TC ROCKHOUNDS

January 2021 issue

WE WILL HAVE OUR NEXT VIRTUAL MEETING, ON JANUARY 19 AT 6:45 P.M. WATCH FOR YOUR EMAIL INVITATION AND JOIN US!

The second virtual meeting on November 17 went well with approximately 30 people in attendance. Most were through video connections and a few by phone.

Instructions for the virtual meetings will come in an email a couple of days before the meeting and will have instructions on how to connect.

Facebook Page

Visit the club's Facebook page that Jenny Burcroff created. To take a look use this web address. There is also a link on our club website.

https://www.facebook.com/TCRockhounds

HAPPY GOLDEN ANNIVERSARY GTARMC !!

Jared was looking through some paperwork and realized that November was the 50th anniversary of the founding of the club. There have been a lot of changes in the club over the years from its beginning with just a few members to the vibrant large club we have now. It has met in many different places over the years including the City Owned Traverse City Senior Center on the bay on Front Street, the City's Carnegie Building on 6th Street, where Crooked Tree now has their Traverse City operations, and where our club workroom is located. Our annual rock and mineral shows have been held at Northwestern Michigan College, the Carnegie Building, GT County's

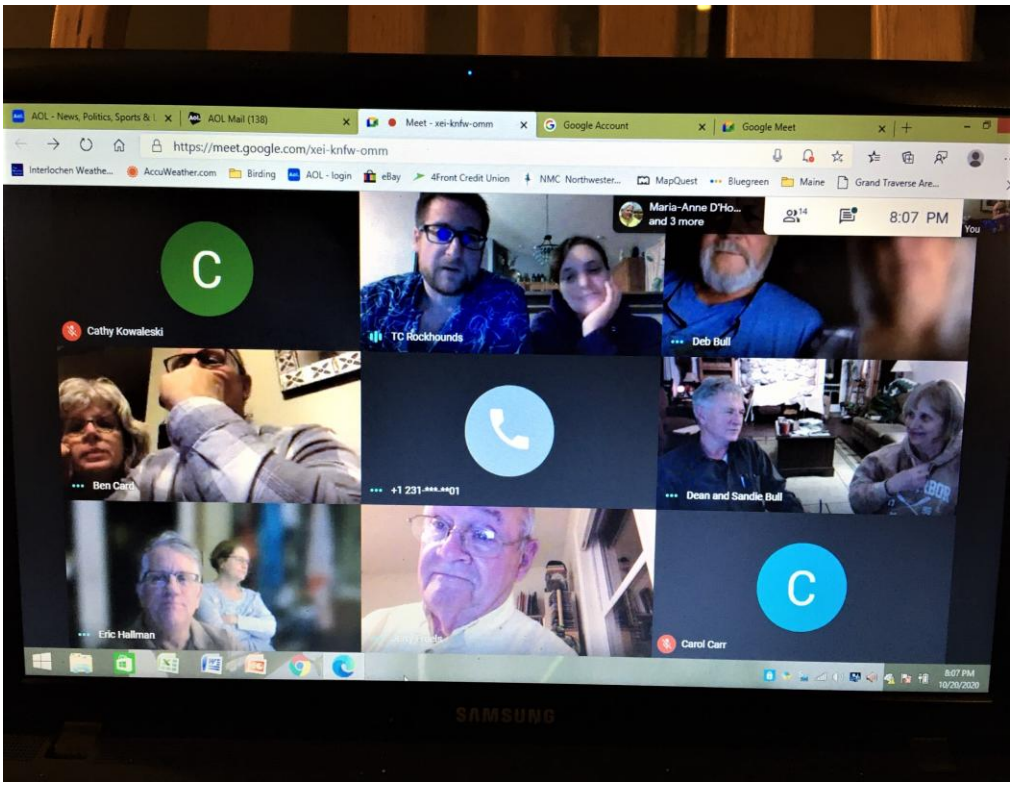
Civic Center and most recently at the Cherryland VFW post. There have been countless field trips, both formal and the informal meeting of members at a particular location.

We look forward to the next 50 years and all of the shows, trips, meetings and other special events that will take place. We hope to have a more hands on event at some time this year after COVID-19 allows us to resume normal in-person events.

