Establishing a Geoheritage List for Nova Scotia

J. H. Calder

Introduction

'Geoheritage' is defined most succinctly as geological features that inform humanity of its relationship with the Earth (Calder and DeMont, 2010). Like UNESCO World Heritage, geoheritage can be divided into two categories. 'Physical geoheritage' denotes geological sites that are valued either for informing us of Earth history and Earth processes or for their aesthetic qualities of landscape. 'Cultural/social geoheritage' denotes sites that are valued due to human interaction with the sites (Calder and Badman, 2009; Calder and DeMont, 2010).

There is a broad range of reasons for the recognition of geoheritage. For example, a geological site may:

- have universal value to humanity;
- have played a role in history of a nation or region;
- have a role in the history of science;
- be a 'type' geological example;
- provide information about modern issues of global change; or simply
- provide a compelling story or visitor experience.

The Earth's geologic past has imbued Nova Scotia with a rich heritage, which has been dramatically exposed by the interaction of land and sea. This rich geological history spans more than a billion years and has bequeathed to the province sites that range in significance from being globally unique to being exceptional geological examples of geological phenomena. In addition, cultural geoheritage, where human activity and geology are entwined, weaves through Nova Scotia's history.

Long recognized by some of the world's great scientific minds, the diverse geology and dramatic sea cliffs of Nova Scotia have drawn the likes of Charles Lyell and Stephen Jay Gould to the province. The geological heritage of Nova Scotia has been commemorated by local communities, in provincial and federal parks, by private sponsors and by the ultimate recognition of UNESCO World Heritage. No systematic, comprehensive inventory of this rich history existed, however, before the initiation of a geoheritage strategy. A thoughtful strategy has the potential to realize the 'Three Es' of geoheritage: engagement, education and economic development. The foundation of such a strategy is a systematic approach to establishing a list of our geoheritage. Underpinning the strategy are the following goals:

- foster sharing of knowledge
- increase public awareness of Earth-related issues
- ensure protection of significant geological sites where necessary
- integrate with other land uses
- consider community development and geotourism opportunities
- prioritize recognition and allocation of resources
- guide appropriate decisions by government

This paper presents the process followed in Nova Scotia for establishing a list of geoheritage sites.

Models of Geoheritage Recognition

The procedural choices that a geological survey employs to institute a program of geoheritage recognition can determine the success or failure of the program. Two approaches illustrate this point: the approach employed by the Geological Survey of Ireland (GSI) and that employed by the Québec Ministère de l'Énergie et des Ressource naturelles (QMERN). The strengths and weaknesses of these two models have informed the approach developed for Nova Scotia. Both Ireland and Québec approached the designation of geoheritage sites by using a theme-based approach familiar to geoscience, wherein geological sites or features are

Calder, J. H. 2014: *in* Mineral Resources Branch, Report of Activities 2013; Nova Scotia Department of Natural Resources, Report ME 2014-001, p. 81-86.

categorized according to geological discipline, such as mineralogical sites, fossil sites or geomorphology. The approach taken to evaluate prospective sites differs, however, and has led to widely divergent success in establishing a list.

The Irish program requires formal vetting of 1200 nominated sites by an expert panel for each theme; these panels are drawn from the geoscience community. After this vetting, each site is evaluated by the GSI. Because of this complex process and large number of sites, only 5 of 16 themes have been completed after 15 years of effort; the process has effectively ground to a halt (Sophie Préteseille, pers. comm., 2012). The Irish experience points to the need for a more streamlined process and a simple framework for establishing a geoheritage sites list.

The Québec approach, pioneered by Pierre Verpaelst, was to first proclaim a small number of sites and then establish a method to invite and accept open nominations of additional sites (Ferron *et al*., 2010; D. Richard, pers. comm., 2014). Sites in Québec were vetted internally by the QMERN, which afforded a more streamlined process than that employed in Ireland. In this way, a representative list was successfully established and continues to grow now that it has achieved a public profile. Under Québec's *Mining Act*, approved geoheritage sites are legal entities and are administered by a central government agency responsible for administration of the Act (Ferron *et al*., 2010). The salient points of the Québec and GSI programs are summarized in Table 1.

