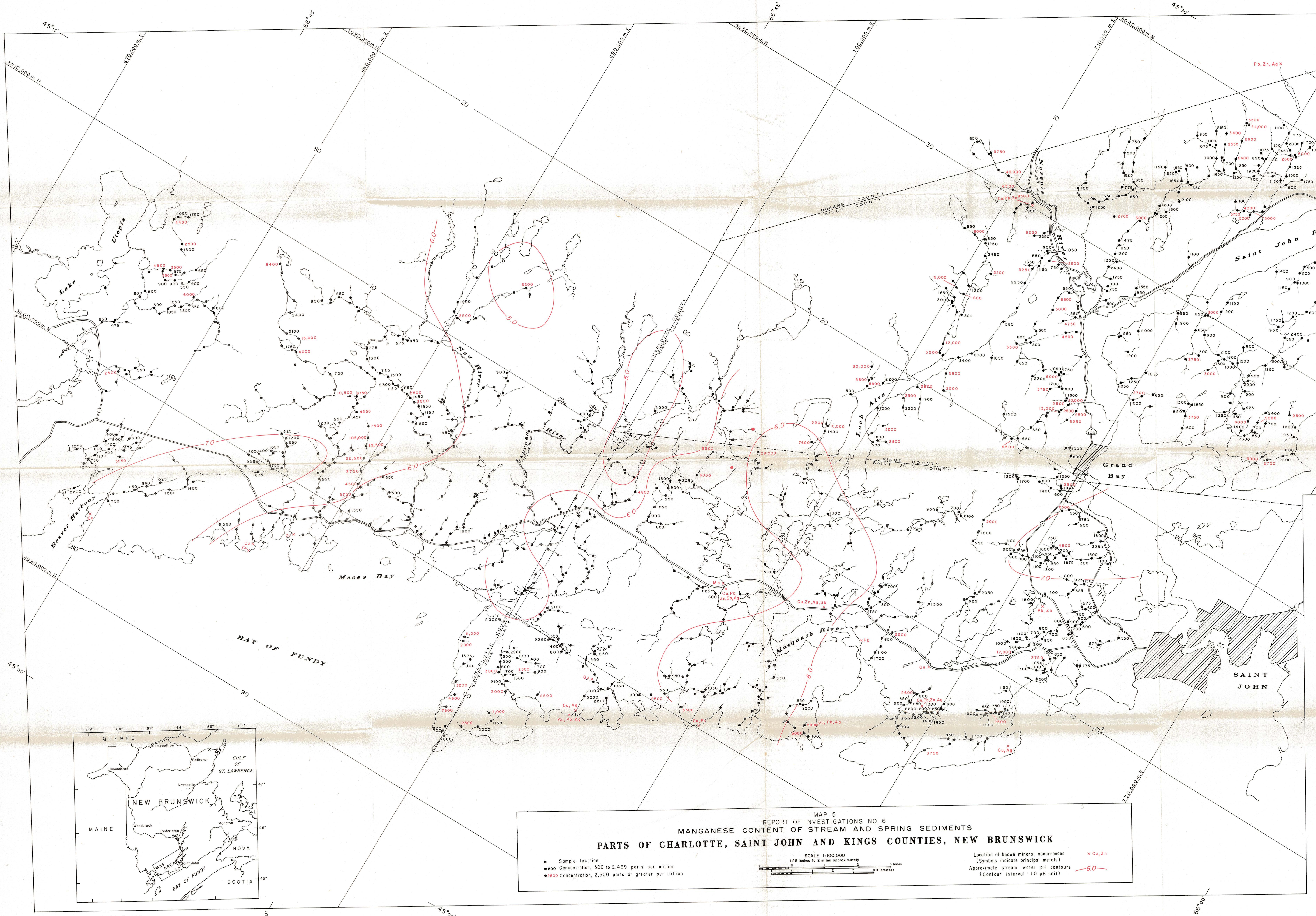
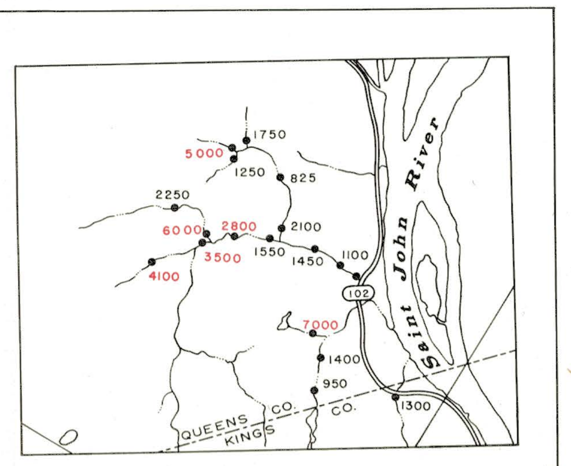




