GEOLOGY OF NEW HAMPSHIRE'S LAKES

New Hampshire Lakes Association September 1, 2021

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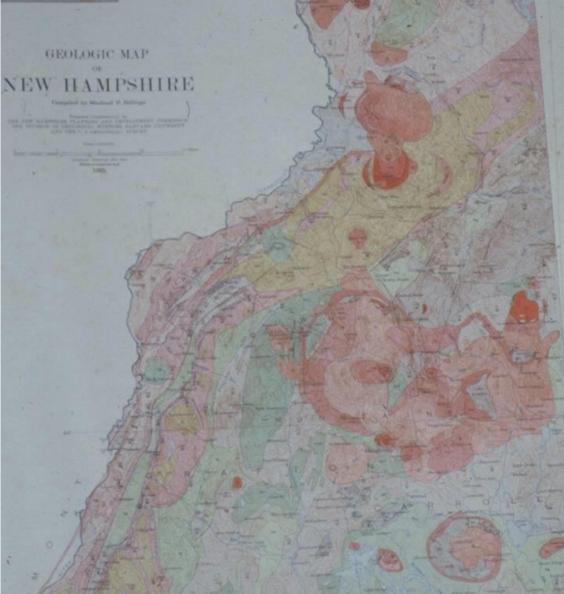












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5 Billion Years of Earth History in 1 Year

New Year's Day 5 billion years ago

Formation of Earth

March - April

3 - 4 billion years ago

Oldest known rocks formed (none in NH)

September 1

1 billion years ago Late pre-Cambrian

Fossil evidence of ancient invertebrates (not in NH)

December 3

395 million years ago Early Devonian period

Ancient seas -- deposition of mud, sand, and lime in NH

A few marine fossils in NH

Sediments formed sedimentary rock -- shale, sandstone, and limestone

December 6

350 million years ago Mid-late Devonian period

Acadian orogeny -- mountain building and metamorphism;

Sedimentary rocks became metamorphic rocks (schist, gneiss, slate): Littleton formation;

NH plutonic series (igneous rocks): Kinsman quartz monzonite, Winnipesaukee quartz diorite

Kinsman Quartz Monzonite





Littleton Schist

Winnipesaukee Quartz Diorite

Bedrock Types

A. Sedimentary

sandstone, limestone, shale, etc. Some are excellent, porous aquifers limestone caves none in NH

B. Igneous

plutonic or volcanic granite, diorite, diabase, etc. form aquifers in fractured widespread in NH

C. Metamorphic

recrystallized sedimentary or igneous rocks result from heat/pressure gneiss, schist, slate, marble, etc. form aquifers if fractured or foliated abundant in NH

December 15

225 million years ago Beginning of Triassic period

Age of Dinosaurs (no fossils in NH)

Rifting of North American and Eurasian plates Faulting and fracturing of rock

Erosion and uplift in NH

December 18

180 million years ago Jurassic period

First birds evolved (no fossils in NH)

White Mountain plutonic series: Albany quartz syenite, Conway granite, Moat volcanics

Ring dike complexes and circular stocks (Ossipee Mts, Red Hill, Belknap Mts, Mt Pawtuckaway, Pilot Range)

December 31 8:00 PM

2 million years ago

Start of Pleistocene epoch

Ice ages began

Human beings evolved (no fossils in NH)



December 31 11:58 PM

19,000 years ago

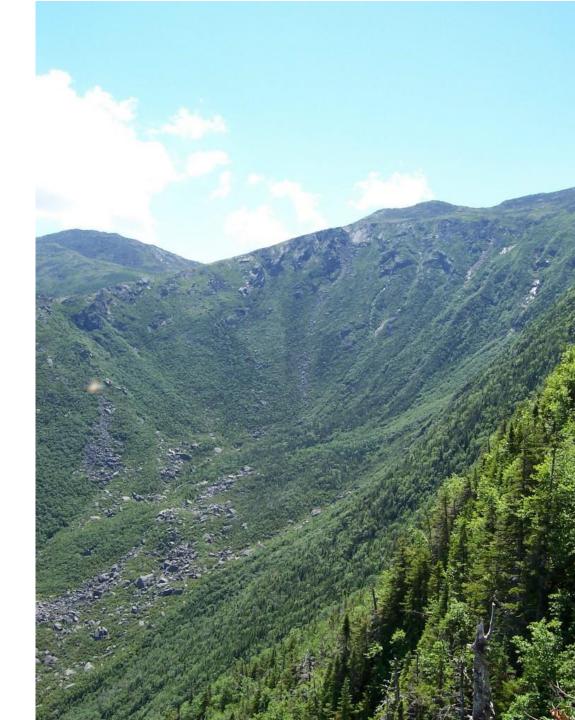
Last ice age (Wisconsinan glaciation)