The Process for Establishing a Geoheritage List for Nova Scotia

The Nova Scotian approach to establishing a geoheritage list (Table 2) is collaborative and consensus based. The Geological Services Division of the Nova Scotia Department of Natural Resources (NSDNR) serves as facilitator. As in Québec, Nova Scotia entertains open nominations for inclusion on the geoheritage sites list. Such an approach in Nova Scotia was deemed to be essential to achieve wide support for the strategy from both the geoscience community and the wider public. The designation of a geoheritage site in Nova Scotia promotes awareness of the site and does not involve legal restrictions on land use, as is the case in Québec.

The Classification Framework

The strategy for recognizing geoheritage in Nova Scotia is informed by the operational guidelines of the World Heritage Convention (World Heritage Committee, 2013) that identifies both natural (geological) sites and cultural sites (where human

Table 1. Key features of the geoheritage programs of the Geological Survey of Ireland and the Québec Ministère de l'Énergie et des Ressource naturelles.

Ireland's Geological Heritage Program

- 16 themes (e.g. karst, paleontology, coastal geomorphology, groupings by geologic time)
- 1200 sites nominated by expert panels
- Each site requires vetting by an expert panel and subsequent evaluation by GSI staff
- Sites may be recommended by expert panels as Natural Heritage Areas or may be promoted by counties as County Geological Sites, following audit by GSI
- 15 years to complete process for 5 of 16 themes

Québec's Sites Géologiques Exceptionnels / Outstanding Geological Sites

- 11 themes (cavern and cave, fossiliferous, mineralogical, lithological, stratotype, landscape, geosystem, ecosystem, meteor impact, glacial structures and landforms, historical or cultural)
- Flexibility to have sites nominated and added to list
- 338 sites proposed to QMERN since 2005
- 63 sites vetted and recommended for inclusion
- Enshrined and protected in legislation (*Mining Act*)
- 10 sites to be legally protected by 2014

Table 2. A systematic approach to establishing a geoheritage list, based on the process employed in Nova Scotia.

Steps in establishing and maintaining a Geoheritage List
1. Establishing a clear rubric
2. Identification of potential sites
3. Circulation of the provisional list
4. Consultation with First Nations on cultural sites
5. Call for open nominations
6. Vetting of the list
7. Peer-reviewed publication of list
8. Recognition and promotion of list
9. Ongoing nomination

history is involved, such as historical mining and spiritual sites). Natural sites (Fig. 1) are ranked by a clear and simple rubric (Table 3) that can be employed in a timely fashion in any jurisdiction. GH1 sites are globally unique and must be recognized as such in peer-reviewed scientific publications. GH2 sites are globally significant; this significance must be demonstrable. GH3 sites are exceptional examples of geological features that also occur elsewhere. This last category is the most subjective and has the potential, therefore, to balloon the list, hence the descriptor 'exceptional.' Cultural sites are not ranked (Table 3) because each is important to the community that nominates them.

The Nova Scotia geoheritage list departs from the practice employed in Québec of categorizing sites primarily by theme ('themes' in Ireland include broad groupings by geologic age). Where possible, sites are listed by geological age to avoid separating geologic process from the evolution of life, which are inextricably entwined. An exception to this rule is the category of mineral sites, for which classification according to age is not always clearly known. Ultimately, the Nova Scotia list will be searchable by various parameters, including geologic age, theme, region and county.

Development of the List

The starting point for building the list was compilation of sites informally identified in publications of the Atlantic Geoscience Society. Identification of these sites has received wide input from the geoscience community. Foremost amongst the publications reviewed was the *Nova*

Figure 1. Examples of geoheritage site criteria. (GH 1) Globally unique fossil lycopsid tree of the 'Coal Age' ecosystem, Joggins Fossil Cliffs World Heritage Site. (GH 2) Globally significant flood basalts heralding the end-Triassic mass extinction event, Old Wife, Five Islands Provincial Park. (GH 3) An exceptional example of columnar basalt, Balancing Rock, Tiverton.

Table 3. Geoheritage criteria.

