than *students*, the people involved are *visitors* – and they can leave if they so choose. Visitors do not have to worry about good grades or being tested; should they stay and pay attention it is because they choose to do so. According to Ham, the over riding difference in these settings is psychological: the classroom is an environment in which the audience has to pay attention, whereas a Geopark is a setting in which the audience – visitors – do not have to pay attention. It is the role of the interpreter to entice the visitor to pay attention, to follow the trail, through opening phrases, arresting graphics and captivating ideas.

Successful interpretation, according to Ham (2013), can achieve the following:

ENHANCE visitor experience.

IMPACT attitudes and promote appreciation for a place.

STRENGTHEN protection and stewardship.

All three align with the goals of the Geopark in creating a memorable visitor experience and in instilling positive attitudes with respect to stewardship and conservation.

Successful interpretation must make a compelling point and hold the attention of the visitor. Specifically, it must meet **four requirements** (Ham, 2013):

1. **have a theme or compelling point**
2. **be organized, easy to follow**
3. **be relevant to the visitor**
4. **be enjoyable to process**

Finally it must accomplish its most fundamental aim of provoking in the visitor a sense of wonder or caring: an answer to the question ***So what?***.

Why use Visuals?

It has been proven that well designed visual elements in interpretation improve learning, memory, and motivation. Visuals can provide content as well as expand on and clarify text.

Some facts to consider

- Approximately 65 percent of the population are visual learners. – Mind Tools, 1998
- The brain processes visual information 60,000 faster than text. – 3M Corporation, 2001
- 40 percent of all nerve fibers connected to the brain are linked to the retina. – Jensen, 1996
- Visual aids in the classroom improve learning by up to 400 percent. – 3M Corporation, 2001
- People can remember the content of 2500 pictures with over 90 percent accuracy 72 hours after looking at them for only 10 seconds. A year later participants had 63 percent recall of those same images. With traditional lecture format delivery, students only remember 10 percent of the material 72 hours later. – Crockett, 2010
- Ideas presented graphically are easier to comprehend and remember than those presented as words. – Kliegl, R., Smith, J., Heckhausen, J. & Baltes, P.B. (1987)

In the process of developing interpretation it is important that visuals are considered as a primary element and not as a second thought. Their effectiveness depends on their appropriateness and impact, which should be part of the interpretive planning process. Ham (2013) goes further, stating that a proper theme needs to be presented as a marriage of image and text.

Who is our Audience?

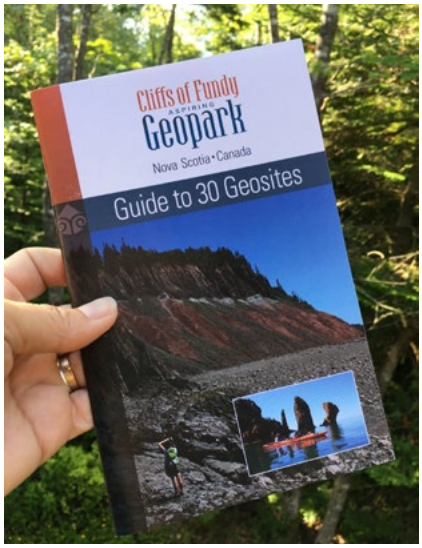
The short answer to this question of course, is anyone and everyone. Given the location of the Geopark, we can do better than this: local residents and visitors. Tourism Nova Scotia analyzes visitors to the province, and their intentions. The largest category of visitors categorized by a measure known as *Explorer Quotient* are Authentic Experiencers (26%), whose characteristics fit well with experiences offered in the Cliffs of Fundy Global Geopark. For those seeking Outdoor Activities, the number one activity is coastal sightseeing (51%). Hiking (34%), nature observance (28%) and viewing the world's highest tides (20%) come in at third, fourth and fifth.

Our audience can be expected to include people with a diverse spectrum of interests and backgrounds, including

- local beach walkers
- casual hikers
- wilderness hikers
- campers
- people reconnecting with their Mi'kmaw heritage
- researchers
- university students on field excursions
- couples on a getaway
- families on vacation
- photographers
- visual artists
- mineral collectors
- beachcombers
- birders
- youth groups
- ... and so on!

All of these folk can be described however by their behaviour as either browsers or deep divers (*studiers* in the parlance of Ham, 2013. Ham further distinguishes those who basically pass through as *streakers*). **Studies have shown conclusively that most visitors fall into the category of browser; they can be convinced to tarry longer if the interpretive presentation is well conceived and delivered – and is provocative.** Deep divers or studiers are in the minority and are likely to be participants in a focused, guided tour or field trip.

Another important concept is **how the interpretation is accessed by the visitor**: by signage at the trailhead or shore, or with them as a guidebook or App. Interpretive signage is inherently limited to the information that it can convey, or more accurately, by how much the reader can absorb. A person can only carry so much information in their head from the panel to their destination; studies have shown in fact that only between 3 and 4 main points *stick* with the visitor. It is a common mistake to use too much text: very, very few people will stand there and read the entire text, and worse, many people will be put off by excessive text and will not read it at all. Even at geological conferences, posters commonly employ too much text, where the author cannot bear not to include everything that they know or have done in words. It is also part of the reason why oral sessions are better attended than poster sessions; the oral session has an interpreter (the speaker) conveying the information.



Interpretation of Geosites

02

Interpretation of geosites in UNESCO Global Geoparks must convey the significance of the geological story in a succinct manner that is understandable to the general visitor.
Because such signage or Apps are most often self guided, this interpretation must be self contained.

Specifically it must be:

- **understandable to the general public, avoiding scientific terminology and underlying concepts that are unexplained**
- **scientifically correct**
- **succinct, due to spatial constraints**

Remember your audience.

Stylistically, such interpretation should not avoid being enthusiastic. Scientific writing for journals is criticized if it conveys emotion as this is considered to be subjective, but such dialogue, even when 'translated' can come across very 'flat'. Illustrations are vital in conveying complex concepts.

The following excerpt is taken from a Geopark website that is intended for public consumption; it is a profound example of how scientific terminology can be a roadblock to understanding:

"From a geomorphological point of view, the Geopark shows clear evidence of both the glacial morphogenesis that remodelled the area intensely and of karstic morphogenesis with a vast array of unique and spectacular epigeal forms and an articulated and well-known hypogeal network."

Alternative wording removes these roadblocks:

"The Geopark has been shaped by recent geological processes both above and below ground: the movement of glaciers remodelling mountains and valleys, and the action of groundwater dissolving the rocks to form a spectacular karst landscape."*

Note that the word "karst" was included; select geological words are important to introduce, but they must be used judiciously. In this case, karst is introduced by the preceding phrase, that is, a landscape formed by "the action of groundwater dissolving the rocks".

(for more on language, see Design of Interpretive Panels, Text, p.47)

The following are **elements of an engaging interpretive strategy** for geosites:

- grounding the visitor in time and space ("Where am I in Earth history?" and "Where does this site fit in the story of the Geopark?")
- inviting language that speaks to the interested layperson
- non-exclusion of visitors by avoiding unexplained scientific terminology and concepts
- reference to other learning resources
- orientation with respect to nearby or related geosites ("Where am I in the Geopark?")
- identification of neighbouring geosites within the viewplane
- access to tourism information (washroom facilities, tours, nearby food and accommodation)

(for more information, see Design of Interpretive Panels, p.45)

Delivery of Interpretation

03

Interpretation of geosites within the Geopark can be achieved – delivered – in ways that range from self directed to guided. *Self discovery* is largely accidental, when a visitor happens upon a geosite, whereas *self guided* visitors are prepared on their own. *Guided walks* and *field trips* offer interpretation in person. *Activities* involve hands on, experiential learning, and *discovery through the arts*, such as interpretive painting, can involve deep self discovery that is far from accidental. I refer to this as the **Circle of Discovery**.

Discovery through the arts

Self discovery

Circle of Discovery

Activites

Self guided

Guided walks and field trips

The UNESCO Global Geopark evaluators focused on the placement of outdoor interpretive panels at geosites, but also additional interpretive materials – these apply primarily to the *self guided* visitor, although they can support *guided walks and field trips* as well. Web-based interpretation tools (*Apps*) were not evaluated during the mission. The evaluators also specified self guided tours (see List of Geotours, p.39) and guided tidal tours.

The following are some of the **potential tools in an interpretation tool kit** for the Geopark and their applicability to the types of discovery.

Physical (on-site)

Interpretive panels	Self guided or guided
Take away pamphlets	Self guided
Geopark Guides (persons)	Guided

Physical (off-site)

Official guidebook(s)	Self guided (also guided)
Visitor map of geosites and centres	Self guided
Third party guidebooks (trails, waterfalls, etc.)	Self guided

Web-based (on- or off-site)

Website	Self guided
Locatify App	Self guided
ESRI StoryMap	Self guided (pre/post trip)
Virtual field trips	Self discovery, self guided or activity

Self Guided vs Guided Geotours

The difference in wording for a guided tour versus an interpretive description lies in the use of verbs – actions such as “witness” or “learn” that evoke an experience. That experience is enhanced primarily by being in company of a guide, although self guided learning can also be offered.

The following is an example for the geosite of Clark Head:

Experience the Geological Wonderland of Clarke Head. *Witness* the power of the Earth as Pangea assembled, “inside” a major fault zone. *Learn* how geologists solve complex riddles – in this case the unusual geological features of Clark Head.

Guided tours of certain geosites, in particular to Wasson Bluff with hands-on experiential activities, have been developed over many years by staff of the Fundy Geological Museum.

Randy Corcoran boat tour. (Photo: Tim Fedak)

The Story of a Quartz pebble from Carrs Brook:

An example of interpretive storytelling delivered in person, inspired by Dr. Tim Fedak, Curator of Geology, Nova Scotia Museum.