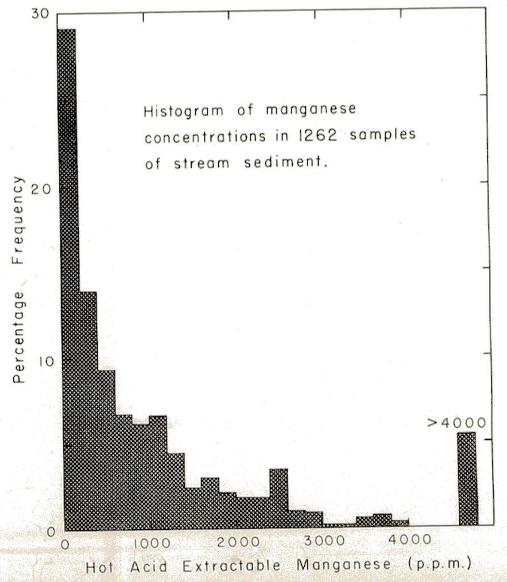
NEW BRUNSWICK

MINES DIVISION

DEPARTMENT OF NATURAL RESOURCES

CANADA

ATLANTIC DEVELOPMENT BOARD



MAP 5

REPORT OF INVESTIGATIONS NO. 6

MANGANESE CONTENT OF STREAM AND SPRING SEDIMENTS

PARTS OF CHARLOTTE, SAINT JOHN AND KINGS COUNTIES, NEW BRUNSWICK

- Sample location
- 800 Concentration, 500 to 2,499 parts per million
- 2600 Concentration, 2,500 parts or greater per million

SCALE 1:100,000
1.25 inches to 2 miles approximately
1 0 1 2 3 Miles
1 0 1 2 3 4 Kilometers

Location of known mineral occurrences (Symbols indicate principal metals) × Cu, Zn

Approximate stream water pH contours (Contour interval = 1.0 pH unit) —6.0—

Geological Notes

The map-area covers a northeast-trending belt of rocks that range in age from Precambrian (?) to Triassic. A major northeast strike fault traverses the area over a distance of 50 miles between Beaver Harbour and Long Reach, dividing the region into two parallel zones of contrasting age and tectonic development. The Precambrian and Carboniferous rocks to the southeast have been subjected to Precambrian (?) deformation and granitic intrusion, and several periods of Carboniferous folding and faulting. "Skarn-type" mineralization is associated with granite-limestone contacts in this general area and several Pb, Zn, Ag and Mo deposits are known to occur west of Saint John. A complex, steeply folded assemblage of Cambro-Ordovician, Silurian and Devonian sedimentary and volcanic strata in the northwestern part of the area has been mainly affected by Acadian folding, emplacement of minor gabbro-diabase bodies and major Devonian granitic masses including the Charlotte batholith. Quartz-calcite veins with Cu, Pb, Zn mineralization are spatially related to this northeasterly-trending structural zone. Tungsten and molybdenum occurrences are associated with the Devonian granitic rocks.

