

GM 08193

GEOLOGICAL REPORT, LAC WAKUACH AREA

Documents complémentaires

Additional Files



Licence



License

Cette première page a été ajoutée
au document et ne fait pas partie du
rapport tel que soumis par les auteurs.

Énergie et Ressources
naturelles

Québec 

LAKE WAKUACH AREA

District of Ungava, Québec

by

René Béland, Ph.D., Prof. Eng.

PUBLIC

Iron Ore Company of Canada, 1950

Ministère des Richesses Naturelles, Québec

SERVICE DES GÎTES MINÉRAUX

No GM-8193

INDEX

INTRODUCTION

Area covered and mapping method.....	1
Topography and Drainage.....	2

GENERAL GEOLOGY

Stratigraphy and correlations.....	3
Table of formations.....	7
The Attikamagen Formation.....	8
The Denault Formation.....	9
The Ruth-Wishart Group.....	11
Coarse arenites.....	12
Quartzites and sandstones.....	14
Shales, slates, arenites, and hornfels.....	15
The Ribero red sediments.....	17
The Nimish Volcanics.....	17
The Sokoman formation.....	19
The Gabbro Sills.....	19
Pleistocene glacial deposits.....	23

STRUCTURAL GEOLOGY

Folding.....	25
Faulting.....	26

ECONOMIC GEOLOGY

Iron.....	27
Copper mineralisation.....	27
Non-metallics.....	28

ILLUSTRATIONS

MAPS. (Not bound with report)

Northern Cramolet: scale: 1 inch 1 mile				
North Wakuach (547W and part of 557W) scale: 1 inch 1/2 mile	<i>Sub</i>			
Geren (547E) - <i>Sub</i>		"	"	"
Wakuach and Louis (537W and 537E) - <i>Sub</i>	<i>Sub</i>	"	"	"
Eclipse and Boulder (527W and 527E)		"	"	"

PHOTOGRAPHS

- Fig.1 - The great muskeg area of the south-west.
- Fig.2 - Coarse conglomerate at the north end of lake Cramolet.
- Fig.3 - Carbonaceous lenses in the Ferrum river shales.
- Fig.4 - Bedded dolostone with thin beds and veinlets of quartz and chert.
- Fig.5 - Shales in the band of Denault dolomite.
- Fig.6 - Contorted bedding in dolostone.
- Fig.7 - Band of conglomerate, near the narrows of lake Cramolet.
- Fig.8 - Contact between hornfels-arenites and a gabbro sill.
- Fig.9 - Quartzite resting on a gabbro sill.
- Fig.10- Outwash gravels west of upper Mitchéchau river.
- Fig.11- Blocks of crystalline rocks underlying outwash gravels west of upper Mitchéchau river.
- Fig.12- Plicated quartzite bed, east shore of lake Wakuach.

LAKE WAKUACH AREA

by

René Béland

INTRODUCTION

Area covered and mapping method.

The lake Wakuach area, as mapped, is shaped like a figure 7 turned left for right and is centered about meridian $66^{\circ} 30' E$. The long arm of the inverted 7 extends southeasterly from the north end of lake Ribero almost to lac le Fer. Lake Ribero, lake Wakuach and lake Boulder lie along its centre line. The short arm of the right-handed 7 takes in the west half of the Geren (547E) sheet. A strip two and a half miles wide beyond the concession limit, at the north end of lake Ribero, and the entire shore line of lake Gramolet, were visited as requested. The ground mapped has a total area of nearly 700 square miles.

All mapping was done by pace and compass traverses at every half mile across the structural trends. Only some ten square miles of muskeg and swamps were left untraversed. A first map was plotted in the field and submitted before leaving the base camp in September of 1950. The maps accompanying the present report have been entirely replotted. All exposures have been checked for position and shapes by reference to the field notes and by careful study of the aerial photographs by means of a magnifying Zeiss stereoscope.

Topography and Drainage.