The orange-red sandstones at Carrs Brook contain trains of rounded white quartz pebbles (as do those at Red Rocks, Cape Chignecto Provincial Park). By being shown and handed a solitary pebble, the visitor immediately experiences the tactile sensation of the smooth pebble, but is also challenged to think from where it came. Quartz is one of the most resistant minerals on planet Earth, and can withstand long journeys of travel and rock tumbling in rivers or on beaches, while other minerals break down. But the story of these quartz pebbles has a twist that the interpreter can share: these look exactly like the stones that are found in the gut contents of dinosaurs. Such stones, called gastroliths, were intentionally swallowed by dinosaurs to aid in the breakdown of food, just as modern birds do. This of course, can lead into the story of dinosaur evolution, and how they evolved into birds (dinosaurs still exist!). An intrepid visitor might ask "Did the dinosaurs pluck the quartz pebbles from the rocks?" - another "Aha" moment of interpretation: these weren't rocks at the time the dinosaurs lived, they were sands in a river channel, and the quartz pebbles lay on the channel bottom, there for the swallowing by a dinosaur pausing for a drink some 200 million years ago.

Such is the magic of person to person interpretation.

UNESCO Recommendations

04

Cliffs of Fundy received recommendations from the on-site evaluators in their 2019 evaluation report and later in the 2020 acceptance letter from the UNESCO Secretariat.

Global Geoparks evaluators Dr. Nickolas Zouros and Dr. Asier Hilario at the Wasson Bluff geosite and Special Place.

The following **explicit recommendations** (*in italics*) were made by UNESCO Global Geopark evaluators in their 2019 report.

> *A full interpretative strategy must be designed, including the storytelling that in our opinion should place the highest tides of the world in the first position.*

It is important to note that this recommendation was made as part of a larger recommendation for a comprehensive, integrated plan to raise the visibility of the Cliffs of Fundy Geopark.

Two clear initiatives were identified as key components of the interpretive strategy:

1. *Interpretive panels with common design placed in the field.*

   Other interpretative materials created, placed in the field. (Note: neither the ESRI StoryMap nor the Locatify App were directly presented to the evaluators during their mission.)

2. *An interpreted, self guided Geotrail network (created in a selected number of geosites).*

Other recommended initiatives to raise visibility of the Geopark:

- *Creation of a network of tidal viewpoints to admire the power of the highest tides on Earth.*
- *Guided tours to low-tide geosites.*
- *Creation of a self guided road trip through the Geopark main viewpoints and geosites.*

The revalidation mission by UNESCO Global Geoparks Network evaluators will expect to see that these and other recommendations have been realized. As expressed by the original (2019) evaluators, these recommendations ultimately are made to enhance the success of the Geopark.

Additional recommendations received subsequently from UNESCO in the Cliffs of Fundy acceptance letter of 16 July, 2020 (Ref: SC/EES/EGR/20/12185) include:

1. *Further involvement and analysis in Climate Change are needed in the territory; findings should be incorporated into educational activities.*
2. *Strengthen partnerships and the involvement of the local Indigenous community engaging them in decision making and using their Indigenous knowledge in interpretation and other Geoparks activities.*
6. *Encourage new commercial activities within the Geopark territory (i.e., helicopter flights, boat trips, etc.) and consider the development of specific guided tours during low tide period.*
8. *Consider the potential of opening new public sites related to the observation of high tides and update tourist maps for visitors detailing all sites, facilities and partnerships.*
9. *Develop a marketing plan that defines the global concept for the territory, ensuring inclusion of added value concepts such as "The highest tides on Earth".*
11. *Possible future integration of sites related to the highest tides on Earth.*

Mi'kmaw Geoheritage

05

The legends of Kluscap (Glooscap) are well known even to the non-Indigenous community, a testimony to their resonance with the people of the Cliffs of Fundy. As well known as they are, it nonetheless falls on the Mi'kmaw people to tell this story, as it is theirs. Two historic written accounts that stand out of Kluscap's role in shaping the Cliffs of Fundy are those of Mi'kmaw Thomas Boonis as recounted by Silas Rand (1894), and Mi'kmaw Jerry Lonecloud recorded by Clarissa Archibald Dennis (1923). Few places in the Geopark escape mention in these tales, from the muddy waters of the upper bay, stirred by Beaver to escape Kluscap, to Isle Haute, where Moose was turned to stone while Kluscap's two dogs looked on from Cape Chignecto.

"Nothing about us without us"

The late Mi'kmaw elder Doug Knockwood, reflecting on the life and skills of his uncle John at his cabin at Franklin Manor.

Indigenous artwork is an important 'voice' in fixed interpretation at geosites or in general: here, the artist 'speaks' in their voice, on their terms. Art is an important cross-cultural bridge and its use is highly recommended.

Here, Mi'kmaw artist Gerald Gloade interprets the stories of Kluscap at the Bay of Fundy (Kluscap's farewell, atop Whale), Partridge Island, and Three Sisters.

Figure 2 *Story sites of Kluscap (Glooscap) legends (courtesy Gerald Gloade, Confederacy of Mainland Mi'kmaq)*

These rich legends are an oral tradition of the Mi'kmaq spanning generations and millenia. Gerald Gloade, Millbrook First Nation and educational officer with the Confederacy of Mainland Mi'kmaq has recorded many of the stories of Mi'kmaw heritage within the Geopark. Here then is a potential case of best practice in the use of QR codes: oral stories of Mi'kmaw heritage in the voice of the Mi'kmaw people at the actual site in the legend. Their role and ownership of interpretation within the Geopark is vitally important from the standpoint of authenticity and has economic development potential for Mi'kmaw partners and interpreters.

Mr. Gloade has been generous in sharing his knowledge of the stories of Kluscap and of broader Mi'kmaw heritage (Calder and Gloade, 2016); he provided the story sites of Kluscap depicted in Fig. 2.

These story sites from east to west are:

- Mik'mawey Debert
- Bass River
- Economy
- Gerrish Valley
- Five Islands
- Wasson Bluff
- Clarke Head
- Partridge Island
- Cape Sharpe
- Cape Spencer
- Horseshoe Cove
- Cape D'Or
- Cape Chignecto
- Isle Haute

Figure 3 *Place names and sites from Kluscap (Glooscap) legends (courtesy Gerald Gloade, Confederacy of Mainland Mi'kmaq)*

Additional sites in the Kluscap legends (Figure 3) include:

- Salmon River
- Spencer's Island
- Refugee Cove

Traditional knowledge transcends stories, however. The use and knowledge of native plants for their healing properties and sustenance is an important part of Mi'kmaw cluture that has potential to be shared if deemed so by the Mi'kmaq; Kluscap's Garden atop Cape d'Or is one such place and story. That said, the Geopark must avoid the temptation of assuming that once sharing has occurred that there is no need for further consultation and collaboration. These stories may be shared by the Mi'kmaw people, *but they remain the owners of their history and legends*.

Storylines for the Geopark and its Geology

06

A UNESCO Global Geopark is a fusion of geological heritage, cultural heritage and sustainable economic development.

To realize all that a Geopark can be, and can offer to the people of a region, a unifying storyline needs to connect all three.

This is an important starting position.
The storyline needs above all to

- **establish the uniqueness of the Geopark**
- **guide interpretation**
- **inform marketing**
- **inspire education**
- **connect and respect our culture**
- **act as a launch pad for sustainable economic development that draws on the uniqueness of place**

Geopark Pillars

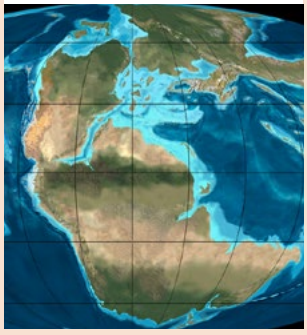
The storyline of the Cliffs of Fundy UNESCO Global Geopark is our calling card to the world. The storyline of the Geopark comprises three main pillars that establish our identity. **Each pillar also establishes our Geopark not only as internationally significant but as *globally unique*.** The Indigenous story of Kluscap is incorporated within the Storyline, a recognition of "Two Eyed Seeing" whereby Mi'kmaw and conventional scientific interpretation are given equal standing.

These three pillars are consistent with the application document for Cliffs of Fundy that was submitted to UNESCO.

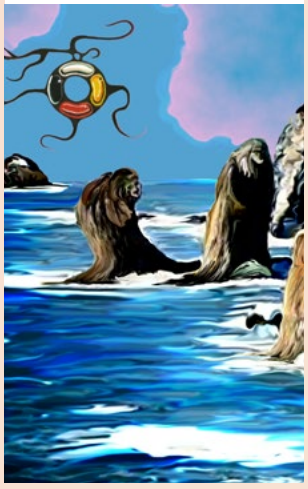
The **three pillars** that define our unique identity

The highest tides on Earth

The best place in the world to see the geological story of the supercontinent Pangea and its breakup



The land of Kluscap, Mi'kma'wi



Geopark Storyline

The Master Interpretive Plan of the Nova Scotia Museum (2009) challenges an interpretive theme to answer the question "What do you want visitors to understand and appreciate about Nova Scotia [here insert Cliffs of Fundy] when they leave". For visitors to the Cliffs of Fundy UNESCO Global Geopark, the answer might sound something like "The Geopark is spectacular and globally unique both in its nature and culture." The storyline of the Geopark should set this expectation.

The ***unifying geological feature*** that links the three pillars is the Cobequid Fault, a feature so profound that it is visible from space. It was along this ancient transform fault that Pangea finally assembled, and it was this zone of weakness in the Earth's crust that was reactivated during Pangea's breakup, forming the rift valley that would one day fill with rising seas and resonate with the highest tides in the world.

The ***unifying interpretive message*** (a true "theme" in the parlance of Ham, 2013) that is common to these pillars is one of **change**: geological change, climate change, changing tides – even the change that Kluscap brought to the landscape. From a human perspective, the profound change that occurs continually with the 6 ¼ hour pendulum of changing tides is inescapable to those who visit or live on our shore. But change has occurred at the scale of tens of thousands of years, recorded by the melting ice caps that last left our Geopark 10,500 years ago as people first inhabited the land, and by the birth of the Bay of Fundy itself. Most people understand that life has changed as recorded by fossils, but may not think beyond to the more profound change recorded in the rocks themselves, over hundreds of millions of years.

A unifying storyline that succinctly captures the unique geological and cultural heritage of the Geopark is essential to the development of interpretation, education programs, and also marketing. This storyline says “who we are” and differentiates us from other UNESCO Global Geoparks. It should also reference the international significance of the Geopark, as this is now a required element of all UNESCO Global Geoparks. But more than just a geological storyline, it is also the storyline of the Geopark.