Upcoming Field Trip Planning

Kevin Gauthier has made it known that he would like someone else to come forward and take over the Field Trip Coordinator position for next year. Kevin will still plan the trip to the U.P. in early September next year.

Here is a photo of what the club meeting looks like on our computer. We hope you can join us on January 19.



INTERESTING MICHIGAN GEOLOGIC INFORMATION

Below is a link to an article from the Michigan State University Geology Department on the Geology of the Great Lakes Region. Thanks to Deb Bull for sending this information to be included in the newsletter.

http://www.geo.msu.edu/extra/geogmich/geology.html?fbclid=IwAR1P1p8RCzowpsvVX3yIEP8em-kxpU9MdJwHWSJStuwSAyrXNki8R-WkPi4

Deb and Gary Bull have some large sturdy buckets at their house that Jared procured. A small donation to the club is required per bucket.

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The above contact list will be included in each newsletter so that you know who to contact for various items.

Anyone that has paid their 2020 membership dues will not have to pay any 2021 dues. This decision was made by the board since we have not been able to have many events or meetings this year.

Club Email Address

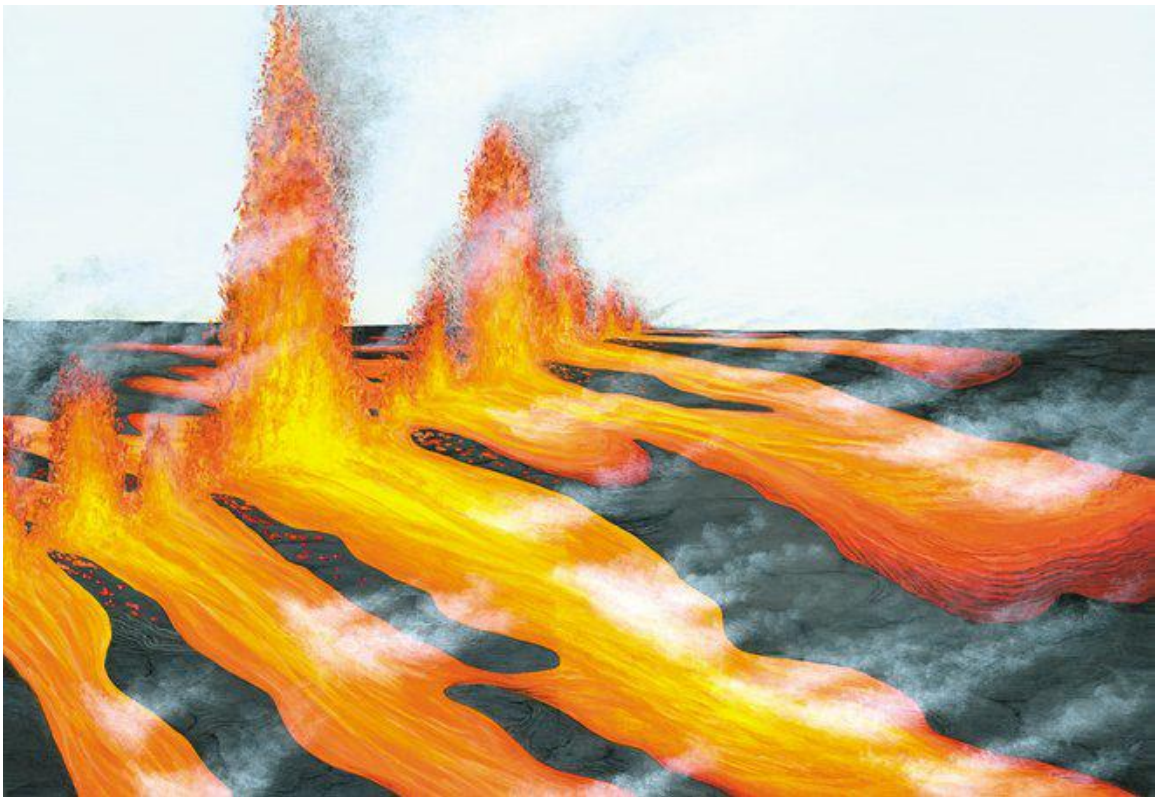
gtarmc@tcrockhounds.com

Hope that everyone had an enjoyable Holiday season. Join us online on January 19.

