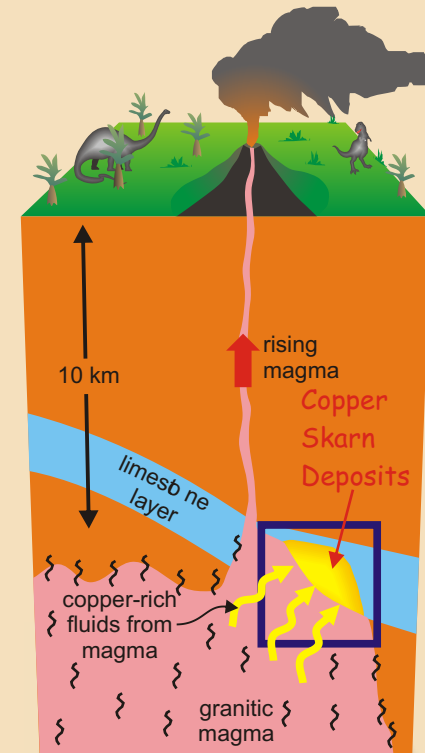


Geoscape Whitehorse

Geoscience for a Yukon community

Whitehorse Copper Belt

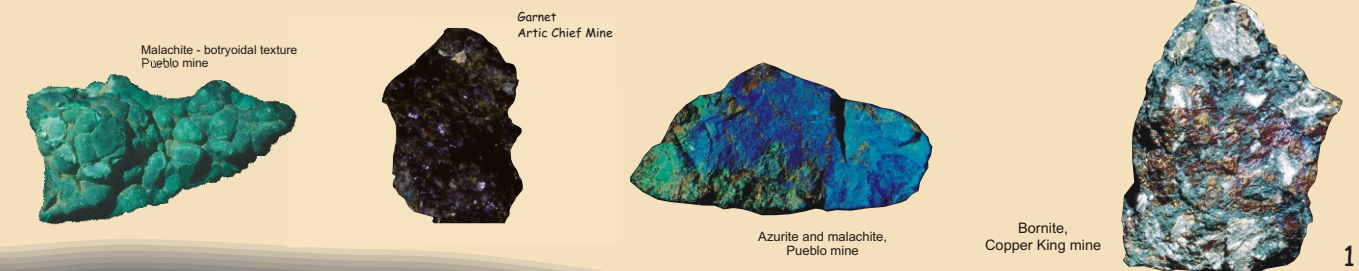
How Did the Copper Form?



The limestone seen on Grey Mountain and under Whitehorse was deposited more than 200 million years ago. Over time, as sediments were laid on top of it, it became buried to a depth of 10 km. About 110 million years ago magma from the mantle melted its way up through the buried crustal rocks including the ancient limestone. When this magma cooled, it became the igneous rock known as granite. Hot, watery fluids released from the crystallizing granites were rich in dissolved metals and reacted vigorously with limestone, causing copper minerals to precipitate. These clusters of copper minerals are known as skarn deposits and are found where limestone is intruded by the granite. Later erosion of the overlying rocks has brought the copper near the surface where it can be mined. The cluster of nearly 20 mine sites along the west side of the valley are the Whitehorse Copper Belt.

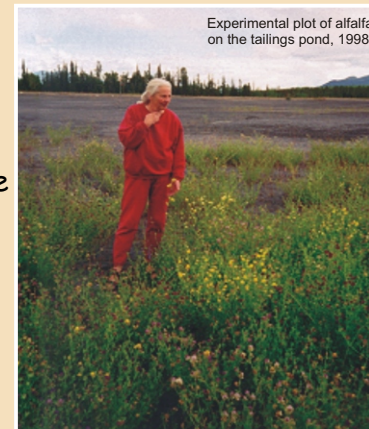
Copper Minerals

Although the mines are all closed now, you can find brightly coloured copper minerals. Among the piles of broken rock at old mine sites (called waste rock dumps by miners) the following minerals are common: **chalcopyrite** or "fool's gold" is a brassy yellow colour, has a metallic luster and is heavy. **Malachite** is green, earthy and appears as a film on other rocks. **Azurite** is a bright blue, and is also earthy and found as a film on other rocks. It is mostly found with malachite. **Bornite**, also known as the "peacock ore", is iridescent purple and blue, has a metallic luster and is very heavy. Other non-copper minerals that are found in the copper belt include **magnetite**, a heavy, magnetic, black mineral and **garnet** a hard, red-brown mineral.



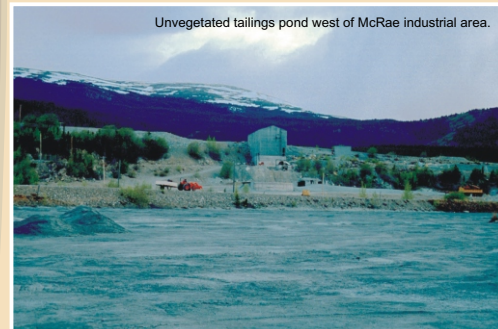
Reclamation

As time goes on and mines exhaust their reserves, reclaiming the landscape becomes an increasing priority. The process of reclamation has many steps. First mine buildings are removed and mine shafts are blocked. Next the large open areas are seeded, tailings ponds drained and the mine site is reclaimed to the standards of environmental regulations.



