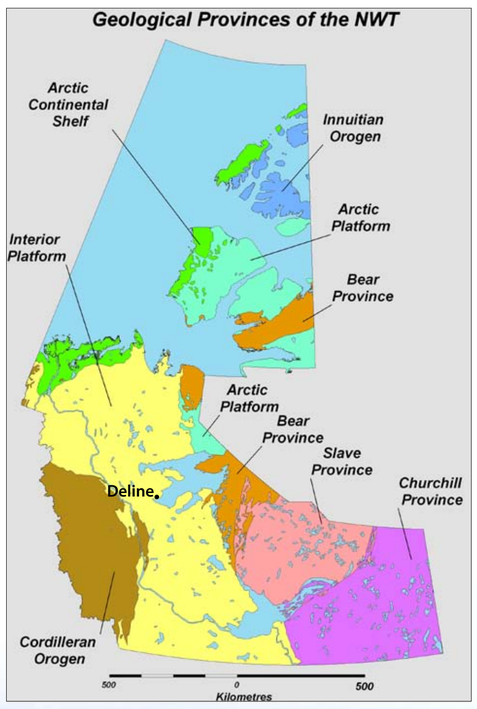
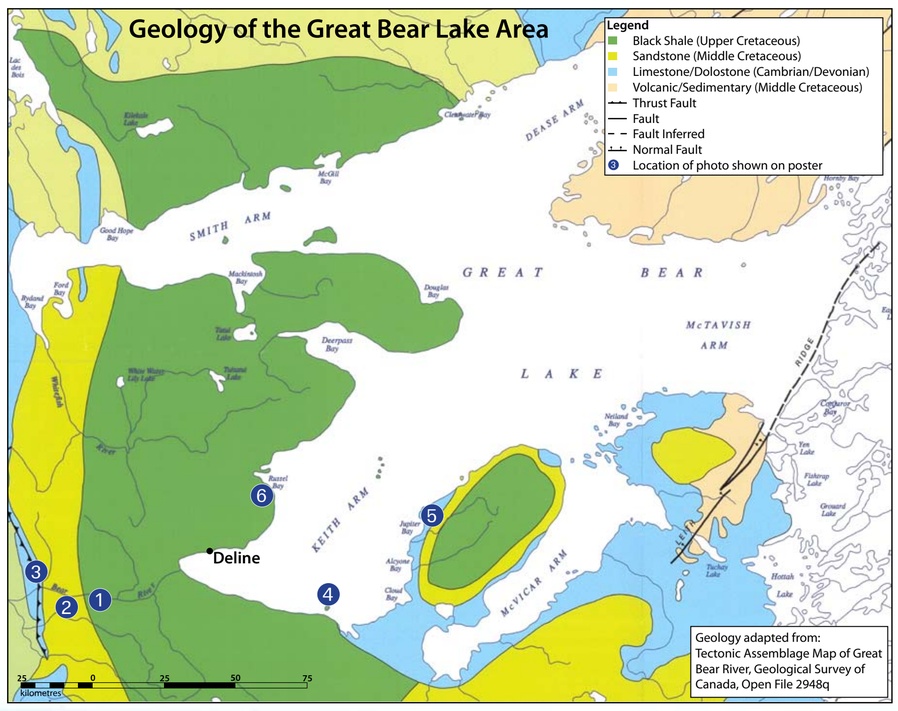
NORTHWEST TERRITORIES
GEOSCIENCE OFFICE
RESEARCH • ANALYSIS • INFORMATION

DELINE

Community Mapping Program

The community of Deline is situated on the shore of Keith Arm, located on the west shore of Great Bear Lake, Northwest Territories. There are about 750 people living in Deline, mainly Sahtugotine Dene and Metis. Great Bear Lake is the seventh largest fresh water lake in the world!



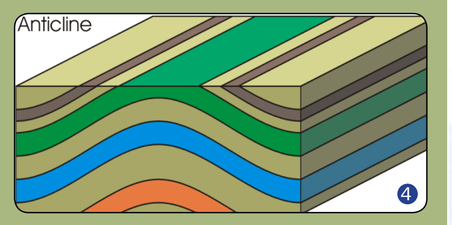


In July 2008, a team of geologists and students examined the rocks and landforms around the community to gain a better understanding about the geology of the Deline area. Sedimentary rocks cover the west side of Great Bear Lake and belong to the Interior Platform, a broad basin that at one time was covered by a warm shallow ocean. Glaciers gouged the rocks beneath Great Bear Lake and deposited a thick sheet of glacial till across the vast landscape.

The east side of Great Bear Lake is quite different geologically in terms of age and rock type. It has supported a variety of mines producing radium, uranium, silver and copper, and holds great potential for other mineral deposits to be discovered in the future.

Manitou Island Anticline

Manitou Island is a special area culturally and geologically.



Rocks on the island can be seen dipping both to the east and to the west. Compressional forces have buckled the sedimentary layers of limestone and dolomite. This is called an anticline. The north- south orientation of the island parallels the axis of the folded rock layers. Walking the ridge of the anticline is like walking along the spine of a wolf. Because the rock material is easily eroded, numerous small caves can be found on the island and the mainland.