On the following pages, is an interesting article that Deb Bull shared about the geologic history of the Lake Superior Basin. It is a very interesting read.

The Lake Superior Basin's Fiery Beginning

by John C. Green June 1, 2002



Susan Robinson

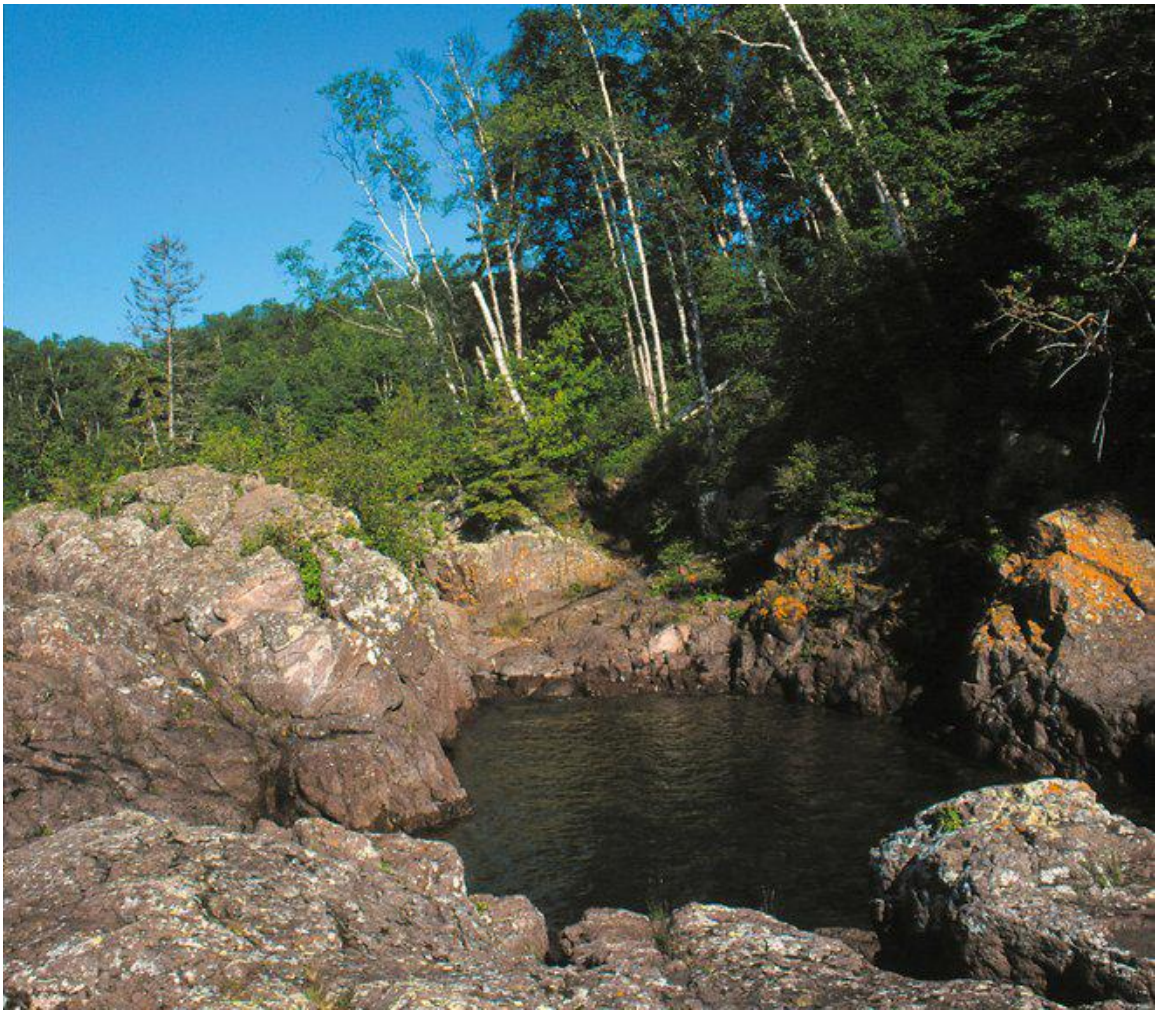
Great fire-fountains of basaltic lava feed flows that will soon coalesce to form a broad, crepe-like lava flow hundreds of square miles in area on a barren plain in this illustration of the early stages of a typical large fissure eruption in the Lake Superior area. Such eruptions occurred during Midcontinent rifting, about 1.1 billion years ago during the Proterozoic Eon.

