

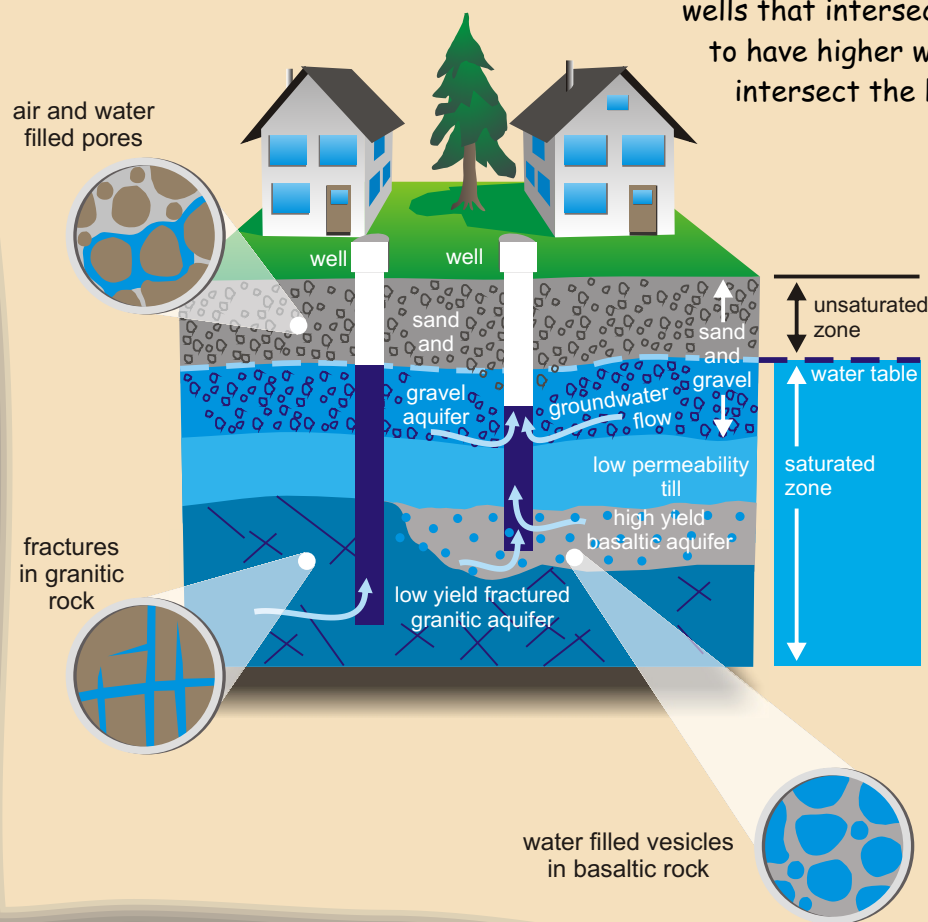
The Chilling Tale of Columnar Basalt

As the flows that formed Miles Canyon cooled, the lava began to shrink. This caused fractures perpendicular to the lava flow to develop. These vertical cooling fractures resulted in 5- or 6-sided polygons that formed columns as cooling continued. These columns are readily visible in the Miles Canyon and downstream of the Whitehorse Fish Ladder.



Getting Groundwater from Rocks

The Miles Canyon basalt covers an extensive area around Whitehorse. In much of this area it is covered in sediments deposited during the last glaciation. The glacial sediments of the area do not provide suitable aquifers for domestic water usage and therefore it is desirable to intersect bedrock. The permeable nature of basalt makes it an extremely good aquifer. Local wells that intersect the basalt tend to have higher water flow than those that intersect the less permeable granitic rock.



Want Information?

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Geoscape Whitehorse

Geoscience for a Yukon community

Volcanic Eruptions!