Geopark Storyline

The Cliffs of Fundy UNESCO Global Geopark changes before your very eyes, shaped by the highest tides in the world, on the shores of the Bay of Fundy. The sea cliffs created by these extreme tides showcase both the assembly and breakup of the supercontinent Pangea better than anywhere on Earth. This is the home of the legendary figure Kluscap, whose feats in shaping the iconic seascapes of the Cliffs of Fundy are recorded in the oral traditions of the Mi’kmaw people.

Geological Storyline

The Cliffs of Fundy embodies change over hundreds of millions of years, recorded in a diverse geological mosaic that reflects its dynamic history of fault movement and geological processes that occurred due its plate tectonic history, its more recent history following the melting of the last glacial ice cover and even more recent development of the highest tides on Earth. The storyline conveys the most important element(s) of this complex geology and history in plain language that is accessible to all who visit or live in the Geopark. (Deeper scientific summary, as for example in the Application to UNESCO, 2018 or in scientific literature, is not the subject of this interpretive strategy).

Caution was exercised in avoiding reliance on the generic storylines of geodiversity ('we have a lot of rock types') and especially of geologic time ('our rocks are old, or span a long time'). The latter storyline has been used at many UNESCO Global Geoparks, in particular the neighbouring UNESCO Global Geoparks of Stonehammer and Discovery, as well as the UNESCO World Heritage Site of Joggins. Simply stating that "we are old" however, is an abdication of deeper interpretation and understanding and most importantly fails to establish uniqueness.

It is not possible to capture the nuances of every single geosite in a concise storyline, but it must capture the majority and at least be relatable for all geosites. An example of this concept is the geosite of Economy Falls, and other sites within the Cobequid Highlands. Many of these rocks predate the assembly of Pangea, but were the foundational building blocks of its assembly. The 734 million year old rocks over which the Economy River tumbles are in fact the oldest crustal rocks exposed in Nova Scotia of the ancient land (terrane) of Avalonia, one of the pieces later incorporated into Pangea. This uniqueness justifies inclusion of Economy Falls and provides an "I didn't know that!" moment for the visitor, which can be related to the over arching geological storyline.

Geo-cultural sites as well can be related to the storyline: the 'ghost town' of Acadia Mines (now Londonderry) was not in this location by mere chance. The iron ore that was mined here from 1844 to 1914 is genetically related to the Cobequid Fault and to the final assembly of Pangea (such ore deposits are known by the acronym IOCG: iron ore-copper-gold).

Most geosites will convey one of the foundational pillars of the Geopark's storyline. Coastal geosites will often convey two. Cape D'Or is one geosite that embodies all three.

Geological Storyline

The Cliffs of Fundy are the home of the legendary figure Kluscap, whose feats and exploits shaped the iconic seascapes that are central to the identity of the Indigenous Mi'kmaq.

The Cliffs of Fundy UNESCO Global Geopark – and all life here – is shaped by the highest tides in the world, on the shores of the Bay of Fundy. The increasing tidal range was born of rising sea level and a warming planet as glacial ice melted and reshaped the land thousands of years ago. The timing of the tides and the shape of the bay combine to create a pendulum-like resonance that creates the highest tides on planet Earth.

The sea cliffs eroded by these extreme tides showcase geological features that record the breakup of the supercontinent Pangea, and before that, the assembly of Pangea from long-lost ancient continents. The Cobequid Fault, comparable in its day to the modern San Andreas Fault, formed as continents slipped against one another more than 300 million years ago to build Pangea. The fault was active again as Pangea broke up over 100 million years later, forming a parched rift valley and hot desert landscape.

The breakup of Pangea witnessed a vast outpouring of lava at the end of the Triassic Period. This event, preserved in the basalt islands and headlands of the Cliffs of Fundy, is implicated in a mass extinction event that ushered in the Jurassic reign of dinosaurs, some of whose remains are found within the Geopark. Within the ancient lavas are found both copper and semi-precious stones like agate and amethyst that have enchanted humans for millennia.

Nearly 200 million years later, the Geopark was covered by ice-age glaciers, which carved away at the bedrock creating broad valleys and depositing bouldery moraines. As the ice melted away sixteen to eleven thousand years ago, the first humans arrived in the area and the sea again invaded the bay. The tides came to dominate life on its rocky shores, while its waves carved the spectacular Cliffs of Fundy, showcasing hundreds of millions of years of Earth history.

Geopark Topics

The geological storyline repeats the three pillars of the Geopark, and addresses several additional topics.

In addition, in the phrase “all life here”, the geological storyline references ecology, geobiology and cultural heritage. Additional topics were identified during the course of evaluating each geosite. Geosites and corresponding topics are found in the Geosites Table, Appendix D, p.70.

- climate change and coastal erosion
- mines and minerals
- fossils, including dinosaurs
- evolution and extinction
- glacial processes and climate change
- ecology
- geobiology
- history of Geology
- geohazards
- heritage
- geoconservation: the value of geological heritage

Interpreting
Cliffs of Fundy Geosites

07

The diverse geological heritage and dramatic coastal exposures created by the Bay of Fundy tides afford the Cliffs of Fundy a remarkable number of potential geosites – both a blessing and a challenge of choice. Geosites that tell the storyline of the Geopark within the context of the three pillars are those which should receive higher consideration for interpretation. The great number of prospective geosites should be considered in a similar vein to a museum collection: only select specimens are chosen for display and interpretation, even though others in the collection may be of great scientific value.

Each geosite has an individual interpretive storyline. These stories are outlined in the following Geosite Table and the Geosites list by pillar.

(Photo: Tourism Nova Scotia)

Geosite Table

This table outlines interpretive messages, values and concepts for each geosite. When developing interpretation materials, the delivery method and audience will determine how and which of these elements are to be included. The **Geosite Table** can be found in Appendix D, p. 70.

The table includes:

- **Geosite name**.
- **Mi'kmaw placename**, where known.
- **Short interpretive message** for each geosite that can be used in Apps or tourist maps, and which guide fuller treatment in interpretive panels.
- **Mi'kmaw significance**. Sites of particular significance in Mi'kmaw culture.
- **Pillar of international significance**. Geosites are linked to one or more of the three main pillars of global uniqueness. *Note:* the pillar of "Pangea" is subdivided into Birth of Pangea (Carboniferous and older rocks and geological events) and Last Days of Pangea (Triassic-Jurassic rocks and geological events).
- **Topics for interpretation** that apply to each geosite.
  The list of topics includes the following:
  - climate change and coastal erosion
  - mines and minerals
  - fossils, including dinosaurs
  - evolution and extinction
  - glacial processes and climate change
  - ecology
  - geobiology
  - history of Geology
  - geohazards
  - heritage
  - geoconservation: the value of geological heritage

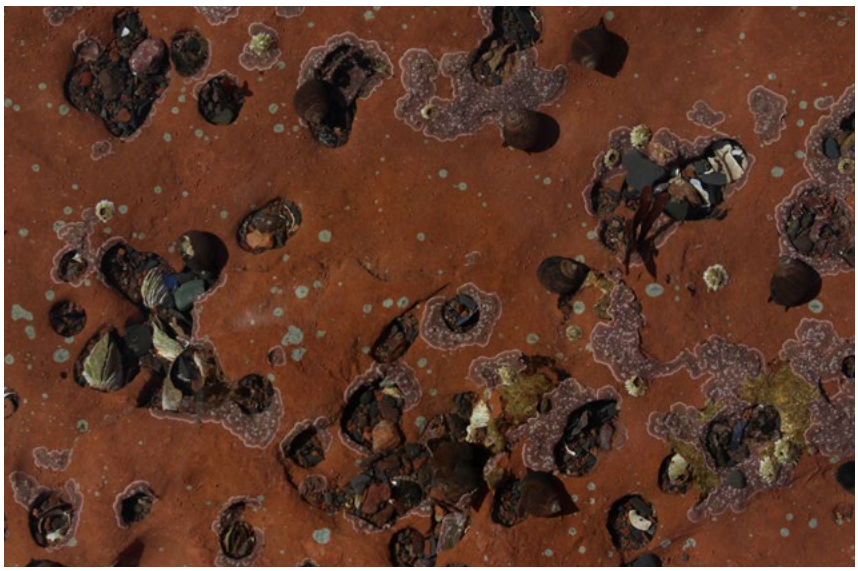
- **Conceptual elements** are essentially educational topics. They are primarily geoscientific in nature and require fuller explanation and deeper interpretation (in person or by links and reference to additional resources) explored through educational programming. Conceptual elements will be further identified during the course of educational programming, but the following have been identified as a starting point for consideration:
  - tides and tidal bore
  - tidal sediments: the muddy waters of the upper bay and its estuaries
  - tidal bedforms and structures: ripples, megaripples and sand bars, beaches and tombolos
  - farmland reclamation by dykes
  - plate tectonic theory
  - the assembly and breakup of Pangea
  - faulting and deformation of rocks: ancient earthquakes and the power of the moving Earth

Basalt cooled from lava is an example of modern day geological processes and events being used to interpret their ancient counterparts – the concept of uniformitarianism. (Lava photo from National Geographic)

The concept of present day sedimentary environments being used to interpret the past, in this case rippled sand bars with beds at East Bay.

- geological time and how we date rocks
- metamorphism
- igneous activity in the subsurface (magma to granite) and on the surface (lava flows to basalt)
- reading sedimentary rocks using modern examples (e.g. ripples, mudcracks)
- identification and origin of minerals such as native copper and gem stones such as agate, zeolites and amethyst
- how living things become fossils
- interpreting fossil footprints
- identification of beach pebbles
- how our landscape was shaped by glaciers
- how the bay filled as sea level rose
- cold glacials and warm interglacials and what drives them
- coastal erosion: sea stack and sea cave formation, headlands and islands
- the concept of geobiology: linking life to rocks and soils (e.g. threatened rock-boring mud-piddocks)

- **Applicable UN Sustainable Development Goal**s for each geosite.
- **Related geosites** that share a common pillar.