When you encounter Lake Superior, what do you see? The vast expanse of clear water, the brooding cliffs of the northern shores, black boulders crowded along some beachfronts or the paler, shifting sands of others? You see the dramatic and aesthetic beauty of the landscapes that keep many of us here and keep others coming back. When geologists look at Lake Superior, we see the beauty and drama, too, but also clues to exciting geological events of the past, a unique history that speaks of fire and ice. The familiar cliffs of Split Rock Point and Palisade Head in Minnesota, the dark ledges of the northern lakeshore and even the mysterious white bands lacing dark rocks in Ontario's Lake Superior Provincial Park conjure up an ancient past having more to do with flows of hot magma than waves of cold water – land-shaping

happenings that took place long before humans came to admire this beauty and these wonders of the lake basin. In fact, these visual delights would not be here for us if not for the area's geological history.

Most people know of the icy origins of the five Laurentian Great Lakes of North America: Ontario, Erie, Huron, Michigan and Superior. None of these huge, world-class lakes would exist if the Great Ice Age glaciers had not scooped out the basins where they now lie. Up to about 2 million years ago, when the Ice Age began, midcontinent North America was a wide, rather featureless plain. Why did those broad ice sheets excavate the Earth's surface where they did, and to such depths to form these huge basins?

Let's look way back into our more ancient geological history for the explanation. In the case of Lake Superior, the rocks themselves tell an ironic geologic story: without fire in our past, we wouldn't have our gigantic bowl of water today.



Gerard Bauer

These dark rocks, familiar around Lake Superior, are evidence of ancient volcanic activity. Called basalt, this volcanic rock is seen here at Temperance River State Park in Minnesota and can be found in all the state parks along Lake Superior's Minnesota shore.

That geologic fire – intense volcanic activity – created the critical beginning for Lake Superior, though not for the other Great Lakes basins, formed where the ice sheets found soft, shaly sedimentary rocks laid down in shallow seas about 500 million to 350 million years ago. These softer rocks were more easily eroded by the glaciers and determined the location of those downstream basins. But those areas to the east did not share the dramatic volcanic history of the Lake Superior basin.

Based on the "record of the rocks," then, what ancient landscapes can we conjure for the Lake Superior area? To develop the proper perspective, we need to travel into "deep time" geologic time – measured in billions of years.

The bedrock of Earth's crust around nearly all of Lake Superior is part of the huge core of North America called the Canadian Shield. This great mass consists of rocks formed in Precambrian times – that is, from the very origin of Earth about 4.7 billion years ago up to a mere 545 million years ago.

In our area, the oldest rocks are about 2.7 billion years old. Found mostly along Lake Superior's Ontario shores and located in the area called the Superior Province of the Canadian Shield, these ancient rocks date from the Archean Eon. Many are volcanic, having formed in island arcs and ridges like those today forming Japan and Indonesia. Others have a sedimentary origin, born from deposition of sand, mud and gravel in long-vanished seas. Still others are great intrusions of granite that invaded the volcanic and sedimentary rocks in a hot, molten state called magma and then solidified deep beneath the Earth's surface.