The ground mapped South and East of lake Wakuach, in the sheets Eclipse (527W), Boulder (527E), and Wakuach (537W), is low and swampy (Fig.1), with scattered exposures, or patches of rubble, all of shales or slates. North and East of lake Wakuach, in the sheets Louis (537E), North-Wakuach (547W) and Geren (547E), the country is very rugged. Long gabbro sills outcrop as parallel ridges, rather closely spaced.

Lake Ribero is 300 Feet (1) higher than lake Wakuach, and the gabbro ridge which separates lake Ribero from the continuation of the lake Wakuach lowlands near lake Piscator is probably 300 feet higher still. The highest ground within the map area is the narrow gabbro plateau between lake Parker and lake Roze. This plateau has all the characteristics of barren lands. Lakes Cramolet, Caput and Nix occupy a valley which marks the axial region of an anticline. There is comparatively little gabbro exposed in that valley.

North of lake Wilson, in the north-western part of the area, the relief is quite pronounced because of the outcropping of strong bands of quartzite and other clastic rocks within the Denault dolomite, and of elongated bodies of gabbro.

The north-western limit of the Wakuach lowlands is practically the outlet of lake Wakuach. To the

(1) Measured by airplane altimeter.

North and North-East, the lowlands extend the depression of lake Wakuach into a point with its apex at lake Piscator.

Most of the area drains into lake Wakuach or its outlet, Swampy Bay river, which flows northward. The rest is tributary to the lake Cramolet basin which also drains northward.

GENERAL GEOLOGY

Stratigraphy and correlations.

The most conspicuous lithologic unit of the area, apart from the gabbro sills, and the only sure horizon marker, is a broad band of dolomite, which has been folded into an anticline overturned to the West. The dolomite bands contains much interstratified clastic material, more in its northern and southern parts, than at its centre. This band has been correlated with the Denault formation because the dominant dolomite or calcareous members are identical in every detail to the Denault dolomite as described in the manual. The lutaceous rocks which are definitely known to lie underneath the dolomite band have been mapped as Attikamagen rocks. Stratigraphically above the Denault rocks, all along the band, are shales, slates and some low rank phyllites, which are darker generally than the known Attikamagen shales. Above the dark shales are tough quartzites, some almost white, some dark grey and other pink, which are comparable to the Wishart quartzite. Although the quartzites constitute a fairly continuous horizon just East of lake Wakuach, their thicknesses vary greatly and they

split into two, or three or more bands, with shales between them. All of these shales, slates, phyllites, and quartzites are thought to be correlatives of the Wishart and the Ruth rocks; hence the term Ruth-Wishart group used in the map legends. It is in rocks of this group that the gabbro sills, at least the lowermost sills, have been intruded.

Clastic rocks of sand, silt or clay sizes, thinly bedded, are in contact with the sills, wherever such contacts are exposed. They are designated on the maps by the general term arenites, but they include minor beds of shales and impure limestone. Some of them, particularly the finer grained facies, have been metamorphosed into hornfels near the lower gabbro sills. Because the total thickness of gabbro exposed greatly exceeds that of the sedimentary rocks, and because the latter are sparingly exposed, the stratigraphic succession is not easy to follow in the gabbro highlands. There is some indication however that all the arenites, from lake Wakuach to lake Hutchinson (Geren sheet), are, in a broad sense, stratigraphically equivalent. Along the East shore of lake Ribero, for instance, red-purplish sedimentary rocks which serve as horizon markers are exposed. They are calcareous but are loaded with enough clastic material of sand grade to be called sandstone. Very similar rocks, though of lighter color, are exposed just West of lake Cramolet and South-West of lake Nix. Since the folding is relatively open in the gabbroic region, it is reasonable to suppose that the stratigraphic horizons are essentially the same from fold to

fold and that all the arenites, from West to East, are broadly equivalent in age. They are considered to represent an oscillating gradation between the dominantly arenaceous Wishart rocks and the dominantly lutaceous Ruth formation. That the arenites and hornfels are not far removed from the Denault dolomite is shown by the fact that true Denault dolomite has been encountered at the North East corner of Roze lake and along the shores of small lakes East of Ribero (1)

Along the north-east shore of lake Cramolet, north of the concession limit, several exposures of a coarse conglomerate were found. In the coarsest facies, the pebbles and blocks have diameters up to two feet (Fig 1.), are oblong and somewhat rounded in shape, and are composed, most of them, of buff weathering Denault dolomite. The less coarse facies are well stratified and contain pebbles of shales or slates and of quartzite besides the pebbles of dolomite. The matrix consists of quartz grains of sand sizes which are cemented by calcareous material. It is thought that the conglomerate represents the base of the Wishart which, in that region, if it were not for the gabbro sills, would rest unconformably on rocks of the Hamilton River series.