The Precambrian Green Head Group includes a thick, complexly folded sequence of limestone, dolomite, argillite and quartzite that forms a broad southwesterly-plunging synclinorium west of Saint John. Isolated patches of Green Head-type quartzite and carbonate rocks form a discontinuous belt that extends 20 miles to the southwest of Saint John. Volcanic flows, tuffs and breccias extend southwestward from Kingston Peninsula in a 50-mile linear belt that includes strata formerly known as the "Kingston Series". The precise age of these rocks is uncertain, but they are tentatively correlated with the Coldbrook Group near Saint John, where volcanic strata of this type have been interpreted to unconformably overlie Green Head sediments. The Coldbrook rocks have been assigned a Proterozoic age although the exact nature of the contact between the Coldbrook and fossiliferous Lower Cambrian strata remains obscure.

Highly fossiliferous Cambrian sediments are exposed near Saint John and northeast of the mouth of the Nerepis River. They occur as isolated, infolded or down faulted remnants of former widespread sandstone, conglomerate and dark shale deposits. In the extreme northeast part of the map-area, argillite, slate, quartzite and minor volcanic rocks are assigned to the Dark Argillite Division of the Ordovician Charlotte Group. The nature of the Cambrian-Ordovician and Silurian-Ordovician boundaries is very uncertain and rocks of the Charlotte Group are distinguishable from similar Cambrian and Silurian beds only by a higher degree of metamorphism and the absence of fossils.

A varied assemblage of steeply dipping, northeast-trending Silurian rocks between Lake Utopia and Loch Alva includes massive andesite, basalt and rhyolite flows, bedded tuff, amygdaloidal flows, grey slate, calcareous phyllite, conglomerate, siltstone, sandstone, and quartzite. These metavolcanic and metasedimentary units in the western part of the map-area may be similar to the Upper Silurian Long Reach and Jones Creek Formations northeast of Nerepis River. The older Long Reach Formation consists of basalt flows, tuffs, breccia, and interbedded fossiliferous slate, argillite and minor shaly limestone. The Jones Creek Formation conformably overlies the Long Reach and consists of highly fossiliferous shale, slate and argillite.

A narrow wedge of conglomerate, sandstone and shale lies northwest of Beaver Harbour in the southwestern corner of the map-area. These rocks are correlated with the terrestrial deposits of the Devonian Perry Formation, but may actually be younger in age.

In the western part of the map-area, a three-mile wide belt of migmatitic granite and associated gneisses and schists lies to the northwest of the Beaver Harbour-Long Reach fault. The granitic rocks contain inclusions of older volcanic rocks and display intrusive contact relations with Silurian rocks to the northwest. Although an age equivalence has not been established, this meta-igneous assemblage is grouped with a second belt of similar lithology that crosses the lower part of the Nerepis River. Rocks to the north and northeast of Loch Alva consist of gneissic granite, meta-diorite and intrusive quartz porphyry as well as metamorphosed conglomerate, volcanic flows, tuff and breccia.

Red conglomerates, sandstones, and shales of the Lower Mississippian Kennebecasis Formation rest unconformably on pre-Carboniferous rocks in the lower part of the Saint John River valley. Carboniferous rocks of the Mispeck Group have been subdivided into two conformable units in the area between Saint John and Maces Bay. The older Balls Lake Formation consists of purplish red to grey and brown conglomerate, arkose and shale with minor tuffaceous beds; and the younger West Beach Formation consists of rhyolitic to basaltic flows and tuffs with minor intercalated shale. Mispeck rocks are locally highly deformed in contrast to rocks elsewhere of equivalent age. Less deformed shales and sandstones of the Pennsylvanian Lancaster Formation contain well preserved plant fossils and apparently rest unconformably on Mispeck rocks.

The Lepreau Formation is well exposed along the east side of Maces Bay, and comprises tilted and faulted grey to red sharpstone conglomerate and sandstone. Since the Lepreau conglomerates contain boulders of grey Lancaster sandstone, a post Pennsylvanian, probable Triassic age is presumed.