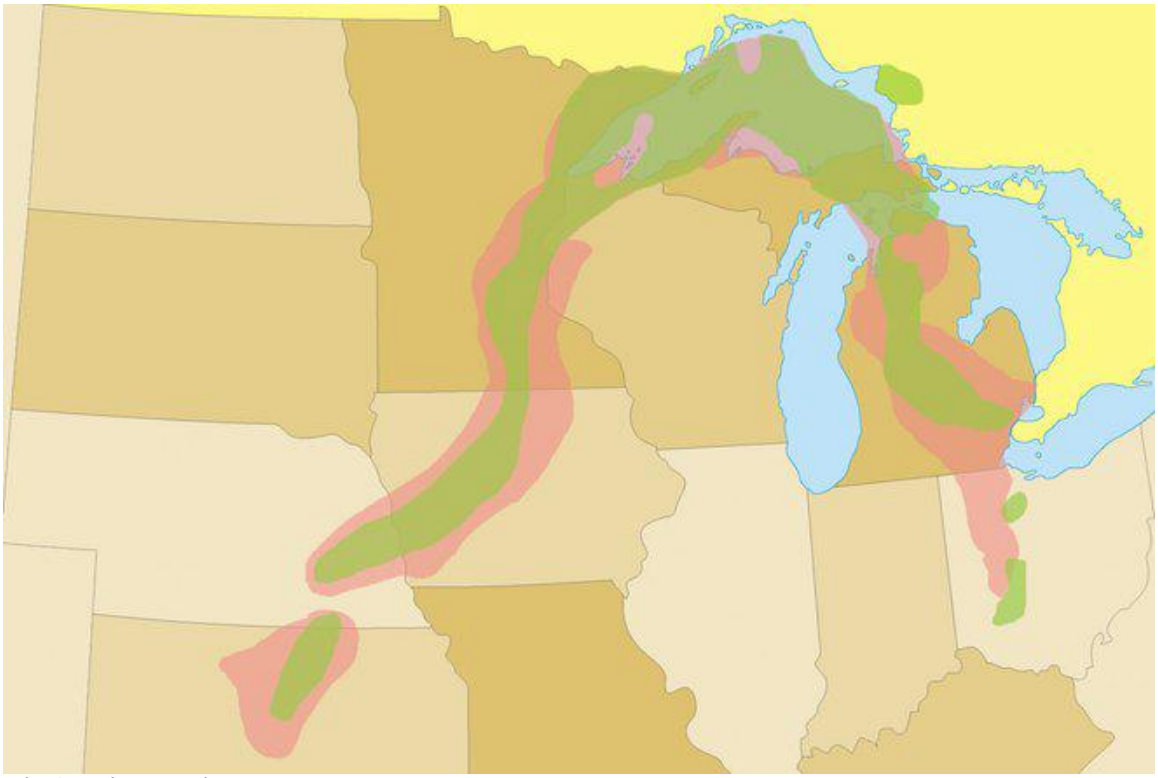
The volcanic and granitic rocks tell us of the building of great mountain ranges, perhaps rivaling the Alps but which have since been eroded to the nub. The rocks we see today along the lakeshore in Ontario were once miles beneath the surface, exposed after hundreds of millions of years of erosion removed the overlying rocks.

Some Precambrian rocks around Lake Superior are younger than Archean, dating from a time known as Early Proterozoic. This was when primitive life was developing, mainly bacteria and algae. These sedimentary rocks formed in a large sea and the rocks today can be found in Michigan's Upper Peninsula, west of Duluth and to Cloquet and on the Mesabi Range in Minnesota and around Thunder Bay, Ontario. Some contain the great iron-bearing strata whose ores have supported a world-class mining industry for more than a century. These rocks were shoved and tilted and can be seen especially between Marquette and Ironwood in Michigan and in the tilted formations in Jay Cooke State Park south of Duluth. These sedimentary rocks were added to the Earth's solid crust in another mountain-building episode about 1.85 billion years ago. Again a long period of erosion followed, reducing those mountains and hills to a plain once more.

But still no hint of the dramatic events that set up conditions for the eventual creation of Gitchi gami, the biggest lake of all.

Then about 1.1 billion years ago a whole new geological revolution began that changed central North America forever. Deep in Earth's mantle (the 1,800-mile-thick layer beneath the crust), the rock grew so hot that it became buoyant and started to

rise by slow, plastic movement. Called a “plume,” this rising cylinder of hot mantle rock came up and spread out under the stiffer lithosphere (the crust and uppermost mantle). This plume (as illustrated on the bottom of this page) apparently centered under where Lake Superior is today and, in fact, determined where our Great Lake would eventually develop.



