

The Opening of the Waterloo GeoTime Trail; a Canadian contribution to the International Year of Planet Earth.

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http://www.iypecanada.org/media/pages/media/iype_mediakit.pdf
Introduction <http://www.city.waterloo.on.ca/DesktopDefault.aspx?tabid=2106>

The Geotime Trail is designed to be a 4.567 km long trail that will eventually make its way from a common start and end point as a loop trail very close to Columbia Street West in Waterloo. The distance of the Trail corresponds to the current estimates of the age of the Earth at 4.567 billion years. Every metre along the trail represents one million years of geological time, and each single millimetre represents 1,000 years.



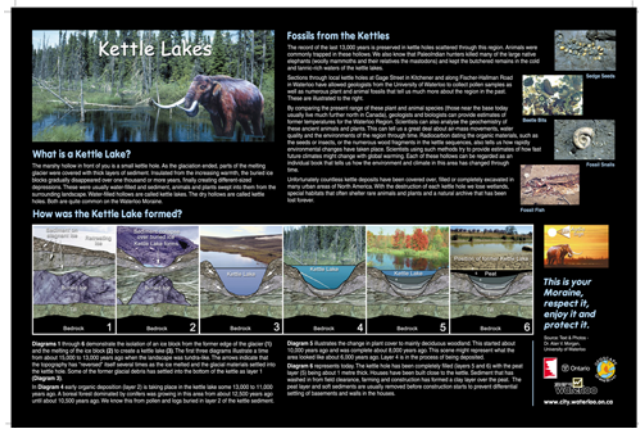
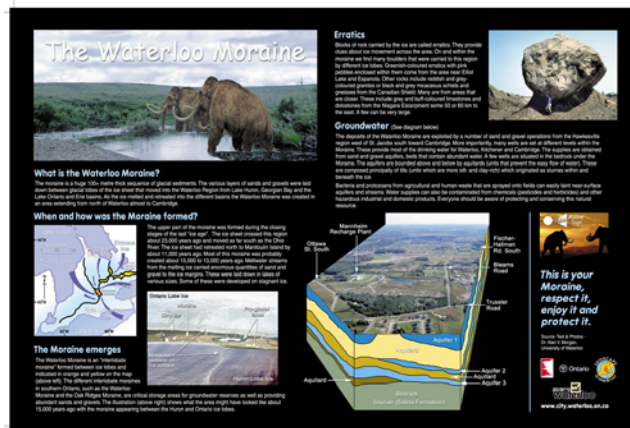
Figure 1: Currently installed signs (2 – 1,300 million) marked in yellow completed in Phase 1. The “Talking Sign” positions are also indicated. Future urbanization on the Westside Lands (west of the central Forested Hills area) has prevented the completion of the trail loop to the west. An approximate route is indicated by orange dots, although the final trail may not take this route and will be longer than that indicated.

Plans for the GeoTime Trail and the initial “Talking Signs” were brought forward to the City of Waterloo in 2001 and the concept was subsequently enthusiastically endorsed by the City's Trails Committee. The “Talking Signs” – signs with an audio track – were completed in 2002 (see below) in conjunction with an educational outreach project called the *Geoscape Grand River* Project and were placed at two locations on the moraine (see Figure 1).

The Talking Signs

The Waterloo Region lies within the Grand River basin in southern Ontario, and is part of a rapidly urbanising landscape (http://www.geoscapegrandriver.ca/about_geoscape.html). The City of Waterloo together with Kitchener, with which it shares a common conurbation border, are situated on the Waterloo Moraine that provided both cities with all of their water up to the late 1980s. Citizen and Environmental groups have been trying to protect the west side of both cities from urban expansion since this is now bordering on impacting the recharge areas of the local aquifers.

For this reason two audio signs were designed to educate the public on the importance of the moraine and how Earth scientists look at the records of past environmental changes preserved in ice-block melt depressions. These were labelled “The Waterloo Moraine” and “Kettle Lakes”.



By activating a push button (left) a soundtrack (about 90 – 120 seconds) explains the significance of the moraine, the late Quaternary history of ice retreat and the kettle lakes of the region.

Both of these signs have become incorporated into the general flow of the GeoTime Trail but are located slightly off the main pathway so as not to confuse the geological order of the Trail.