4 **Raised beaches record past water levels. Since the last ice age, the lake level has dropped hundreds of feet.**

Great Bear River Rock Types

Three main sedimentary rocks types are found on the Great Bear River: black shale, sandstone and limestone/dolostone.

Black Shale
This is a very crumbly black rock formed from mud and organic material. It is compacted by the weight and pressure of the overlying sediments and turned to rock. The organic material is rich in carbon, which gives the shale a black colour. The rusty brown colour indicates the presence of iron.

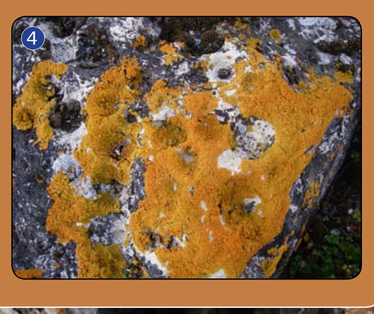
Sandstone
A rock formed from sand grains, sandstone is a common sedimentary rock found in flat-lying layers along the Great Bear River. Here the sandstone is a mustard-brown colour. As the sand is deposited, the grains settle in flat layers called beds. Over time these beds accumulate forming a thick sandstone unit with the oldest layers at the bottom.

Limestone/Dolostone
These sedimentary rocks formed at the bottom of a warm ocean about 350-400 million years ago. Limestone and dolostone are made up of calcium and magnesium which were dissolved in sea water and then deposited on the sea floor. Here you'll see that the beds are no longer horizontal. They have been tilted by compressional forces and now dip 60° to the west. They form a linear mountain ridge that crosses the Great Bear River near Bennett Field.

Distinct Rock Surfaces

A. The pitted texture on this limestone surface reveals its ability to weather easily. Limestone is composed of many tiny grains of the mineral calcite ($CaCO_3$). Rain water, which is mildly acidic, breaks down the mineral compound into calcium and carbonate (CO_3).

B. Bright orange lichen thrives on these calcium-rich rocks. When you see this vivid lichen growing on rocks you'll know it has found it's source of calcium.



450 Million Year Old Fossils at Jupiter Bay

A warm shallow sea once covered Jupiter Bay and the entire region we call the Interior Platform (see map of geological provinces). The continent of North America was downwarped into a basin or linear trough, allowing the ocean water to fill in this low area. Here marine life flourished and evidence can be seen by the presence of fossils in the dolomite rocks.

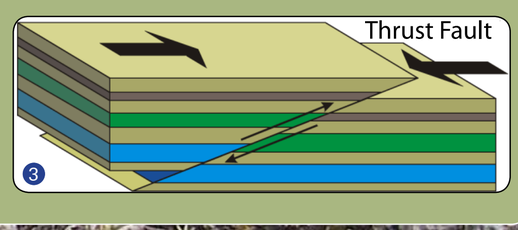
A. This is a cephalopod fossil. It is a squid-like marine animal which lived near the bottom of the sea. It filtered nutrients from water and moved along by ejecting water out the rear. All that remains is the hard shell that protected the soft-bodied organism. We found these fossils up to 2 feet in length!

B. This is a bivalve shell fragment. We are looking at a cross-section or side-view of only one half of the shell. A soft-bodied organism lived within the shell similar to a clam or mussel. It is about 10 cm in size so we know that they thrived in a warm ocean environment. Warmer water allowed organisms to grow to a larger size.

Thrust Fault Mountains

The mountain at Bennett Field stands tall against the surrounding flat lying landscape. Understanding the geology can explain how this marine limestone now forms a prominent mountain ridge.

Compressional forces within the earth's crust fractured the sedimentary rocks and thrust or pushed one side up relative to the other side. This is called a thrust fault. At Bennett Field the fault is oriented in a north-south direction and continues for over 100 kms. When flying over this area, you can see sections of limestone ridges that are aligned parallel to this fault.



Concretions

These unusual rocks can be found along the beaches or weathering out of the black shale outcrops. These rounded rocks are usually much harder and heavier than the rocks they occur in. When iron, calcium and other elements percolating though the rocks are deposited in concentrated areas a concretion is formed. Often beginning with an organic center, the iron and calcium-rich fluid acts as a cement binding the surrounding sediments together. Multiple concretions may be found along the same bed or layer. In the center of this concretion white calcite veinlets can be seen.

A Rocky Resource

A thick sheet of glacial till (boulders, cobbles and sand) provides evidence that large ice sheets once scoured the land. These boulders are very well rounded telling us they have travelled a great distance in a high energy environment. During the last ice age, glaciers carried and tumbled them along eroding sharp edges off. As the glaciers melted, about 10,000 years ago, they were transported by melt water, were further eroded and deposited over a large area on the west side a Great Bear Lake.

Today the sand and gravel deposits are a valuable resource for Deline. Also known as aggregate resources, it is the stable foundation on which our homes and buildings sit. Aggregate is used to build roads, airport runways and create level building sites in the community.


Deline sand and gravel pit.

Project Team

Participants:
Methilda Baton-Modeste, Hilary Andre, Kelly Kenny, Carla Kenny, Karly Oliver, Diane Baldwin, Bruce Kenny and Chris Yukon.

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