Experimental plot of alfalfa on the tailings pond, 1998.

D. Craig



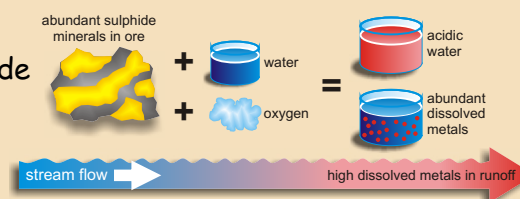
Unvegetated tailings pond west of McRae industrial area.

D. Craig

One problem at the millsite west of McRae, is that the 11 hectares of mine tailings have been slow to revegetate. The sandy tailings retain little moisture, and abundant calcite makes them too alkaline for most plants. Although not toxic to humans or plants, the loose tailings are blown about by strong winds. Some areas have been fertilized by the former owner, and a pilot study has shown that, when mixed with compost, the tailings support naturally occurring grass and trees. Deer and birds now frequent the area.

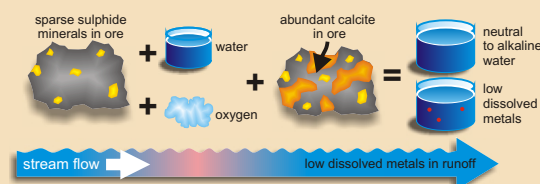
Acid Rock Drainage

Many mining operations must deal with the problem of acid rock drainage, which occurs when rock rich in sulphide minerals, such as pyrite, reacts with water and atmospheric oxygen. Under these conditions, sulphide minerals dissolve and produce acidic waters. Acidic waters can transport high concentrations of metals that can harm aquatic plants and animals downstream.



This problem does not exist in the Whitehorse Copper Belt because sulphide minerals are sparse in the ore, while calcite (limestone) is abundant. When calcite dissolves in water, it consumes acid that has been generated by dissolution of sulphides. As a result, waters

flowing from the mine wastes do not transport metals.



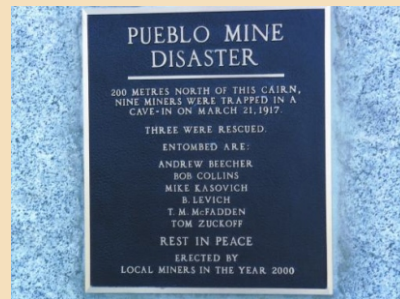
Want Information?

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www.nrcan.gc.ca/gsc

The Early Days 1898-1920

In 1897, on their way to Dawson and the Klondike, prospectors discovered these copper deposits. Jack McIntyre staked the first claim, known as the Copper King, on July 6, 1898. Many claims were then staked, including the War Eagle, on July 16, 1899, by the famous Sam McGee. In 1900, as mining on claims continued, many with flamboyant names such as Empress of India, Ben Hur, Hoodoo and Excelsior. The North-West Mounted Police reported, "Copper has been the all-absorbing question."

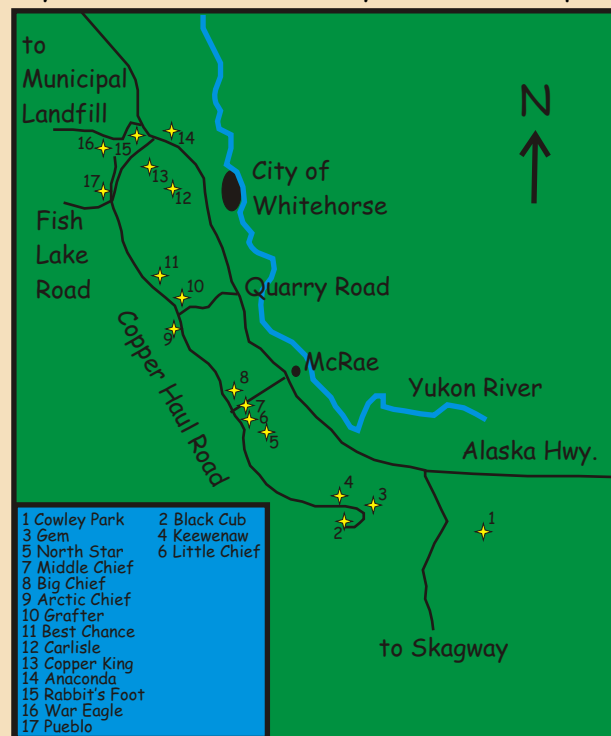


Ore shipments began in 1900 and continued until 1920. Early mining was slow and labour-intensive, and the transportation cost to smelters on Vancouver Island was very high. Between 1902 and 1909 \$45,000 was spent by the Territorial government on 36 wagon roads in the area. In 1909 the White Pass & Yukon Route had also built a railway spur to the Pueblo Mine, along a route later used by the "Copper Haul Road", west of the city.