The threatened rock-boring clam Barnea truncata *and its preference for the Jurassic McCoy Brook Formation is an example of the concept of geobiology.*

Geosites List by Pillar

Note that many geosites are significant in more than one category, in particular with respect to Mi'kmaw heritage and tidal significance for coastal geosites.

** Denotes addition to original geosites list with input from G. Gloade, D.W. Piper and G.E. Pe-Piper.*

Mi'kmaw Heritage Sites

- Mi'kmawey Debert
- Gerrish Valley*
- Five Islands
- Partridge Island
- Spencer's Island
- Cape D'Or/Horseshoe Cove
- Three Sisters
- Isle Haute

Bay of Fundy Tides (Recent)

- Fundy Discovery Site
- Upper bay estuaries*
- Soley Cove sea caves*
- Soley Cove "flowerpot"
- Economy Point
- Thomas Cove
- Five Islands Lighthouse Park
- Parrsboro Harbour at First Beach
- Partridge Island tombolo & weir
- FORCE Centre at Black Rock
- Age of Sail
- Diligent River Harbour*
- Apple River*
- Eatonville Harbour
- Eatonville sea stack

World of Pangea

(Carboniferous & Older: 300-700+ million years)

- Londonderry Mines
- Economy Falls
- Clarke Head
- Hidden Falls*
- Jeffers Falls*
- East Bay
- West Bay
- Rams Head
- Wharton
- Wards Falls
- Brookville Rock
- West Advocate
- McGahey Brook
- Refugee Cove*
- Bald Rock Cove & Trailhead*
- Seal Cove*
- Spicer Cove
- Eatonville Loop: Anderson Cove

Last Days of Pangea
(Triassic-Jurassic: 200-220 million years)

- Carrs Brook
- Old Wife
- Red Head
- Five Islands
- The Brothers (Two Islands)
- Wasson Bluff
- Red Rocks

Although not globally unique, an additional grouping is required to capture the geology of the Geopark and in particular the topic of climate change and glacial processes that have shaped our landscape.

Glaciers & Climate Change
(Quaternary: last 10,000+ years)

- Highland Village drowned peat*
- Bass River of Five Islands drowned forest*
- Drowned Forest off Carrs Brook
- Leake Lake*
- Advocate Harbour sea level threat*
- Raised Beach at Squally Point*

Scenic Geodrives

- Lakelands: glacial kames and terraces
- Crossroads: Cobequid Fault*
- Fraserville: Cobequid Highland topography

Points of Geologic Interest

Surficial Geology

- Silica Lake, Castlereagh: diatom deposits*
- Outwash gravel ("Granny's Ice Cream")
- Boars Back esker*
- Gilbert Lake terminal moraine*
- Tunnel valley, upper Bass river of Five Islands*
- Moose River: changing drainage pattern*
- Upper Bass River of Five Islands

Coastal Geology

- Ottawa House sea level rise*
- Eatonville Gorge ("Fissure")

Basin-fill

- Pinkey Point lacustrine beds
- Crane Point fossils, sedimentary strata
- Blue Sac
- Post-Jurassic Fault at Five Islands Provincial Park

Type Sections

- Murphy Brook: earliest basin-fill
- McLaughlin Bluff conglomarates
- McCoy Brook type section
- Others to be compiled

Cobequids Bedrock Geology

- Frog Lake gabbro*
- Rockland Brook Fault mylonite*
- Rory Pond magma mixing*
- East Mines complex dykes*
- McCallum Settlement granite*
- Gamble Lake quartzite, old quarry on Highway 4*
- Gabbro, Highway 4*
- Pleasant Hills pluton at Gamble Lake*
- Pleasant Hills granite on Economy Lake Road*
- Granite contacts on West Moose River woods road*
- Fountain Lake Group*
- Saints Rest (cemetery) coastal erosion*
- North Greville cataclastic diorite*
- Kirkhill diorite*
- Jeffers Brook granodiorite*
- Lynn Road Precambrian basalts, turbidites*
- Moose River Falls*
- North River Falls*
- Others to be determined

Minerals & Mines

- Pleasant Hills lime quarry*
- Quartz Crystal Mine, East River*
- New Britain barite mine*
- Economy Mt. amethyst*
- Byers Lake gold deposit*

Geotours: Linking Geosites

08

The identification and development of geotours connecting some of the Cliffs of Fundy geosites was stipulated in UNESCO's Evaluation Report. Their recommendation echoes that of former Steering Committee and Board member Anne Grabinsky of NovaShores Kayaking, who from her experience as an adventure tourism operator recommended regional bundling of geosites. Such *bundling* is appropriate, given the linear configuration of the Geopark.

Nova Scotia Provincial Park employee and Five Islands resident Carol Corbett sharing her deep knowledge of Five Islands Provincial Park.

List of Geotours

Eatonville – Three Sisters Geotour

- Spicer Cove
- Eatonville Harbour
- Eatonville Gorge (Fissure)
- Sea stack
- Three Sisters
- Anderson Cove

Cape Chignecto Park Geotour

- Red Rocks
- Cobequid Fault at West Advocate
- McGahey Brook Canyon
- Other Park sites to be added (e.g. Bald Rock)

Partridge Island – East Bay Geotour

- East Bay
- Partridge Island Trail
- Crane Point

Waterfalls of the Cobequid Fault Geotour

- Economy Falls
- Wards Falls
- Wharton
- Hannah Falls
- Hidden Falls

Five Islands Provincial Park Geotour

- Fault at Old Wife
- Old Wife
- Five Islands
- Red Head

Cape D'Or-Isle Haute Marine Geotour

- Horseshoe Cove
- Cape D'Or
- Isle Haute

Fraserville Marine Geotour

- Spencer's Island
- Fraserville
- Brookville Rock
- Rams Head
- Cape Sharp

Tours by Air

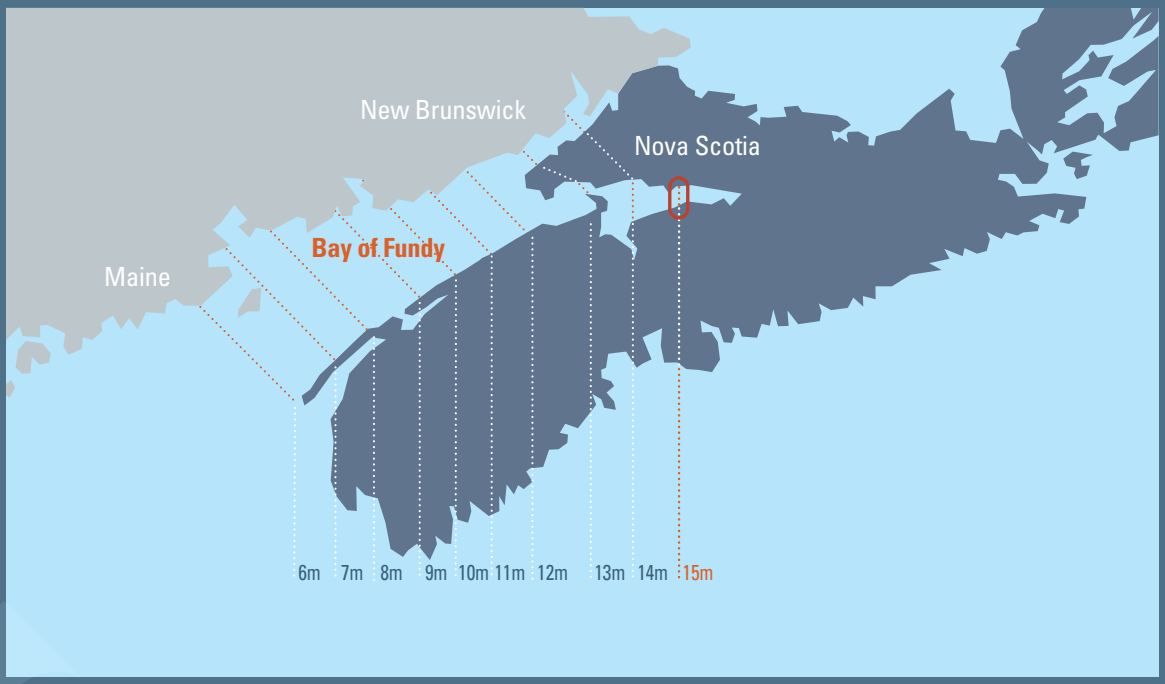
- helicopter tours
- fixed wing aircraft tours

UNESCO evaluators recommended helicopter tours of the Geopark after their experience by air, here over Cape D'Or.

Bay of Fundy
Tidal Experiences

09

Experiences of the Bay of Fundy have been identified as a priority for the Geopark, and the Cliffs of Fundy is the sole UNESCO Geopark that can lay claim to being home to the highest tides in the world. The actual line along which the highest tides on Earth occur extends from Burntcoat Head, Hants County, to Economy Point, Colchester County: the honour is shared by the two municipalities.



Where to View the Tides

Sites to Witness & Explore the Tides

- Fundy Discovery Site: tidal bore, muddy rivers (upper bay)
- Parrsboro Harbour Tidal Experience: bar & lighthouse, mud/sand flats, harbour and wharf, aboiteau (mid bay)
- Partridge Island: tombolo ('causeway'), bubbling waters & weir (mid bay)
- Five Islands Provincial Park/Old Wife: beach, sand bars and mud flats, muddy creek (mid bay)
- Cape D'Or: power of the tides: 'Dory Rips' (lower bay)
- Spencer's Island: tidal ecology of the lower bay– dulse, sand dollars

Sites to Explore the Evolution of the Bay

- Saint's Rest
- Highland Village peat: sea level rise and climate change
- Anderson Cove: raised beach at Squally Point

Tidal Interpretive Centres

Primary

- Fundy Discovery Site: explanation of tides, view of tidal bore
- Black Rock/FORCE: tidal energy, explanation of tides, tidal power, Kluscap legends, geology of the bay

Secondary

- Geopark Welcome Centre, Economy, with emphasis on tides, geology, culture and history
- Fundy Geological Museum: overview of geology, fossils, dinosaur research, Mi'kmaw culture
- Age of Sail Heritage Centre: use of the tides in shipbuilding
- Eatonville Loop (Eatonville lookoff): use of the tides in lumbering

Interpretation, Experiences and Education

The Bay of Fundy tides offer a wealth of interpretive possibilities. The changing cycle of tidal height marked by stranded lines of sea weed on the shore, the natural tumbling of rocks into pebbles and other sizes, the profile of the beach, the "bimodal" coarse pebbles high on the beach and the sandy bars lower, clues of life within the ocean in seaweeds and shells, traces left by passing life on the mud and sand bars, sedimentary structures like small ripples and huge sand waves, migrating and year round shorebirds ... the opportunities are boundless.