NATURAL GEOHERITAGE	
Level of significance	**Validation**
GH 1. Globally unique	Verified by peer-reviewed publication
GH 2. Globally significant	Significance must be explained, demonstrated
GH 3. Exceptional example of a geological phenomenon that occurs elsewhere	Experiential validation
CULTURAL GEOHERITAGE	
Site of particular cultural / historical value to a community or region	Commemoration by community or by government, except for sacred sites, the validation of which lies with First Nations

Scotia Geological Highway Map (Donohoe *et al.*, 2005), which was supplemented by publications such as *Nova Scotia Rocks* (Atlantic Geoscience Society, 2004, 2013) and *Discovering Rocks, Minerals, and Fossils in Atlantic Canada* (Wallace, 1998). Additionally, input was sought from senior geoscientists at NSDNR and from colleagues in the geoscience community.

Input was sought on the developing list of geoheritage sites at all available opportunities, including professional meetings such as the Atlantic Geoscience Society Annual Meeting and Colloquium; meetings of focus groups, such as the Education Committee of the Atlantic Geoscience Society; and meetings with individual colleagues. Actively seeking input from deeply experienced geoscientists not only brought the value of their expertise, but also helped to promote a sense of openness in the process, which greatly assisted in establishing 'buy in' to the strategy.

Throughout the process of circulating the list, nominations were encouraged and added to the provisional list. As in the Québec model, the concept of open nominations will continue, in the main through the portal of the NSDNR Geoscience and Mines Branch website.

Consultation with First Nations

The inclusion of cultural sites sacred to indigenous people, which in the case of Nova Scotia are the Mi'kmaq, must follow a path of open consultation. Simply put, it is not the role of others to speak for or to disclose sites that may be sacred to First Nations, whose understanding of the origin of geological features predate those of geoscientists (Calder and Badman, 2009). Unless agreeable to the Mi'kmaq community, sites identified as sacred are to be excluded from the subsequent vetting process.

Vetting of the List

Vetting of candidate natural sites by individual geoscientists has been welcomed throughout the process of establishing the geoheritage list. A forum where geoscientists gather to discuss the vetting process is an even more powerful exercise in sharing philosophical views of criteria, potential issues and applications. Such a forum will take place at the Annual Meeting of the Atlantic Geoscience Society in 2014. The ultimate peer review of the list will be achieved through formal publication.

Unlike the natural sites, candidate cultural sites undergo no vetting. Cultural sites are determined by communities to commemorate valued parts of their history. It is considered inappropriate to question this relationship. The intent of the cultural list is to build a network of sites that communities have identified as significant.

Making the List Public

The primary vehicle for recognition and identification of sites on the geoheritage list is web-based. The NSDNR website will offer an interactive map of sites that will permit linkages to

partners at sites and to related resources. The base map of natural and cultural sites was completed in 2013. Summary descriptions and images of GH1 and GH2 sites will be added during 2014 before launch of the website. The *Nova Scotia Geological Highway Map* will be another important vehicle for identifying geoheritage sites to the public. These media will be supplemented by physical signage, which are currently in the planning stage. These signs will include QR codes that will link visitors to the geoheritage list website.

Partners who incorporate the list in their program goals will also be important in developing a wide recognition of the list. Examples of such partnerships are given below.

Applications of the List

The branding of Geoheritage Sites in Nova Scotia has created a growing number of applications and partnerships. Partnerships include private operators, regional development agencies, municipalities, interdepartmental collaborations, intergovernmental co-operation, provincial and federal parks, and provincial and territorial surveys. Specific collaborative projects developed in the past year include:

- the *Nova Scotia Geological Highway Map* (Atlantic Geoscience Society)
- geotourism itineraries (Nova Scotia Tourism Agency)
- the Outdoor Network (Recreation Nova Scotia)
- the identification of International Appalachian Trail route (International Appalachian Trail Committee and Nova Scotia Trails Network)
- park interpretation (Nova Scotia Provincial Parks)

Assessment of Global Geopark potential

The Global Geoparks Network provides a vehicle for drawing public attention to the geoheritage values of a particular region. Unlike conventional provincial, state or national parks, which typically are restrictive land-use designations, Global Geoparks focus on geotourism and community-based economic development. Although the process of nominating a region for possible inclusion in the Global Geoparks Network is community-driven (Canadian National Committee for Global Geoparks, 2010), geological surveys play a key role. Geological surveys, through their geoheritage lists, can guide decisions proactively by assessing regions of the province that have potential as aspiring Global Geoparks. This can be achieved by clarifying geoheritage values of each site, by helping to identify boundaries, and by identifying geoheritage sites that have a strong unifying theme and which may be grouped within an aspiring Geopark.