<http://www.bulletin.uwaterloo.ca/2002/oct/31th.html>

The GeoTime Trail (Phase 1)

The GeoTime Trail will be a closed loop covering a distance that can be walked in 1 to 1.5 hours (a reasonable distance for a healthy workout). Participants can walk either way along the Trail although it would be sensible to walk from the origin of Earth toward the present (i.e. clockwise) to see the gradual evolution of the planet as events occurred. However, at this time only the last part of the trail is sign-posted. For this reason it would be appropriate to start the walk at the “Waterloo Moraine talking sign” (Figure 1), and walk toward the end of the Trail. As explained above the Trail will be completed over the next few years as the Vista Hills development takes place on the west side of the Forested Hills. Funding for Phase 1 of the Trail was provided by the *Canadian Geological Foundation* and the City of Waterloo.

The Opening of Phase 1 of the Geotime Trail

The Waterloo GeoTime Trail was opened on Sunday, October 21, 2007. The weather was fantastic; - blue skies, not a cloud in sight, and warm at 23° C.



The crowd assembles just prior to the opening ceremony. City dignitaries, members of the local universities and citizens from several surrounding communities gathered on the Westside of Waterloo. Waterloo is also celebrating its 150th Anniversary as well as being named as the *World's Top Intelligent Community in 2007*.



The “official” ribbon cutting ceremony. (From left to right; Brenda Halloran, Alan Morgan, David Johnston and Terry McMahon).

The opening was attended by well over 200 people. Over 150 completed the 3.0 km roundtrip walk from the ribbon cutting area to the start of the trail. The ribbon cutting ceremony was conducted by Mayor Brenda Halloran representing the City of Waterloo and the University by David Johnston (President), Terry McMahon (Dean of Science) and Alan Morgan (Professor, Department of Earth and Environmental Sciences).

Following the ribbon cutting a piper led the way to the first sign; - illustrating what happened at the time of formation of the geologically oldest rocks beneath the region about 1.3 billion years ago.



City of Waterloo surveyor (and piper), Finley MacIennan, leads the way at the opening of the GeoTime Trail. The local CTV station (CKCO) video crew joined over 150 participants along the GeoTime Trail to the first sign.

Phase 1 of the GeoTime Trail has resulted in ten signs that cover the last 1,300 million years of geologic time. This time frame represents the oldest rocks below the Waterloo Region. Unfortunately rock sequences are not exposed in Waterloo because the area is covered in a thick sequence of glacial sediments and there are multiple time breaks in the stratigraphy of the region.

However, rocks of Silurian age and older are present in the subsurface and many of the deeper water wells and oil and gas exploration wells in the region have penetrated rocks of Paleozoic age and some have reached the Precambrian “basement” some 850 metres below the ground surface.

Precambrian Time

4,000 million years 3,000 million years 2,000 million years 1,000 million years Present

← Origin of Planet Earth

ARCHEAN **PROTEROZOIC** **Post Precambrian**

GeoTime Trail **Late Precambrian**
1,300 MILLION YEARS AGO

MORE SCIENCE FACTS

- The Precambrian rocks about 853m (2,800 feet) below your feet date to 1.3 billion years (1,300 million years).
- When these rocks were being formed there were volcanoes active in the Waterloo region and the area was located in the southern hemisphere.
- At this time the last part of the Canadian Shield was being formed as a result of continental collision which created a “supercontinent” called Rodinia.
- These Precambrian rocks are part of the Canadian Shield that is exposed throughout much of Canada. They can be seen at the surface near Parry Sound and north of Manitoulin Island. Shield rocks also underlie the younger rocks of southern Ontario and the United States.

Rocks of this age are present in many parts of the world and are especially well exposed in the Waterton Lakes region of southern Alberta and adjacent Montana. At this time in the world’s history there were no burrowing organisms and the shallow ocean sediments now preserved as sandstones and shales show signs of ripple marks and drying cracks.

Although complex life forms did not appear for another 700 million years, the Late Precambrian oceans had abundant cyanobacteria, sometimes referred to as “blue green algae”. These were present as early as 3,500 million years ago. Through photosynthesis cyanobacteria gradually built up the oxygen content of the world’s atmosphere, preparing the way for more advanced animals and plants.