The tidal processes that occur change dramatically from the lower to upper bay; the upper Bay from Economy to Truro is typified by deposition of muddy and sandy bars and bedforms, with meandering estuaries and salt marsh, whereas the lower bay is increasingly erosional as the bay deepens and opens, exemplified by the 'Dory Rips' at Cape d'Or, along with towering cliffs. No one geosite can capture this spectrum, and so necessitates a number of sites (see Geosites list by Pillar, p.33) or aerial tour.

Opportunities for interpretation

Every guided walk and many drives along the coast presents opportunity for interpretation of the tides and of life within the bay. Experience-based programming and guided tours exploring the many facets of the world's highest tides have great potential for the geopark. Examples include:

The greatest tides on Earth

- **Lessons in learning the celestial origins of the tides**. The geological story of why they are the highest in the world (in person, or at Fundy Discovery Site and FORCE).
- **Reading the tides**. Learn how strand lines of seaweed mark the last high tide, and in all cases but spring tide, their record of tide range from spring tide (when the gravitational pull of sun and moon act together) to neap tides (when the gravitational pull of sun and moon cancel one another).
- **The power of the tides** viewed at Economy Point, Black Rock (FORCE) and Cape D'Or's "dory rips".
- **The speed of incoming tides** at The Brothers.
- **The vertical range of tides** at Bass River of Five Islands, Parrsboro Harbour, and Advocate Harbour.
- **The tidal bore** high in the upper reaches of the bay, at Fundy Discovery Site.
- **The mystery of the legendary "boiling waters"** of Partridge Island on the falling tide.

The geology of the beach

- **The profile of the beach.** How waves build the beach, and how beach sediments change from mud through sand to pebbles and cobbles.
- **Pebbles.** Identifying pebbles, considering their roundness and source.
- **Trace fossils in mud** in the trails of worms, periwinkles and snails; footprints of shore and land birds.
- **Sedimentary structures** that record the power of the gentle to rushing tides, from ripples to large sand waves.
- **Barrier beaches** formed by longshore currents at Advocate Harbour, Diligent River harbour, Parrsboro harbour and other locations.
- **Estuaries** of the muddy, upper bay, their salt marsh ecology, sequestration of carbon, and importance as nurseries for life in the bay.

The ecology of the beach and bay

- **Geobiology,** the dependence of life on the geology of the coast, including:
  - endangered rock-boring clam *Barnea truncata*, which burrows almost exclusively in the early Jurassic aged McCoy Brook Formation at The Brothers and Old Wife
  - marine worms, favoured bait for sea bass
  - shore birds feeding on invertebrate life in mud flats
  - peregrine falcons nesting atop sheer basalt cliffs
- **Weir fishing** with the cooperation of weir fishers, a census of marine vertebrates that live beneath the surface of the bay. The cultural history and art of constructing a weir.
- **Beachcombing / ecological** scavenger hunt to find shells, algae (seaweeds), bryozoa, sponges and other signs of life in the ocean and bay.
- **"This should not be here":** beach clean ups to leave the shore better than you found it by packing out at least one piece of garbage; discussion points for ocean pollution.

People and tides

- **How people of the Cliffs of Fundy used the tides** to launch sailing ships, and to transport logs and sawn lumber, as well as to receive dry goods and food for sale by merchants.
- **Wis**dom of elder fishers and the changes that they have witnessed over their lives.

The geology and evolution of the bay

- **The story of how the bay formed**, an artifact of the long ago breakup of Pangea, glacial features, climate change and rising sea levels is an equally deep well of interpretation, introduced at the FORCE centre and told at prospective geosites and points of geological interest across the Cliffs of Fundy.

Design
of Interpretive Panels

10

Guidelines for Design

Evaluate site for placement of panel

Evaluate where parking is located and the most likely path that the visitor will take. All introductory panels should be visible from the parking area and should be between parking area and the path to the site or look-off. The visitor should not need to back track.

Evaluate size and mounting structure of panel

Keep in mind view from panel, ease of access for reading, and distance from geosite.

Evaluate messages for site

Each site has a primary storyline as defined within the interpretive plan in the **Geosites Table** (Appendix D, p.70). Secondary storylines should align with topics as identified in the Geosites Table. Secondary information should be evaluated depending on priorities of site, amount of space, location of panel and what one can see from that location.

Primary elements in each sign (in order of heirarchy):

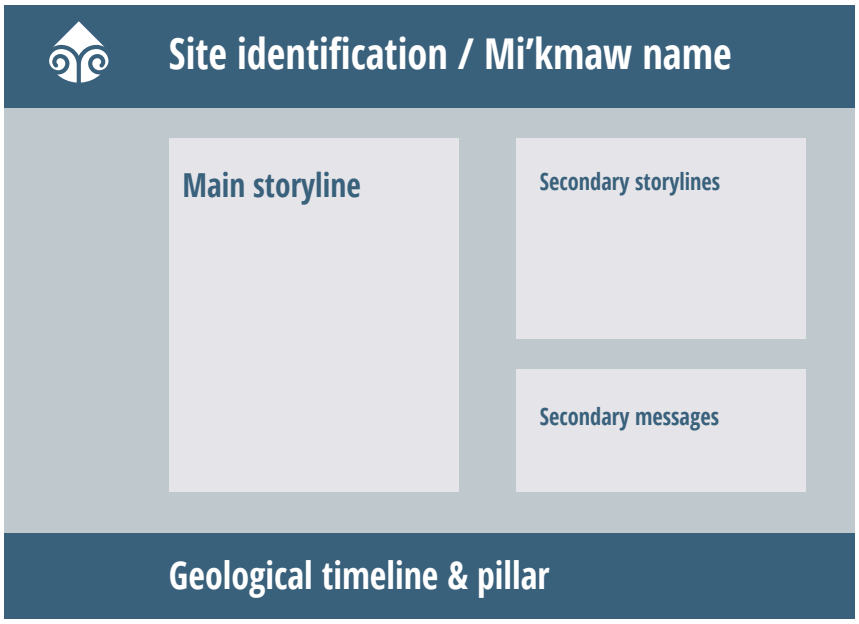
- site identification (include Mi'kmaw site name if available)
- Geopark logo and identification
- main storyline – this may be either geological or Mi'kmaq
    - main geological storyline – aligned to main pillars of the geopark (birth and break up of Pangea and tides) and significance in site
    - main Mi'kmaw storyline – certain sites have a much stronger or equal storyline of the Kluscap legends (e.g. Partridge Island – *Wa's'oq* – for which there are eight distinct Mi'kmaw legends)
- geological timeline
- Mi'kmaw symbol and if available, Mi'kmaw archaeology
- safety (if applicable)

List of secondary messages that could be included:

- secondary storylines
- time place in relation to Pangea
- climate change
- look at... / look for... (a guide to look around, could include views of other sites) (see "Related Sites" in Geosites Table, Appendix D, p.70)
- "see ... next" (suggested site to visit next and why)
- Leave No Trace
- historical or cultural significance
- gems & minerals
- fossils

Primary elements have the highest hierarchy but the importance of secondary elements can be increased by placement as separate units on panel (example, Mi'kmaw storylines, if presented as a separate sidebar are more visible and accessible than if incuded in a long primary storyline).

Example of organization of elements in an interpretive sign:



*This to show defined elements **ONLY** and is **NOT** a sign design.*

Images should be the dominant feature that explains primary and secondary messages.

The pillar should be expressed as a recognizable icon that links other geosites of the same theme.

Text

The **Smithsonian Institution Exhibits** group (SIE) has developed guidelines for word counts for various elements of interpretive installations, which are followed in the two examples of Economy Falls and Old Wife (see Examples of On-site Interpretive Panels, Appendix A, p.60). They recommend the following word limits:

Introductory (main) text: 150 words maximum

Side bar text: 50-100 words

The SIE note that people are most likely to read paragraphs of 25-75 words, so main text should be broken up accordingly.

This document (see A Guide to Exhibit Development–Smithsonian Exhibits in the Selected Bibliography) is recommended for its additional tips for creating lively, engaging scripts.

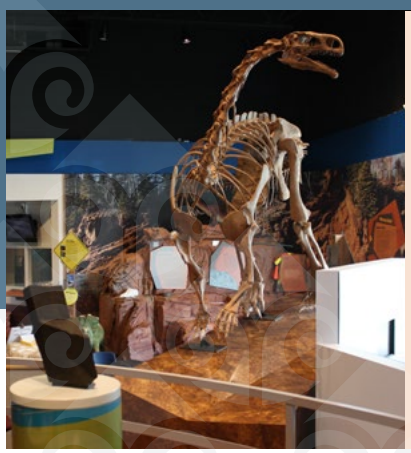
(see Introduction to Interpretation, p.2, and Interpretation of Geosites, p.8, for further information on text and language)

Integration of Existing Interpretive Programs

11

In order to ensure consistency in interpretive programming for visitors to the Geopark and to avoid redundancy, it will be important to work with and where needed to support partners that have a history of such delivery. These partners include: Five Islands Provincial Park, Economy Welcome Centre, Age of Sail, FORCE, and Fundy Geological Museum.

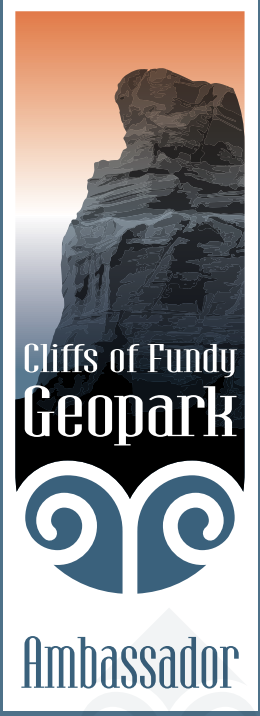
[BELOW] Age of Sail interpretive boardwalk.