Lake Superior Magazine

The magenta and green areas show where a plume of hot mantle rock rose and spread under the stiffer lithosphere (the crust and uppermost mantle), stretching the old rocks which started to pull apart along great fissures, tracing out a huge arc known as the Midcontinent Rift System. This geologic activity a billion or so years ago laid the foundation for where Lake Superior’s basin would be formed later during the Ice Age.

As the plume slowly rose and spread out, two important processes began. One was a spreading or stretching effect on the old rocks of the overlying lithosphere. Now under tension, they started to pull apart along great fissures, tracing out a huge arc known as the Midcontinent Rift System and following from what is Kansas today up under Lake Superior then south through Michigan.

As the lithosphere above stretched and rifted, the hot plume rock started to melt as it encountered the lower pressures near the surface. Huge amounts of melt (magma) were produced and the fissures in the rifting crust allowed the magma a passage to the surface. Thus began an intense period of volcanic eruptions that continued – with only one 5 million year pause – for about 24 million years.

Magma that comes from partial melting of the Earth’s mantle has a particular chemical composition. When it erupts and solidifies, this kind of magma produces a rock called basalt. This is the same dark volcanic rock that makes up nearly all of the

volcanic islands we know today, such as Hawaii and Iceland. Similarly, Lake Superior is largely rimmed by these billion year - old basaltic lava flows that gave us the Keweenaw Peninsula and Isle Royale, Michigan, Michipicoten Island and Mamainse Point, Ontario, and Minnesota's north shore.

Susan Robinson

About 1.1 billion years ago during the Proterozoic Eon a great plume of hot mantle rock rose under this area, stretching the crust and erupting many huge basaltic lava flows (black) in the subsiding basin along the Midcontinent Rift System. Note the Earth's curvature for scale. Lake Superior would eventually form along this ancient rift system. Some of the rocks around Lake Superior date back to the earlier Archean Eon, a time when the oldest rocks were formed on Earth

But don't think that this volcanic activity was similar to what we see in Hawaii today. Instead of lava dribbling and drooling down the flanks of large volcanic mountains, imagine huge fountains of intensely glowing lava spurting up from fissures that extended for miles across a barren plain. So much highly fluid lava would erupt in one event that it simply spread out, in many cases for hundreds, or even thousands of square miles, to form a huge, pancake-like lava flow.

Fortunately for humans, no such "flood basalt" has occurred in historic times. Only one eruption has come close – in a devastating fissure eruption in Iceland in 1783, lava from a 16- mile long fissure covered 221 square miles during eight months. Many Midcontinent Rift eruptions were much bigger than that.

Eventually, for reasons not yet well understood, the plume in our ancient region became inactive, and magma production and rifting ceased. But so much heavy

basalt had been transferred from beneath the crust onto the surface, that the land continued to sink along the axis of the rift. This created a low basin into which streams rapidly brought gravel, sand and mud eroded from the newly formed volcanic rocks. One brief period of compression squeezed up parts of the middle of the rift along the great Keweenaw and Isle Royale faults. The sagging and build-up of sediment continued for several million years until the region finally stabilized. This left the tilted, upturned edges of the harder lava flows around the margins, with the middle of the rift occupied by several miles of overlying sedimentary rock, mostly sandstone. We see these sandstones today making up the Bayfield Peninsula and Apostle Islands, the north shore of the Keweenaw and the southeast part of Isle Royale.

After the traumatic events of the Midcontinent Rift, this area had a long, hard-earned geological rest, undergoing only gentle, broad uplift and erosion for a billion years or so. But the stage had now been set for the final act of the geologic drama that produced Lake Superior – the time during the past 2 million years when the Lake Superior basin itself would take shape as time and again the mighty ice sheets excavated the softer sedimentary rocks that occupied the center of the rift. When the last of the ice melted – about 10,000 years ago – Lake Superior was born.