The GeoTime Trail Project has been brought to you by the generosity of:

THE CITY OF **Waterloo** **UNIVERSITY OF Waterloo** **planetearth**

Concept, text and illustrations: Dr. Alan Y. Morgan

The oldest time frame sign erected in Phase 1 illustrates how the region might have appeared 1,300 million years ago. The sign shows a time scale bar across the top with an oval circle in yellow that marks the position of both the time represented and the distance to the end of the Trail. Additional “Science facts” are provided for that time frame and the logos of the supporting groups are in the bottom right.



(Left) Some of the participants walking along part of the GeoTime Trail to the first sign at 1.3 billion years before the present. For hikers on the Trail the 1.3 billion years converts to 1.3 kilometres to the end of the trail.
(Right) The unveiling of the first sign. (Images by Anne Morgan).

At the first sign Alan explained the rationale of the Trail, where every metre represents one million years and each centimeter, 10,000 years. Local television cameras recorded parts of the opening and the first 700 million years of the Trail with some interviews with University of Waterloo President David Johnston and a student representing WATROX, the geological club at the university. This was aired on Sunday evening (October 21, 2007) on the local TV station. Following the explanation Finley Maclellan filled his lungs (and the bagpipes) and led the crowd onto the second sign.



The eighth sign, 600 metres from the end of the Trail illustrates events at 600 million years ago during Ediacaran time. The illustration above shows one of the panels showing ocean life at that time. (Left): Image courtesy Peter Russell.

At each of the following signs Alan explained what was represented on the signs and how this fitted into rock sequences that appear in southern Ontario from the Niagara Escarpment west to the shore of Lake Huron.

The ten signs that illustrate the geological story of the region are based either on local rocks that can

be seen nearby, for example at the Elora Gorge or on the Niagara Escarpment, and time frames that show features of geological interest elsewhere in the world. Examples cited are from Australia, different parts of Western Canada and the United States and from Europe. Parts of the GeoTime Trail that are steeper are graded for wheelchair access and these sections are hard surfaced and lined with fossiliferous rock slabs of Devonian age from just west of Waterloo.



Devonian rocks, placed as retaining walls along the Trail are richly fossiliferous with corals, - both solitary and compound, stromatoporoids, brachiopods, gastropods and crinoid remains.