The **Fundy Geological Museum** (FGM) in particular has a long established history of delivering interpretive walks for visitors to geosites that include Wasson Bluff, Clarke Head, First Beach, Partridge Island and East Bay. For many of these sites, coordination in timing of field trips and tours will be required (if necessary). The FGM has a long established history of programming at Wasson Bluff, and it is recommended that they continue to be the lead in program delivery given the paleontological significance of this geosite.

12 Training of Partners in Interpretation

A high quality experience by visitors is essential to the growth and long term viability of a Geopark. Many visitors will enlist tourism operators for that experience. It is of mutual benefit to operators and to the greater Geopark to offer highest quality interpretation during the course of a visitor experience.



A **focused course for tourism operators** will help to achieve this goal, and to ensure universal high quality delivery.

Ambassador (or other name) training by operators should be recognized on the Geopark website, at the point of delivery, and for operators through badges or other identification.

Interpretation and **Marketing**

13

Interpretation and marketing are like team mates in a relay, with one (interpretation) handing the baton to the other (marketing). Although marketing is not the focus of this plan, understanding what is unique or special about the Cliffs of Fundy, its geosites and cultural history – the **Geopark Storyline** – is fundamental to successful marketing messaging. The Geopark Storyline is one on which marketers can "take to the bank", assured that it will stand the test of scrutiny.

Marketing Examples

Opportunities for marketing abound. The following are a few examples of potential marketing opportunities beyond signing on for a guided or self guided experience of our geosites:

Lighthouses & Geology
Lighthouses at the End/Edge of the World

Virtually all lighthouses in the upper bay of the Geopark – indeed in Nova Scotia – are situated on headlands (or islands) that are resistant to erosion because of their rock type: it is therefore not surprising that many sit atop basalt outcroppings. These same vantage points also posed threats to sailing ships in days before navigational aids, particularly at night. A guided or self guided tour of lighthouses with reference to why they were built where they were is one example of linking cultural and geological heritage. This is an example of a tour that will appeal to those who do not consider themselves to be geological 'deep divers'.

Waterfalls & Geology
Waterfalls where Worlds Collided or **Waterfalls of Lost Continents**

The attraction to water and to waterfalls that humans exhibit is deep and visceral. Although only two waterfalls were initially included in the list of geosites for the Cliffs of Fundy, the number of waterfalls in the Geopark is substantial. All waterfalls are directly linked to geology, and those featured in the Cliffs of Fundy invariably tumble over the Cobequid Fault and related structures, tying neatly into the geological storyline of the Geopark.

The internet site *To Do Canada* lists *25 of the Best Waterfalls to Visit in Nova Scotia*: fully one third occur within the Cliffs of Fundy, including the most visited, Economy Falls. They are classified from easy to difficult in terms of hiking; Ward Falls and Economy Falls have well prepared paths, steps and bridges, while others such as Moose River Falls are accessible only by experienced wilderness hikers.

The Geology of Food
Thinking outside the (lunch) box

Every visitor to the Geopark, indeed every resident of the Geopark, seeks food daily. On a visit to a new area, visitors seek culinary experiences (Tourism Nova Scotia, 2017); the Cliffs of Fundy offers food that is directly linked to the three pillars that define us. These foods offer an opportunity for interpretation!

Foods made available to us as a direct consequence of the tidal processes of the Bay of Fundy include:

- clams in the upper bay, living in tidal flats and accessible for digging because of the low tides that expose them
- fish caught passively in weirs at Carrs Brook and Partridge Island that are on offer with each lowering of the tide

Foods linked directly to our geology:

- wild blueberries that favour glacial deposits as soils

The GeoFoods™ initiative of Magma Geopark, Norway, raises the visibility of locally harvested foods that are endemic to Geoparks around the world, an example of the dovetailing between interpretation and marketing.

Wild blueberry fields on glacial kames at Lakelands.

Implementation
Plan and Timeline

The following assessment addresses priorities and acknowledge incremental access to funding for the development of infrastructure and interpretation.

The following criteria are considerations in determining impact and readiness:

- **strong geological and/or cultural story**
- **strong aesthetic appeal**
- **minimal additional work required to achieve access**

Plan

First Priority

Highest impact geosites, assumed to be access ready (east to west)

- Economy Falls
- Old Wife
- Clarke Head
- Partridge Island
- East Bay
- Cape D'Or
- Three Sisters – Eatonville Loop

Other high impact geosites

- Fundy Discovery Site: viewing site of the tidal bore
- Mi'kma'wi Debert Interpretive Trail: highest Mi'kmaw cultural and archeological impact, development being undertaken by the Confederacy of Mainland Mi'kmaq. Trail has high quality interpretive panels, requires only reference to importance of Mi'kmaw culture to Cliffs of Fundy.
- FORCE Centre: well developed interpretation of the Geopark
- Wasson Bluff: oft-visited by tours and programs of the Fundy Geological Museum; restricted promotion in accordance with Special Places designation.

Second Priority

Moderate to high Impact, access ready (east to west)

- Londonderry Iron Mines
- Upper bay estuaries (Portapique River or other)
- Thomas Cove
- Five Islands Lighthouse Park
- Parrsboro Harbour tides
- Ward Falls
- Advocate Harbour + Isle Haute
- Cape Chignecto West Advocate: Red Rocks, West Advocate Cobequid Fault, McGahey Brook
- Cape Chignecto trails & seacoast: Refugee Cove, Bald Rock, Seal Cove

Additional resources should echo the storyline of the Geopark, and where appropriate, the full geological storyline. Deeper treatment of the geological history of the Geopark is best suited to geological guidebooks and can be offered as 'further reading' on internet platforms.

Timeline

First Priority Year One

Products	Programs
• Development and installation of interpretive panels at high priority geosites. • Inclusion of Mi'kmaw placenames and if possible, text (investigate funding through CCUNESCO) • Completion of the Locatify Geopark App, reflecting all high priority, accessible geosites and edited to include the Geopark storyline and geological storyline. • Consultation with Nova Scotia Geological Survey regarding text update to the ESRI StoryMap, including incorporation of Geopark storyline, and promotion of its availability. • Production of a geotourism map of the Geopark, showing locations of accessible, interpreted geosites, experiences offered by sanctioned partners, and key visitor information including tides.	• Exploration and development of a Mi'kmaq-led interpretation program in concert with Confederacy of Mainland Mi'kmaq and Nova Scotia Indigenous Tourism Network. • Develop and offer a concentrated (one day or two evening) interpretation course for Geopark partners and tourism operators prior to start of 2021 tourism season. • Development of a Geopark Guide program and interpretive training course. • Initial launch of interpretive training course, to be re-evaluated at the end of the season.

Second Priority Year Two

Products	Programs
• Development and installation of interpretive panels at second priority geosites. • Redevelop and republish the Guide to 30 geosites, with additional description of what can be seen and experienced at each site and inclusion of additional key sites. • A comprehensive summary paper in Atlantic Geology authored by emeritus geoscientists (Olsen, Pe-Piper, Piper, Waldron or others) that describes the geological evolution of the area within and adjacent to the Cliffs of Fundy UNESCO Global Geopark. Such a paper would serve as a resource for geoscientists and geological field parties, and could be reshaped as an in-depth geological guide.	• Launch of Mi'kmaq-led interpretive tours. • Launch of Geopark Guide training; offer of guided, interpreted tours.

Summary of **Recommendations**

15

Over arching recommendations in the development of the interpretive strategy for the Cliffs of Fundy UNESCO Global Geopark.

- Pursue with vigour a Mi'kmaq-led guiding/interpretive program.
- Commission Mi'kmaw artist Gerald Gloade to create additional artwork depicting Kluscap legends at sites of prominence in Mi'kmaw heritage that currently do not have such artwork.
- Where known, incorporate the Mi'kmaw placename prominently.
- Focus on deliverable products and programs for the initial operating year that will meet or exceed visitor expectations raised by the publicity surrounding the Cliffs of Fundy's newfound status as a UNESCO Global Geopark. Deliverables should include the Locatify App and ESRI StoryMap, which should incorporate the Geopark Storyline and the Geological Storyline.
- Focus resources for on-site interpretive signage on highest impact geosites that have assured access.
- Develop a Guide program for the Geopark to enhance visitor experiences with the added benefit of employment opportunity.
- Develop a concentrated training program for geotourism operators to enhance visitor experience, with provision for recognition and promotion of operators who have taken such training.
- Integrate and strengthen existing programming offered by partner institutions and organizations, visibly acknowledging their partnership with Cliffs of Fundy UNESCO Global Geopark.
- Develop programming and resources specific to interpretive walks (both self guided and guided) to experience the many facets of the Bay of Fundy Tides.
- Develop a Marketing Plan that incorporates and echoes the Geopark Storyline.

Acknowledgements

The following people were consulted in the course of the preparation of this plan or provided inspired ideas.