The Ground Around You

Throughout the lake basin there are examples of volcanic activity on the cliffs above you to the rock beneath your feet. Gas bubbles in basalt set the stage for formation of Thomsonite and for Lake Superior agates. Here are just a few lake places where evidence of the fiery past can be seen:

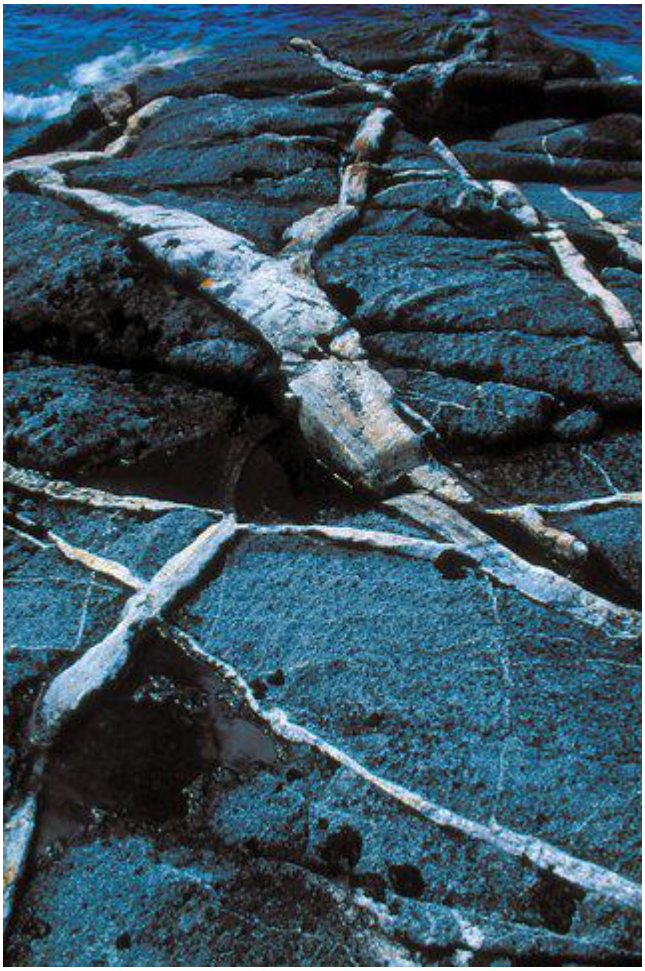
Minnesota

The dark basalt flows are evidenced in many areas. In Duluth, look around at Leif Erikson Park or at Amity Creek and Lester River. Basalt is found on the lakeshore at Town Park and Lighthouse Point in Two Harbors. Most of the shoreline state parks feature ancient basalt flows. Check out the falls above and below Highway 61 at Gooseberry Falls, or the lakeshore southwest of the Split Rock Lighthouse. The famous Palisade Head and Shovel Point are made of light-colored volcanic flows called rhyolite. The river beds of the Temperance and Cascade are also carved from basalt.

John C. Green
The ropy surface of a basalt flow above a pool at the mouth of the Temperance River.

Ontario

The road cuts and lakeshore around Mamainse Point north of Sault Ste. Marie are made of volcanic basalt flows as are the shores of the islands south and west of Rossport, the Black Bay Peninsula south of Nipigon and Michipicoten Island.



Bruce Montagne
A granite intrusion caused when molten granite invaded gneiss at Lake Superior Provincial Park

Michigan

A stop at the state Tourism Information Center in Ironwood features a parking area where the walls are made of local basalt lava rock. At Seventh Street west of Agate Street in Houghton, the hill there is made from a large basaltic flow. Many of the abandoned mine dumps within the Keweenaw Peninsula are made of blocks of basalt lava rock. The northern two-thirds of Isle Royale features the Greenstone Ridge, a huge ancient lava flow.

Wisconsin

Big Manitou Falls shoots water over a basalt lava flow in Pattison Park while in Amnicon Falls State Park, east of Superior off of Highway 2, one finds dark basalt lavas shoved against lighter-colored sandstone along a fault.

Dr. Green recently retired as professor of geology at the University of Minnesota Duluth. For more than 35 years, he has focused on the volcanic rocks of Lake Superior's Minnesota north shore. In May 2000 in Thunder Bay, Ontario, the Institute on Lake Superior Geology awarded him the S.S. Goldich medal for work on the geology of the Lake Superior area.