The Pueblo Mine contained the richest ore and employed up to 20 people at one point. Because of the fractured rock underground it was also the most dangerous. After a collapse in 1917, killing six miners it was abandoned and is currently the location of the Icy Waters Fish plant.

How much the Early Mines Produced

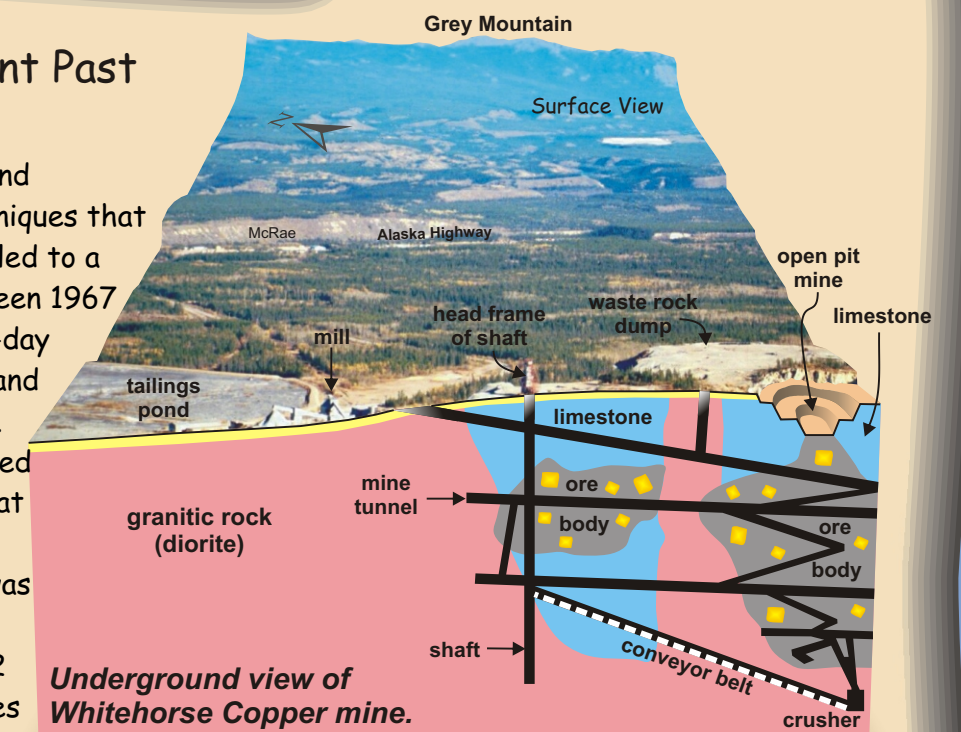
Name	Dates	Produced (tonnes)
Artic Chief	1899-1907	202
Grafter	1899-1917	12,200
War Eagle	1899-1915	900
Pueblo	1899-1920	127,635
Copper King	1898-1920	5,317
Carlisle	1900-1910	907



2

The Not-So-Distant Past 1967-1982

Development of geophysical and geochemical exploration techniques that could detect buried deposits led to a second period of mining between 1967 and 1982. An 1800 tonne-per-day mill was constructed in 1966 and open-pit mining soon followed. Underground mining commenced in 1972 and milling continued at 2000 to 2400 t/d until the ore at the Little Chief mine was depleted in 1982. Total production from 1967 to 1982 is estimated at 123,000 tonnes of copper, 90 tonnes of silver and 7 tonnes of gold (Tenney, 1983). The total value of these minerals mined near Whitehorse was almost 500 million dollars. Further exploration using modern techniques may result in additional ore reserves. Also possible is re-mining. The tailings pond is a potential source of magnetite for use as a heavy medium in coal preparation plants.



How much the Later Mines Produced

Name	Dates	Produced (tonnes)	Reserve (tonnes)	Minerals
Little Chief	1967-1982	8,536,400		bornite, chalcocopyrite, magnetite, serpentine, phlogopite, garnet
Black Cub S.	1971		156,000	bornite, magnetite, serpentine, phlogopite
Gem	1967-1970		625,000	chalcocopyrite, magnetite, serpentine, phlogopite, garnet
Artic Chief	1968-1969	201,800		bornite, chalcocopyrite, magnetite, serpentine, phlogopite, garnet
War Eagle	1970-1971	899,000		bornite, chalcocopyrite, molybdenum, wollastonite, garnet
Keewenaw	1971	159,000	202,000	bornite

References: Watson, P. 1984: The Whitehorse Copper Belt a Compilation Indian and Northern Affairs Canada, Open File 1984-1

3