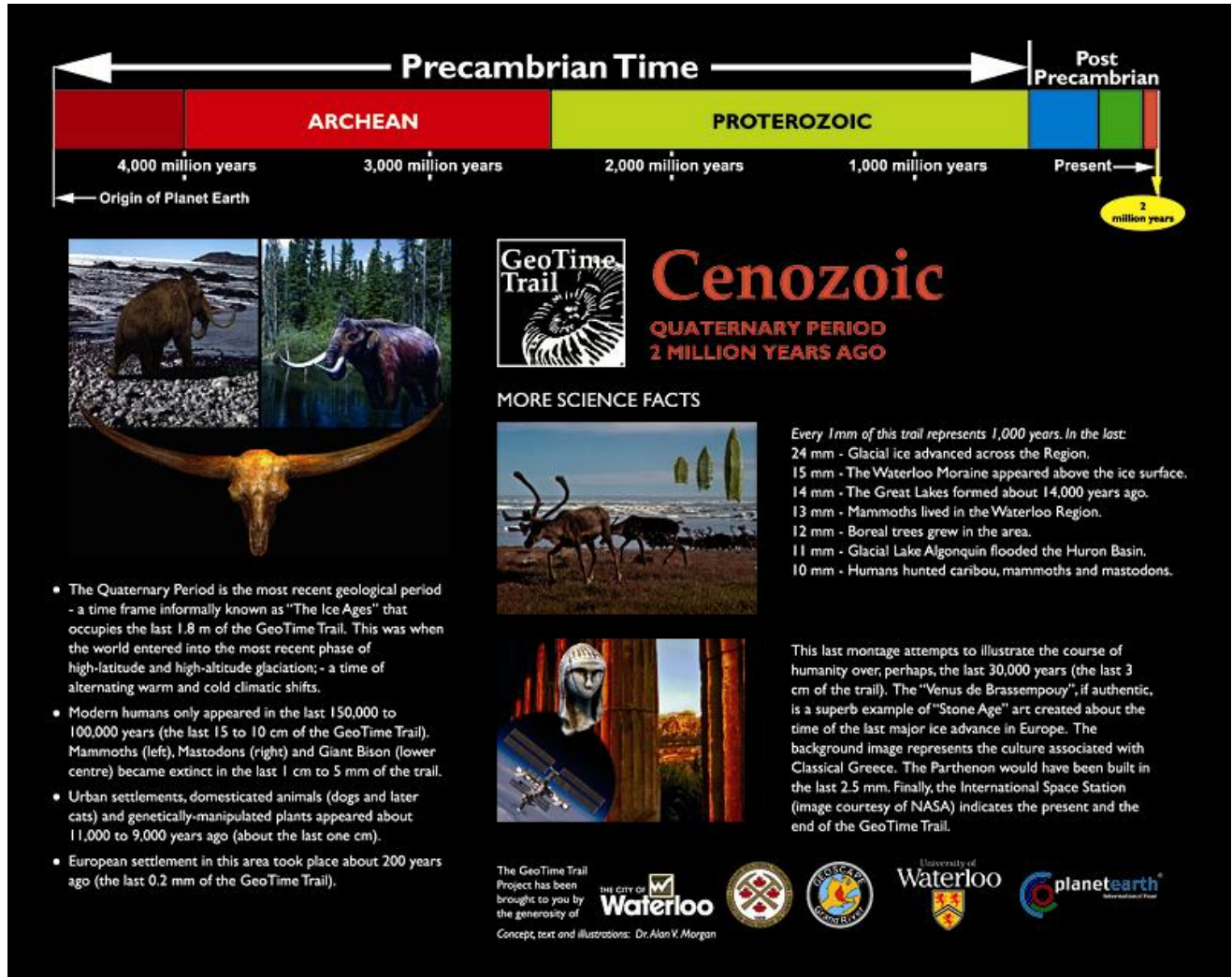
(Top left). An explanation of the Devonian Period sign some 400 metres from the end of the Trail. (Top right) one of the illustrations showing what the Waterloo Region would have looked like in the Devonian Period 400 million years ago. (Lower left) Stromatoporoid showing mammillated surface. (Lower centre) Solitary horn corals. (Lower right) Spiriferid brachiopod. All these fossil images are from the retaining blocks along the Westside Trail and are from quarries in the Woodstock area, Ontario. They illustrate marine life in the Devonian Period.

The last sign represents the Quaternary Period, the time frame when humanity appeared and an explanation was provided that illustrated humanity's place on the planet at this point in geological time. Here Alan re-emphasised the time frames of the Trail where each millimetre represents 1,000 years. The whole of human history from the city states of Ur and Sumer are present in the last 5 mm of the Trail whilst the earliest human communities date back the last single centimetre of a 4.5 kilometre trail. The European settlement of the Waterloo Region took place 0.2 mm from the end of the Trail.

One of the principal objectives of the GeoTime Trail is to provide a learning tool for students of all ages to try to relate to the immensity of geological time; - where geological periods start and end, when different biological organisms appeared on Earth and when major catastrophic events took place and when (and how) economic mineral deposits such as the Sudbury impact at 1.85 billion years were created. In this way students can more easily relate to the place of humanity on Earth.

For example, as mentioned above, all of human history in terms of agriculture and urban settlement takes place in the last 10 cm of a trail that is almost 4.6 km long! The relationship of dinosaurs to humans can also be clearly seen when dinosaurs vanished 65 m from the end of the Trail.

The last sign on the GeoTime Trail is placed in the last metre or so of the Trail and represents “modern” time.



National significance

The Waterloo GeoTime Trail is the first of this type in Canada and is one of the projects outlined in the Canadian contributions to the IUGS/UNESCO-sponsored International Year of Planet Earth that will take place in 2008. Expressions of interest in adopting the concept have been informally received from Edmonton, Montreal, Saskatoon and Halifax. Ultimately it is hoped that "GeoTime Trails" with as many as 40 or more signs will be established in many parts of Canada and perhaps elsewhere in the world.

Future expansion of the GeoTime Trail

Phases 2 and 3 will see the development of the booth for the start and the end point of the 4.56 km loop trail together with the creation of an additional 30 signs and specific markers that will illustrate additional points in the history of Planet Earth. Phases 2 and 3 will follow as the Trail is gradually expanded over the next few years. A web site is being created to further explain the GeoTime Trail.