Geotourism

‘Geotourism’ refers to the visitation of geoheritage sites and its economic benefits (Calder and DeMont, 2010). Geotourism sites are drawn from the geoheritage list, which establishes the value and messaging of each location. Although there is great potential in geotourism, it is important to recognize that not all geoheritage sites are appropriate candidates for reasons of integrity, visitor safety or even scientific obscurity (see Table 4). As mentioned above, potential geotourism itineraries are being explored with the Nova Scotia Tourism Agency, and the message of geoheritage value for individual sites is being conveyed to partners who manage, and in some cases own, specific geoheritage sites around the province.

Conclusions

The process of establishing a list of geoheritage sites for Nova Scotia has proven to be an effective strategy for developing a robust list in a timely fashion. Early success can be measured in the growing awareness of the geoheritage and geology of Nova Scotia, the establishment of new partnerships, and the interest of sister geological surveys in other provinces and territories. The formal launch of the list in 2014–15 is expected to create still greater awareness and more partnerships.

We share a rich geoheritage on this planet, the recognition of which is growing worldwide. The evolution of the Earth and life upon it define who

Table 4. Considerations for assessing geotourism potential of geoheritage sites.

Interpretive value	
Does the site have exceptional interpretive potential?	
or	
Is the site one with exceptional aesthetic value?	
Mitigating Factors Against Geotourism Promotion	
Scientific obscurity	Is the site primarily of scientific interest, and hence obscure? It may not be suitable as a geotourism site. (e.g. a type section)
Safety	Is the site unsafe to visit? (e.g. inadequate roadside pull-off, unsafe access, problematic site)
Integrity and conservation	Is the site vulnerable to unsupervised visitation/collecting? (i.e. is it inappropriate to disclose the site publicly?)

we are. Around the world, extraordinary geological sites serve as chapters in the 'Big Volume,' as Sir Charles Lyell once referred to Joggins and Earth history. The cornerstone of taking stock of our geoheritage is the establishment of a list of geoheritage sites, a task for which geological surveys are particularly suited. The dangers of not having such a list lie in missed opportunities and in the potential for ill-advised allocation of limited resources. As other provinces and territories develop their own geoheritage lists, a cross-Canada geoheritage network becomes a real possibility across this geologically diverse country.

References

Atlantic Geoscience Society 2004: Nova Scotia Rocks, first edition; Atlantic Geoscience Society, Publication 21.

Atlantic Geoscience Society 2013: Nova Scotia Rocks, second edition; Atlantic Geoscience Society, Publication 39.

Calder, J. and Badman, T. 2009: Earth heritage: a common past … and future; World Heritage, no. 52, p. 6-15.

Calder, J. H. and DeMont, G. J. 2010: Geoheritage in Nova Scotia; *in* Mineral Resources Branch, Report of Activities 2009; Nova Scotia Department of Natural Resources, Report ME 2010-1, p. 1-10.

Canadian National Committee for Global Geoparks 2010: Guidelines and Criteria for Canadian Sites Seeking Designation within the Global Geoparks Network (GGN); Canadian Federation of Earth Sciences, 14 p.

Donohoe, H. V. Jr., White, C. E., Raeside, R. P. and Fisher, B. E. 2005: Nova Scotia Geological Highway Map, third edition; Atlantic Geoscience Society, Publication 1.

Ferron, P., Bélanger, M., Madore, L. and Verpaelst, P. 2010: Guidelines for Managing Outstanding Geological Sites, Classified Under Section 305.1 of the Mining Act; Ministère des Ressources naturelles et de la Faune, Québec, DV 2010-5, 47 p.

Wallace, P. I. 1998: Discovering Rocks, Minerals, and Fossils in Atlantic Canada: a Geology Field Guide to Selected Sites in NF, NS, PEI and NB. Atlantic Geoscience Society, Publication 14.

World Heritage Committee 2013: Operational Guidelines for Implementation of the World Heritage Convention; UNESCO, World Heritage Centre, Paris, 165 p.