All of New England covered by ice





Glacial Cirque



December 31 11:59 PM *10,000 years ago*

Retreat of last ice age with moraines of glacial till left behind

Meltwater rivers, temporary lakes, & present lakes

Deposition of sand and gravel aquifers

Beginning of soil formation

Recolonization by plants

Sea level rise

Glacial rebound

Types of New Hampshire Lakes

- Artificial (dug or dammed) lakes, ponds, reservoirs
- Large basin lakes
- Tarns
- Kettle lakes and ponds
- Oxbow lakes
- Beaver ponds
- Streams dammed by landslides
- Temporary glacial meltwater lakes

Large Basin Lakes

- Formed by the glacier grinding out broad basins in the rock;
- Mostly formed in broad basins underlain by igneous plutons;
- Less common in metamorphic layered rock;
- There are exceptions;
- Examples: Winnipesaukee, Squam, Sunapee, Sebago (Maine).
- There are small basin lakes gouged out of rock too!



FORMATION OF LAKE WINNIPESAUKEE

Prior to glaciation, a series of rivers flowed through a lowland area underlain by weathered igneous rocks.

Glaciers moving from NW to SE scoured out the weathered rocks in the Winnipesaukee basin.

As the ice gradually melted and retreated to the NW, the present outlet at The Weirs was dammed by ice. The lake was much higher than today, and the outlet was at Alton Bay.

As ice retreated, water broke through Paugus Bay and down the Winnipesaukee River. The lake dropped to its present level.

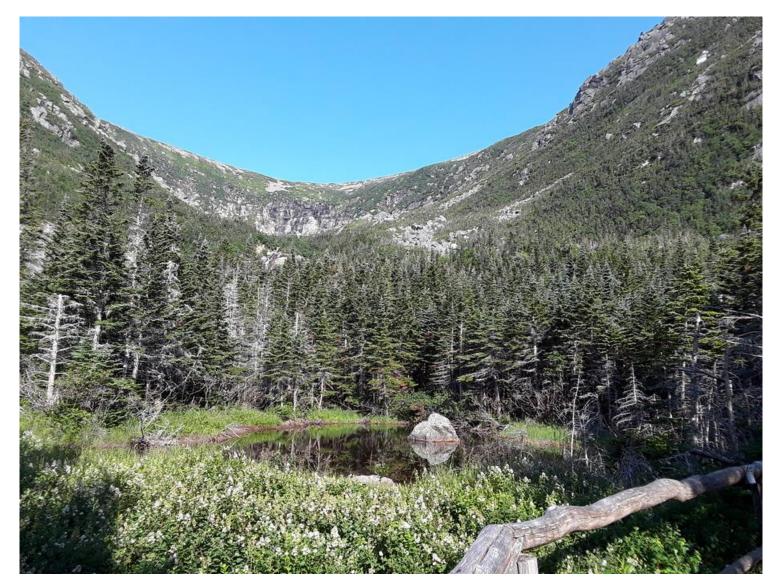




Tarns

- Small lakes in the floor of glacial cirques (ravines);
- Hermit Lake (Tuckerman Ravine), Spaulding Lake (Great Gulf);
- Formed as glacial remnants carved out cirques in mountain ravines
- Small lakes on mountain ridges often called Tarns, too;
- Lakes of the Clouds, Star Lake;
- Formed as the glacier gouged out rock basins on a ridge