Extensive granite, granodiorite and diorite masses intrude Precambrian Green Head and Coldbrook rocks in the Saint John area. Upper age limits have not been established for these intrusive rocks and some may be much younger than their assigned late Precambrian age. Middle Devonian granitic batholiths and stocks intrude Lower Palaeozoic volcanic-sedimentary strata on the northwest side of the Beaver Harbour-Long Reach fault. The Charlotte batholith dominates the northwestern part of the map-area and is composed mainly of granite, quartz monzonite and granodiorite. A northeast-striking apophysis of the main batholith contains syenitic and granophyric facies associated with granite and adamellite. Ordovician, Silurian, as well as all older sedimentary and volcanic rocks are extensively intruded by gabbro-diabase sills and stocks.

Map 1 should be consulted for further details on the geology and economic geology of the district.

Geochemical Notes

The data recorded on this map are based on the analyses of 1,262 samples of fine-grained sediment collected from the channels of rivers and streams, and from rivulets flowing from springs and seeps. Where possible the active channels were sampled, but in a few cases bank material or residual sediment of dried-up streams was used. Sediment samples from poorly drained areas of muskeg and beaver workings contained abundant decomposed organic matter. All samples were collected during the 1967 field season. An attempt was made to maintain a uniform sample density, but this was frequently not achieved because of irregularities in the drainage network and the absence of an actively deposited silt-sized fraction in streams draining areas underlain by granitic rocks. All streams and rivers were traversed on foot, and samples were collected, where possible, at intervals of 1,000 to 1,500 feet.

Sediment samples were air dried prior to shipment to Bondar-Clegg & Company Limited, Ottawa, Ontario for laboratory analysis. Manganese was determined by atomic absorption analysis after extraction from the -80 mesh sieve fraction by hot HNO_3 - HCl digestion. Values shown on this map are expressed in parts per million. The subdivisions used on the map are arbitrary, and the lowest subdivision can be taken to represent the regional background.

The manganese content of the stream sediments ranges from 5 ppm to 105,000 ppm. The frequency distribution of manganese shows that 52.3 per cent of the analyses exceed the normal background value of 600 ppm, and 9.3 per cent of the analyses exceed 3,000 ppm. Local variations in stream gradient, pH and/or oxidation potential may lead to erratic distribution of manganese in the sediments.

Several heavy metals, including Cu, Pb, Zn and Mo are strongly adsorbed and coprecipitated by manganese hydroxides and oxides. Zinc concentration is most markedly affected by the presence of manganese, and this feature may lead to false anomalies or abnormal enhancement of valid anomalies. At low metal concentrations (less than 200 ppm Mn and less than 25 ppm Zn) the zinc-manganese correlations for stream sediments are probably controlled by pH-solubility relations rather than by coprecipitation-adsorption factors. Manganese lows in the central part of the map-area are coincident with regionally low pH values in the surface waters of poorly drained areas of peat accumulation in the Musquash, Lepreau and New River drainage basins. Stream waters in the pH range of 4.0 - 6.0 play an important role in suppressing regional sediment background values for manganese by a factor of 10, and similar pH-concentration relations have been observed for copper and zinc.

The manganese contents of stream and spring sediments shown on this map should be interpreted with respect to the geological environment (Map 1) and compared with the contents of individual elements in stream sediments on Maps 2 to 6 inclusive.

Metal Symbols

Antimony	Sb	Iron	Fe	Silver	Ag
Copper	Cu	Lead	Pb	Zinc	Zn
		Molybdenum	Mo		

Field work by W.J. Wolfe, N. Szabo, J.S. Estabrooks, D.K.J. MacKinnon, A. Ashaolu and B.J. Sullivan

Analyses by Bondar-Clegg & Company, Limited, Ottawa, Ontario

Published, 1968
Copies of this map may be obtained from the Mines Division, Department of Natural Resources, Fredericton, New Brunswick