

# Geological Information about the Waugh and French Rivers, Northern Nova Scotia

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## **Introduction**

The French and Waugh rivers flow north into Tatamagouche Bay on either side of the village of Tatamagouche. Both rivers rise in the Cobequid Mountains and flow north across the rolling terrain underlain by Carboniferous rocks into Tatamagouche Bay. Both rivers are in the range of 25 to 30 km long and flow across private lands from their source to Tatamagouche Bay.

The rivers have a relatively large drainage area. Numerous tributaries join the rivers from the Cobequid Mountains. Shorter and smaller tributaries join the two rivers north of the Cobequids in the Carboniferous rocks. The boundary, between the older rocks of the Cobequid Mountains and the younger Carboniferous rocks, runs east-west between New Annan, Central New Annan, The Falls and Balmoral Mills. The southern boundary of the two watersheds is approximately the southern outcrop limit of the dark-coloured basalts of the Late Devonian-Early Carboniferous Diamond Brook Formation. The light coloured rhyolites of the Byers Brook Formation are somewhat older and crop-out to the south of the Diamond Brook formation.

The entire area has been glaciated and is covered by 1 to 4 m of glacial drift. The rivers and their tributaries cut through bedrock and drift in their valleys. All of the bed load and suspended load of these two river systems is derived from the bedrock and drift substrate in their drainage areas.

The stream channels of the rivers are a mix of carved bedrock and scalloped surficial deposits. In the Cobequids bedrock exposures create numerous pools between outcrops that are 1 to 3 m deep. Further downstream in the Carboniferous rock outcrop area, the pools are less frequent because the bedrock is more uniform in hardness [or ability to erode]. Discharge at any point on the rivers varies with the season because there is no large body of water at the source of either river.

## **Bedrock Geology of the Region**

For over half of their lengths the rivers flow across Late Carboniferous bedrock of the Pictou Group. From their mouths in Tatamagouche Bay to the high escarpment of the Cobequid Highlands, a distance of about 10 km, both streams cut through red-brown sandstones, siltstones and shales of the 300 million year old Pictou Group. Maps 82-9 and 90-14 from the Nova Scotia Department of Natural Resources describe and locate the bedrock geology.

In the Cobequid Mountains the French River flows across several rocks types. Following the river course upstream, the river crosses the chlorite schist of the Precambrian Jeffers Group and ends in the basalt flows of the Diamond Brook Formation.

The Waugh River enters the older rocks of the Cobequid Mountains at The Falls where it crosses the red-brown conglomerates of the Early Carboniferous Falls Formation. Upstream from here

the river is located in a broad, almost U-shaped valley underlain by the Silurian aged Wilson Brook Formation. These rocks are generally grey coloured, fine-grained sandstones and siltstones. Near Earltown the river crosses a fault boundary and flows across the red sandstones and basalt flows of the Diamond Brook Formation. There is no single dominant bedrock substrate in the Cobequid Mountains for either river.

North of the Cobequid Mountains the Late Carboniferous rocks of the Pictou Group hosts a large number of copper occurrences with or without uranium minerals. One of the occurrences, the Oliver copper mine on the French River, was in production during parts of the 1800s. The occurrences of copper and accompanying iron are found as sulphides; the uranium as oxides. Both of these minerals are localized in either chemical reaction zones called roll-fronts or in masses of paleo-driftwood and vegetation in former channels. The exposed mineralized zones have had most of their minerals leached away by surface run-off. They are not a significant source of acid water drainage.

### **Surficial Geology of the Region**

Surficial material lies on top of the bedrock of the region. In this case the surficial material is glacial debris called drift. The material was picked up by the glacier and deposited as it melted. Most of the material in the drift is very local – no more than 1 to 3 km from the site of erosion to the location of deposition. Some boulders and cobbles have been transported as far as 5 to 10 km from the Carboniferous rocks around Tatamagouche. The composition of the drift mirrors the underlying bedrock. Map 92-3 shows the surficial geology of the area as part of the provincial picture.

### **Soil**

Soil development is the result of slow chemical and mechanical weathering of glacial drift. None of the soil has developed in place and therefore it is all transported soil. Commonly the soil profile will show a well developed A-horizon and B-horizon. Below these horizons are relatively un-weathered glacial drift. According to the Soils of Nova Scotia map all of the soils north of the Cobequids and in the Cobequids are acidic.

### **Conclusion**

The Waugh and French rivers are similar to many streams originating in the high ground of the Cobequid Highlands and flowing north across the Carboniferous lowlands. The Cobequids have more rock-type diversity and variations in hardness than the lowlands and thus have more pools in their stream beds. None of the rock formations have significant amounts of limestone and therefore no real capacity to modify the somewhat naturally acidic conditions through chemical reactions. The chemical and physical characteristics of each river's water are defined by the local bedrock and surficial deposits. Soil development is minimal and is all transported soil. The former mine at Oliver and the large number of sulphide mineral occurrences on tributaries and the rivers have generally been leached of sulphides and are not significant acid drainage sources.

Both rivers are picturesque and offer recreation and tourist opportunities. There is little development in the drainage basins and therefore no major source of pollution. The Nova Scotia Museum maintains a branch museum at the Balmoral Mills Grist Mill.

## **Sources of Geological Information**

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