Hermit Lake, Tuckerman Ravine



Kettle Lakes and Ponds

- Formed in sand and gravel deposits (not gouged out of rock);
- Formed when large blocks of ice are left in a sand/gravel deposit by the retreating glacier;
- Formed circular depression when ice block melted;
- If the depression extended below the water table, a lake or pond formed;
- Often circular;
- Often have no inlet or outlet;
- Example: White Lake, Tamworth (most are smaller)

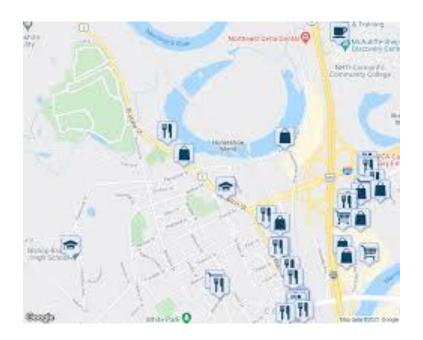
White Lake, Tamworth





Oxbow Lakes

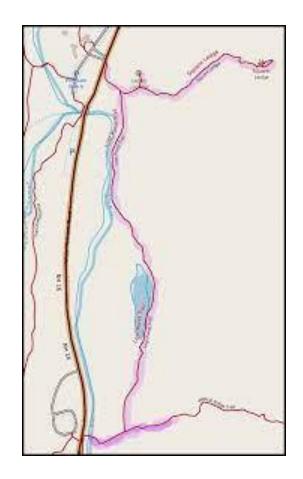
- Abandoned river meanders;
- Example: Horseshoe Pond, Concord





Stream Dammed by Landslide – Example: Lost Pond, Pinkham Notch

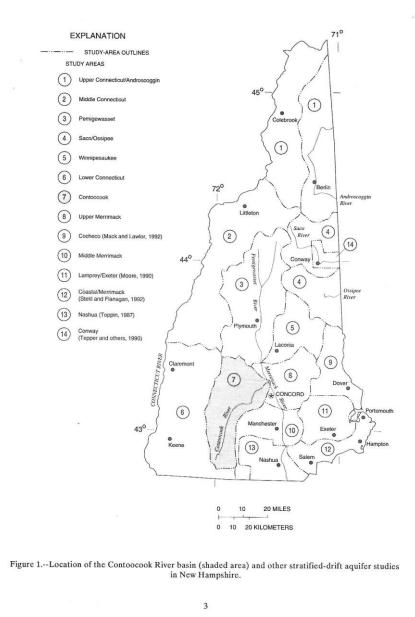




Glacial Meltwater Lakes

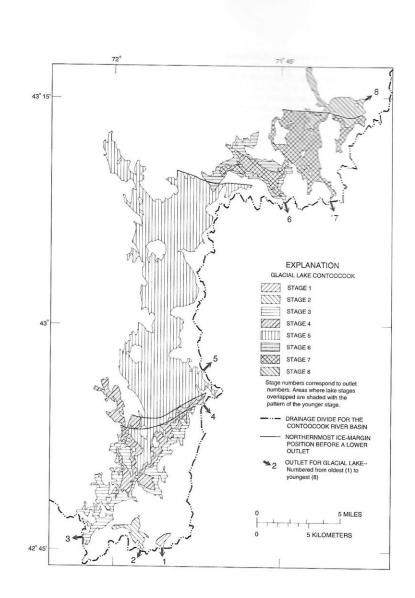
- Formed in valleys as the ice front retreated northward;
- Formed when melting ice formed large rivers;
- Often in present river valleys;
- Formed when meltwater river dammed by ice or moraine ridges;
- Fine-grained sediments deposited in lake beds;
- Deltas formed at upstream ends and sides;
- Water eventually broke through the ice or moraine dam

Contoocook River Basin



From Harte and Johnson, 1995

Glacial Lake Contoocook Stages 1 - 8



• From Harte and Johnson, 1995

Figure 4.--History of successive lake stages and outlets of glacial Lake Contoocook.

Whiteface Intervale – Bed of a Glacial Meltwater Lake

State State State

December 31 11:59:59.7 PM

29 years ago

NH Lakes Association formed -- 1992

Some pictures from Google Images