White River Ash

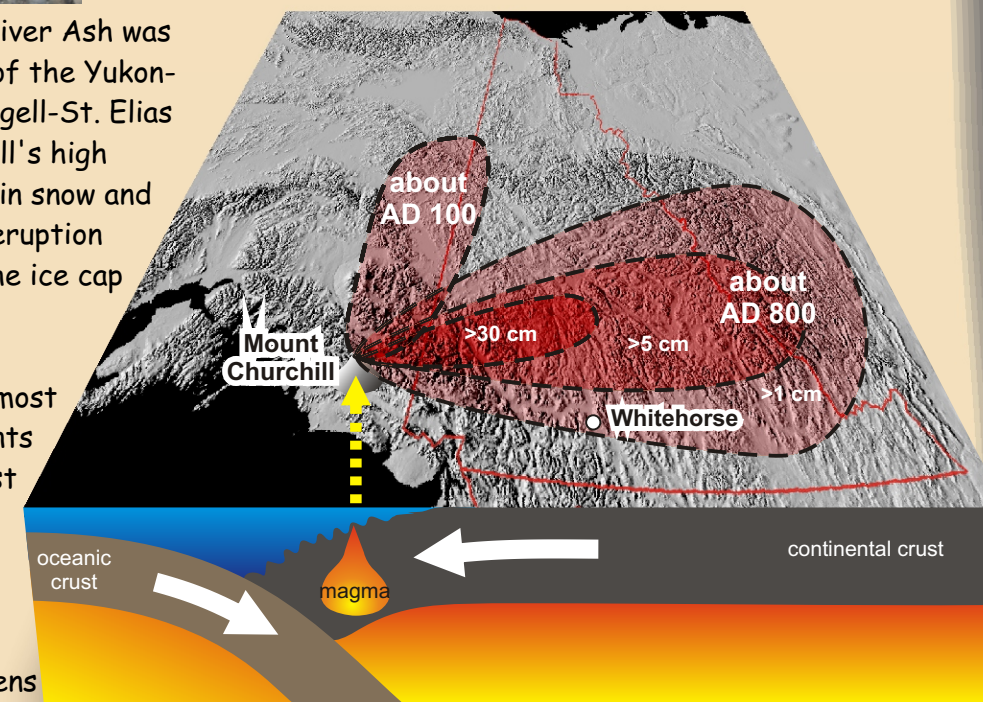


A deposit of grey white rock dust that was spread over south and central Yukon by volcanic eruptions 1200 and 2000 years ago is called the White River ash. It forms a white layer below the soil that is seen in road cuts, gravel pits and riverbanks. The ash formed when gas-rich magma was flung into the air by the eruption, cooled rapidly, and shattered into tiny glassy pieces. Its white colour indicates abundant silica, while organic staining causes it to sometimes appear a beige colour. It typically decreases in thickness away from the source.

The White River ash covers an area more than half a million km² in two lobes. The northern lobe erupted about 2000 years ago. The larger eastern lobe erupted 1200 years ago.

The source of the White River Ash was Mt. Churchill, 25 km west of the Yukon-Alaska border within Wrangell-St. Elias National Park. Mt. Churchill's high summit (4800 m) is locked in snow and ice year-round. When the eruption occurred, the melting of the ice cap caused massive avalanches.

These eruptions were the most voluminous pyroclastic events in North America in the last 2000 years. The eruption of the eastern lobe for example was 10 times the size of the eruption that occurred at Mount St. Helens in 1980.



Eruptions at Mt. Churchill were fueled by melted continental crust in a subduction zone.

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Where Did All the People go?

The eruptions of Mt. Churchill in Alaska would have profoundly affected the people living in southern Yukon more than a thousand years ago. The ash fell during the winter, blanketing the snow. During the spring ash in the melting snow would have choked and contaminated water bodies, killing the fish. The ash blanket smothered most shrub vegetation, leading to dramatic reductions in the number of game animals in the area.



Mt. Bona and Mt. Churchill

People who depended upon the land covered by ash were forced to leave. During their search for suitable land they encountered competition from pre-existing groups which forced them to continue their trek. Where did these people go?

The linguistic similarities between the northern Athapaskan and Navajo languages have given rise to a theory that the Mt. Churchill eruption forced the Athapaskan people of the southern Yukon to migrate. Due to competition with other groups they eventually settled in the desert region of the southern United States where they became the Navajo people.



Distribution of Athapaskan-speaking people

NAVAJO	ATHAPASKAN	ENGLISH
Dibe	Divii	Sheep
Shush	Shoh	Bear
Gah	Geh	Rabbit

Molten Basalt in the Valley

The basalt that makes up Miles Canyon erupted several times between 15 and 9 million years ago. The flows likely oozed out quietly from a vent near Copper Cliff Lake, not far from the Mt. Sima ski area with occasional spatter eruptions. Small cones of lava spatter may have built at the vent, but today these cannot be seen; they have been eroded away or buried by later sand, gravel and soil. The erupted lava flowed away from the vent like a slow-moving river and ponded to depths of 50 m. The Yukon River has since eroded into these lavas, providing a great cross-section view of the uppermost lavas at Miles Canyon and Whitehorse Rapids hydroelectric dam.

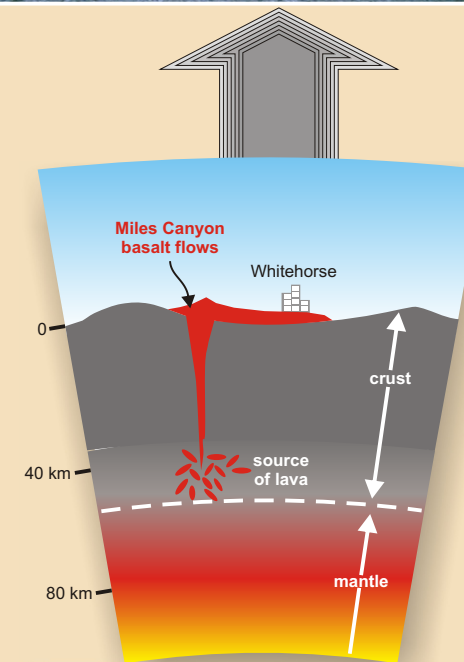
Spatter Eruption



C. Hellier

The basalt magma that made up these eruptions formed 40 to 70 km beneath the surface, within the lower crust. It rose to the surface along fractures. Dissolved gases in the magma formed bubbles as the magma rose, creating pressure that wedged open the fractures and caused the magma to rise quickly. When the magma reached the surface, it was frothy with gas bubbles. These holes, called vesicles, can be seen in the basalt and are the best feature to identify this rock. Sometimes these bubbles will be filled in with calcite, gypsum and zeolite minerals.

Different flows can be identified within the basalt. Tops and bases of flows are distinguished by their lack of columns. Sometimes soil horizons can be identified between the flows. These may contain spruce cones or other vegetation that is used to determine the age of individual flows.



Although Miles Canyon is one of the better-known locations to see this basalt, it is not the only one in the Whitehorse area. Basalt outcrops in other areas including Wolf Creek, Schwatka Lake and Crater Lake are all part of the same series of flows. One of the best areas to collect samples of this rock is on the east bank of the Yukon River, downstream of the Whitehorse Fish Ladder.