- Ken Adams, Fundy Geological Museum (retired)
- Members of ArtLab, Parrsboro
- Carol Corbett, Five Islands Provincial Park
- Members of the Cliffs of Fundy Geopark Board
- Randy Corcoran, Parrsboro Boat Tours
- Elders Advisory Council, Confederacy of Mainland Mi'kmaq
- Dr. Tim Fedak, Nova Scotia Museum
- The late Eldon George, Parrsboro Rock & Mineral Shop
- Gerald Gloade, Confederacy of Mainland Mi'kmaq
- Anne Grabinsky, Nova Shores Adventures
- Caleb Grant, Geoscientist for Cliffs of Fundy Geopark
- Kathy Kaulbach, Touchstone Design House
- The late Doug Knockwood, Mi'kmaw Elder
- Dr. Don Julien, Executive Director, Confederacy of Mainland Mi'kmaq
- Eric Leighton, Nova Scotia Department of Natural Resources (retired)
- Dr. Jason Loxton, University of Cape Breton
- Regan Maloney, Fundy Geological Museum
- Dr. Patrick McKeever, former Head, UNESCO Geoscience and Geoparks Program
- Chris MacIntyre, Five Islands Provincial Park
- Anita MacLellan, Geopark Welcome Centre, Economy
- Dr. Asier Hilario Ortiz, Basque Coast UNESCO Global Geopark
- Hilary Paquet, Municipality of Colchester County
- Dr. Georgia Pe-Piper, Emeritus Professor, Saint Mary's University
- Beth Peterkin, Executive Director, Cliffs of Fundy UNESCO Global Geopark
- Dr. David Piper, Emeritus Scientist, Geological Survey of Canada
- Dr. John Shaw, Emeritus Scientist, Geological Survey of Canada
- Dr. Elizabeth Silva, Portuguese National Commission for UNESCO
- Devin Trefry, Municipality of Colchester County
- Members of US Geoheritage Working Group
- Katherine Wadden, Tourism Nova Scotia
- Dr. John Waldron, University of Alberta
- Dr. Nickolas Zouros, Lesvos UNESCO Global Geopark

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Appendix A

Examples of On-site Interpretative Panels

Example: Economy Falls Panel

Panel ID	Element	Text	Word count
EF. Main	Title	***Economy Falls: Behold the Edge of a Lost World***	9
EF. Main	Primary text	Before you, Economy Falls tumbles over the edge of a lost continent. The rocks exposed here are 734 million years old, and represent the oldest crust of an ancient land called Avalonia, part of a supercontinent called Rhodinia. These rocks actually tell a tale of two long ago worlds: Rhodinia and Pangea. The dark grey rocks are called gneiss, and they formed deep below the surface of Avalonia on the edge of Rhodinia. The gneiss was heated and transformed millions of years later as the supercontinent Pangea began to assemble along deep faults in the Earth's crust.	97
EF. Side.1	Title	***Explore the Rocks***	3
EF. Side.1	Secondary Text	Look closely at the rocks and you will see the lines in the gneiss --- called mylonite -- where it was stretched and heated as faults moved. Search as well for small patches of pink granite embedded in the gneiss. The granite was Pangea's calling card, cooled from magma that squeezed its way into the older gneiss as Pangea was born, about 360 million years ago.	66
EF. Side.2	Title	***The Changing Falls***	3
EF. Side.2	Secondary Text	The falls once towered twice as high as today, but following unusual weather conditions in 1997, the power of the Economy River, swollen by rains, caused the upper rock face to collapse.	32

EF. Side.3	Title	***Hiking the Kenomee Wilderness***	4
EF. Side.3	Secondary text	We follow the Leave No Trace philosophy: pack it in, pack it out. Please respect flora and fauna, and be vigilent for coyotes and bears – back away slowly and never run.	32

Example: Old Wife Panel

Panel ID	Element	Text	Word count
OW. Main	Title	***Old Wife: End of a World, Birth of Another***	9
OW. Main	Primary text	The story told in these breathtaking cliffs is one of the most significant in the history of our planet Earth. These cliffs tell the story of Pangea, a supercontinent that ended 200 million years ago with the largest outpouring of lava in the history of the Earth. Carbon dioxide and other greenhouse gases from the lava altered the Earth's climate, and led to one of six major extinctions in the history of life on Earth at the end of the Triassic Period. It ushered in the Jurassic Period and the true reign of the dinosaurs as the dominant animals on Earth, which lasted for another 135 million years. And while Pangea bled lava as it broke apart, moving tectonic plates created new continents, a new ocean - the Atlantic - and a new world.	134

OW. Side.1	Title	***Our Geological Twin, Separated at Birth***	6
OW. Side.1	Secondary Text	M'Goun UNESCO Global Geopark in Morocco was our 'other half' during the late Triassic and early Jurassic periods about 200 million years ago. Since our separation, each Geopark has been shaped by different climates, different processes of erosion, and are 'adorned' by different cultures. But under it all lie the same rocks, created in the same world at the heart of Pangea.	62
OW. Side.2	Title	***Be Tide Smart!***	3
OW. Side.2	Secondary Text	The area that you will walk to the Old Wife will soon be under water as the tide comes in. Check tide times with Park staff, and be sure to head back at least 2 hours before high tide.	39
OW. Side.3	Title	***And be Careful!***	3
OW. Side.3	Secondary text	Stay back from the cliffs: those large boulders that you see at the bottom of the cliff fell there and more fall daily, without warning. Underfoot, mind slippery rocks, especially those covered with green algae or seaweed.	37

Appendix B
Essential Geological Concepts as *Virtual Panels*

An understanding of the geological storyline of the Cliffs of Fundy requires comprehension of two foundational concepts of geology: i) **geologic time** and ii) **plate tectonics**. In a book , field guide or website, concepts such as these can be introduced and explored incrementally, but at individual geosites, any of which could be the first or only site visited, this presents an interpretive challenge.

Geologic time

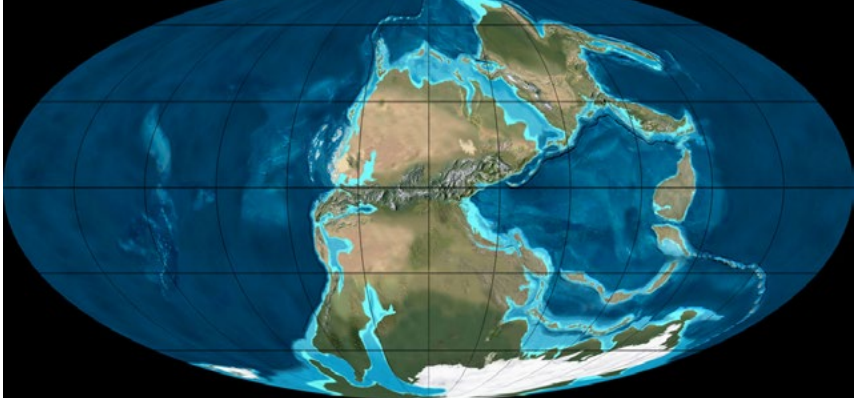
Full comprehension of "deep time" challenges all who are introduced to the passage of millions of years, given the brevity of a human life which seldom exceeds 100 years. For many people, "old" might mean a very few years (a smart phone, for example).

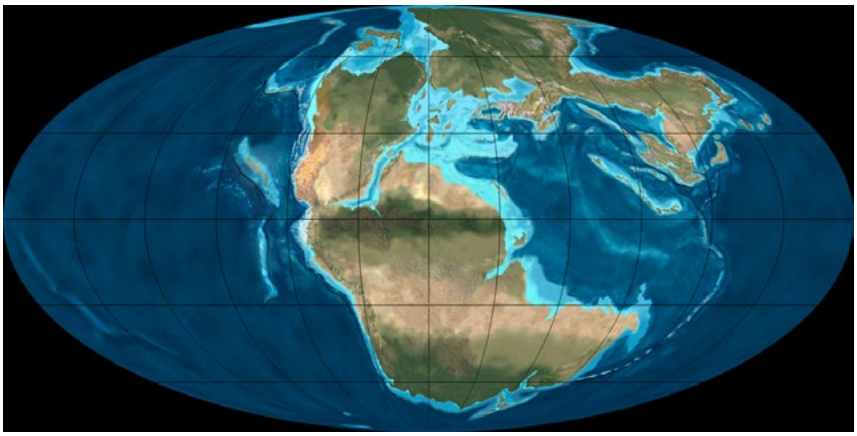
By and large, however, geologic time can be introduced graphically or through physical devices. Reference to the geological timescale should be incorporated in each interpretive panel. The timescale will also reference where the geosite is in the Geological storyline of Pangea: before its assembly, during assembly, or during breakup. Quaternary "post-glacial" sites will have a timeline specific to comparatively recent glacial climate events.

Plate tectonics

The movement of ancient continents riding atop crustal plates and movement of the Earth's crust along faults – the reason why there was an ancient continent called Pangea – require the deeper explanation of plate tectonics. The treatment of such concepts in the field presents challenges due to the spatial constraints of physical signage and the unreliability of internet coverage. Thoughtful use of graphics and words therefore are essential.

The geosite of Economy Falls is perhaps the best suited geologically to explanation of plate tectonics, and serendipitously, space at the site allows for panels to address the concept. From other geosites, the visitor can be directed to Economy Falls to learn more about plate tectonics on site, and also directed virtually at other geosites through





Reconstructions of Pangea by Rob Blakey.

TOP: Pangea fully assembled, about 280 million years ago. Cliffs of Fundy lays near the equator.

BOTTOM: Pangea as it began to break apart at the Triassic-Jurassic boundary, 200 million years ago. Cliffs of Fundy had drifted about 25 degrees north of the equator, on the edge of North America.

web-based resources (Locatify app, ESRI StoryMap and others such as EarthViewer) – where internet connectivity permits. In addition, the world before Pangea and the antiquity of the Cobequid Highlands can be introduced at Economy Falls (see Interpretation of Geosites, p.8).

Examples: **Virtual Panels (Web-based)**

Our Restless Earth

The Earth has been changing since it formed 4.55 billion years ago. Earthquakes, violent volcanic eruptions, and the rise of mountain chains like the Rockies, Andes, Appalachians and Himalayas have all occurred because of a process called plate tectonics.

First imagined by German scientist Alfred Wegener in the early 20th Century, the theory of plate tectonics as it later became known is fundamental to understanding our Earth and its geology. Huge plates – broken pieces of the Earth's crust and upper mantle -- are pushed and pulled by molten magma rising and falling deep below within the Earth's mantle. These plates collide, slide jerkily beside one another or simply move in opposite directions, creating many of the most dramatic shows on Earth of the force of nature.

Through the long history of the Earth, plate tectonics have created and destroyed previous continents and oceans – today's map of the world is really only one temporary frame in a very long motion picture.

Roughly 300 million years before today, the plates had slid and collided into a large landmass that Wegener named Pangea – Greek for 'One Earth'. It eventually broke apart 100 million years later causing an environmental cataclysm (see the geosite of The Old Wife). The Cliffs of Fundy showcase both the birth and death of Pangea better than anywhere else on Earth.

Journey to the Centre of the Earth

The crust, cooled from magma and recycled by erosion and plate tectonics, contains all rocks on planet Earth. These include igneous rocks cooled from magma, sedimentary rocks recycled from pre-exisiting rocks, and metamorphic rocks transformed by great heat and pressure deep within the crust.

Below the thin crust lies the mantle: a thick, boiling mass of magma which at times breaks through to the Earth's surface as lava and quickly cools into volcanic rocks called basalt and rhyolite. Other magma cools near the surface, forming granite and related plutonic rocks. All rocks that cool from magma, whether above surface or below are called igneous rocks.

The Earth's core is thought to be a near solid mass of heavy minerals such as iron and manganese, surrounded by superheated magma possibly fueled by radioactive decay. These heavy minerals are thought to have been pulled to the centre of the Earth by gravity.

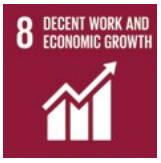
Appendix C
UN Sustainable Development Goals

The 17 Sustainable Development Goals (SDGs) of the United Nations, expressed in the document Agenda 2030, are an important part of all UNESCO Global Geoparks.

These SDGs, referenced on pages 45-46 of the Cliffs of Fundy application to UNESCO, are broad reaching, and pose a challenge to incorporation in interpretive signage, but their incorporation where possible is strongly encouraged. Certain of these goals, such as SDG 1 (No Poverty), SDG 2 (Zero Hunger) and SDG 5 (Gender Equality), are difficult to represent in interpretation except to be endorsed broadly by the Board of the Cliffs of Fundy Geopark. Others reflect goals inherent in UNESCO Global Geoparks, such as SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth) and SDG 11 (Sustainable Cities and Communities). These values are not specific to individual geosites. SDGs 16 and 17 importantly reference Canada's goals of reconciliation with Indigenous peoples, in our case, the Mi'kmaq.

SDGs that reflect the overall Geopark mission:*

(proposed)*



SDG 8: Decent work and economic growth. For many, this could be seen as the raison d'être for the Geopark, and so it applies broadly to all geosites and initiatives.

SDG 10: Reduced inequalities. As for SDG 16, the goal of reduced inequalities is laudible and far-reaching. The deep inequality between Indigenous and non-Indigenous peoples may be the most egregious of these, but application of this SDG requires careful thought in order that it be appropriate.

SDG 11: Sustainable communities. By its title, SDG 11 tilts towards urban communities, but is equally applicable to rural communities such as those of the Cliffs of Fundy. The goal of sustainable geotourism is at the heart of this and all UNESCO Global Geoparks, and therefore applies to all geosites.

SDG 16: Peace and justice. This SDG references Canada's reconciliation with its Indigenous Peoples. All geosites exist within unceded Mi'kma'wi, whereas others are sites of great significance to Mi'kmaw culture through the stories of Kluscap (Glooscap). It is recommended that all geosites reference SDG 16.

SDG 17: Partnerships to achieve the Strategic Development Goals.
This SDG applies to all geosites, particularly but not exclusively because of SDG 16, above.

Geosite-specific SDGs

SDG 3: Good health and well being. The Geopark actively promotes outdoor activity that in turn promotes a healthy lifestyle, and this SDG applies to virtually all geosites and especially those that require hiking. The inclusion of persons with restricted abilities, for example wheel chair transport, is an area that will require improvement. The Eatonville loop is one area comprising numerous geosites for which wheel chair accessibility can be realized.

SDG 4: Quality education. Although an over-arching goal of all UNESCO Global Geoparks, interpretation includes education, and so the inclusion of SDG 4 is appropriate at all geosites.

SDG 7: Affordable and clean energy. This SDG is geosite-specific, in particular referencing initiatives by FORCE partners to harness the Bay of Fundy tides. It would also apply to the Eatonville Interpretive Centre should it become part of the Geopark infrastructure.

SDG 9: Industry, innovation and infrastructure. Today, FORCE is a symbol of current innovation in industry, whereas the Eatonville Centre is an example of innovation in infrastructure. Historical innovation is an important theme of the Geopark as well, including historic industries of shipbuilding and weir fishing that utilized the Bay of Fundy tides, lumbering using natural rivers and tidal harbours, and mining innovation. Geosites for which SDG applies from an historical narrative include Eatonville Harbor, Age of Sail, and weirs at Partridge Island and Carrs Brook.

SDG 13: Climate action. The word 'action' may be here replaced by 'awareness' at geosites where coastal erosion in particular has been shaped by extreme weather events and ongoing climate change. Geosites where catastrophic, sudden change has occurred include rock collapse at Economy Falls and Five Islands, whereas coastal erosion exacerbated by sea level rise and extreme weather has contributed to geosites at Three Sisters, Eatonville Sea Stack, Partridge Island (tombolo/causeway) and Soley Cove.

SDG 14: Life below water. This SDG is applicable at any site that involves the fishery, clam harvest, or weirs, and it can be argued that it applies as well to all coastal geosites where signs of aquatic life are found on the beach.

SDG 15: Life on land. This SDG applies to all geosites landward of the coast, but also applies to geosites such as The Brothers, where peregrine falcons nest atop the sheer basalt cliffs.

Summary of application of SDGs to interpretation

This discussion refers to application of the United Nations Sustainable Development Goals in interpretation. It does not preclude any additional SDGs from being championed by the Board of the Cliffs of Fundy in their hiring practice (for example, SDG 5 Gender Equality) or day to day operations (for example, SDG 6 Clean Water & Sanitation or SDG 12 Responsible Consumption & Production). Reference to the UN Sustainable Development Goals will be looked upon favourably during the revalidation of the Cliffs of Fundy UNESCO Global Geopark. More than this, however, the Geopark can be seen as a champion for 'a better world' by embracing these goals publicly.

In summary, the Geopark itself embodies SDGs 8, 10, 11, 16 & 17:

All geosites reference SDGs 3 and 4,

whereas others reference SDGs 7, 9, 13, 14 and 15:

Appendix F
Geopark Map

1 Fundy Discovery Site
2 *Mi'kma'wi* Debert Interpretive Trail
3 Londonderry Iron Mines
4 Highland Village drowned peat
5 Upper Bay Estuaries
6 Economy Falls Keno'mi
7 Economy Point Keno'mi
8 Thomas Cove & Brick Kilns
9 Carrs Brook
10 Drowned Forest at Carrs Brook
11 Gerrish Valley
12 Soley Cove Flowerpot
13 Soley Cove Seacaves
14 Red Head
15 Old Wife
16 Five Islands Lighthouse Park *Nankl Mniku'l*
17 Hidden Falls
18 Wasson Bluff
19 The Brothers
20 Clarke Head
21 Parrsboro Harbour
22 Jeffers Falls
23 Leake Lake
24 Partridge Island *Plawejue'katik* or *Wa'soq Wktaqamiku'jk*
25 East Bay
26 West Bay
27 FORCE Centre
28 Ward Falls
29 Wharton Fault
30 Rams Head
31 Diligent River Harbour
32 Age of Sail
33 Brookville Rock
34 Spencer's Island Wtuoml
35 Cape D'Or-Horseshoe Cove *L'mu'juiktuk*
36 Advocate Harbour *Atuonjek*
37 Red Rocks
38 West Advocate A*tuonjek*
39 Cape Chignecto Provincial Park Coast: McGahey Brook
40 Cape Chignecto Provincial Park Coast: Refugee Cove
41 Chignecto Provincial Park Coast: Bald Rock Cove
42 Eatonville Loop: Anderson Cove Lookoff
43 Cape Chignecto Provincial Park Coast: Seal Cove
44 Three Sisters
45 Raised Beach at Squally Point
46 Spicer Cove
47 Apple River
48 Isle Haute *Makusetkik*

Appendix G
Evaluation Form for Geosite Interpretive Panels

T*o be used as a guide to evaluat*e location and content *for Interpretive Panels.*

Geosite name: _____

Evaluator / name: _____

Date: _____

Some geosites have parking areas directly at the viewing place for the geosite, others have parking areas at a trail or coastal hike to the geosite and a final geosite location. Each of these areas need to be evaluated to help define location and content of interpretive panels.

*Check **Geosite Table** for interpretive messages and themes.*

Parking area

Sketch entrance area with approximate measurements.

Identify and locate - ☐ parking areas / ☐ entrance to trail / ☐ suggested area for panels ☐ ALL signs on site *(photograph if possible)* / ☐ significant views (including views of this geosite, other geosites, any interpretive elements in Geosite Table for this geosite).

Are there (could there be) any access/safety concerns? (tides, spring mud, crossing streams, overhanging cliffs, erosion etc.)

_____

_____

Trail

Is there a trail to the geosite? ☐ no ☐ yes

How long a walk is it (length or time)? _____

What is the trail's degree of difficulty?
☐ low ☐ moderate ☐ high

Identify and locate ALL signs on trail *(photograph if possible).*

_____

_____

Identify and locate any points of interest along the trail? Sketch each location with approximate measurements. Identify any space for a free standing interpretive panel.
Identify any natural mounting supports (trees, rocks)? *Photograph if possible.*

Geosite viewing area

Note this could be the parking area at some sights.

Sketch the geosite viewing space with approximate measurements.

Identify and locate - ☐ entrance to site / ☐ beach area (if applicable)
☐ first point of view / ☐ other views / ☐ suggested area for panels
☐ ALL signs on site *(photograph if possible)*

Can you see other geosites? ☐ no ☐ yes

Visible geosite _____

Visible geosite _____

Identify and locate any visual elements that directly relate to any of the interpretive messages for this geosite. (See Geosite Table: Interpretive message, Mi'kmaq significance, additional theme, subtheme or conceptual elements) Are these easy to see or would someone require directions? *Photograph if possible.*

Element: _____

Requires directions to see ☐ no ☐ yes

Element: _____

Requires directions to see ☐ no ☐ yes

Tides

Does the tide affect access to the geosite? ☐ no ☐ yes

If yes, how? (e.g. pinch point that is cut off en route at high tide)

_____

_____

Timing of access (hours before and after high tide when inaccessible).

_____

_____

Safety

Are there any safety concerns at this geosite or along the trail to the geosite? ☐ no ☐ yes

Identify and locate all. (Note: in all coastal sites consider tides and cliffs; in all woodland sites consider coyotes, bears and ticks).

_____

_____

_____

_____

Notes

_____

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_____

United Nations
Educational, Scientific and
Cultural Organization

Cliffs of Fundy
UNESCO
Global Geopark

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