It should be noted however that the arenites which are here above considered to represent the upper part

(1) Denault dolomite, and calcareous shales, slightly recrystallized into phyllites, also outcrop as islands and elongated peninsulæ in a large bay of lake Cramolet, at the northern limit of the map area.

of the Ruth-Wishart group are lithologically somewhat similar to some members of the Menikek formation as described in the Manual. The Ribero red sediments might be a ferriferous horizon equivalent to the Sokoman formation, the supply of non clastic silica and of iron oxides having been practically nil or very small in this region compared to other sections of the trough. Whichever interpretation is adopted, no iron formations are expected to occur - and none were found - in the gabbro highlands within the limits of the mapped area.

One exposure of Sokoman iron formation was seen in the Eclipse sheet near the south-west corner of the map area. The iron formations are in contact with slate-phylrites which may be either Attikamagen or Ruth, but are not ~~however~~ ferriferous. Since the actual contact is not exposed, being hidden under a 20-foot wide stream thalweg, it may be a fault contact.

Pyroclastics are exposed on a string of islands at the center of lake Hutchison. Other exposures were found on strike $\frac{1}{3}$ of a mile south of the lake. The band of coarse tuff and agglomerate constitutes a small synclinal trough and rests probably on arenites of the Ruth-Wishart group or on a gabbro sill. One small exposure of amygdaloidal lava was mapped in the south eastern part of the area, three and a half miles east and north of the southern tip of lake Wakuach. The exposure is in the brow of a gabbro hill, in the axial region of a supposed synclinal basin, and very close stratigraphically to lower Ruth-Wishart rocks.

It would seem that volcanic rocks are to be found at several horizons in the Ruth-Wishart group as here pictured. The volcanic rocks have been called Nimish.

The intrusive sills of gabbro are the youngest rocks in the area and they obviously belong to the Montagnais igneous series.

Table of formations

Pleistocene and recent	Swamps and muskegs, moraine, drift, eskers.
Montagnais Series	Gabbro sills, albitite and other differentiates, copper mineralisation.
Ferriman Series	Sokoman formation Lean cherty Iron Formation. Thin bedded cherty I.F. Thin banded jaspilite I.F. Lean chert Iron Formation.
Ferriman Series	Nimish group Agglomerate and tuff. Amygdaloidal lava.
Ferriman Series	Ruth-Wishart group Arenites with lutaceous and calcareous bands, some horizons metamorphosed into hornfels. Quartzites with interbedded shales and slates. Grits, conglomerate Local unconformities
Hamilton River Series	Denault formation Grey or buff dolomite, interbedded shales and quartzites
Hamilton River Series	Attikamagen formation Grey shales, slates and phyllites, some well bedded.

The Attikamagen Formation

The grey shales which are exposed in various places between the south end of Boulder Lake and Wilson lake are stratigraphically below the dolomites and are probably Attikamagen. Exposures are very scarce, except in the axial region of ^{the} northward plunging anticline, south east of lake Wilson. The flat swampy land drained by Mitchechau river and extending from Lac le Fer to the outlet of lake Wakuach has no exposures, except for a few patches of slate or shale rubble. It is therefore not certain that the bed rock in the Wakuach low lands be all slates and shales.

In most exposures of shales believed to be Attikamagen, bedding is not well marked and is probably parallel to the foliation. The rocks are grey greenish, tend to weather light grey or, where pyritiferous, yellowish-brown. Where bedding is apparent, it shows as fine laminae, alternatively dark and pale, and 1/4 to 1/8 of an inch thick. Although these shales possess a sericite-like sheen on their cleavage faces, they do not appear recrystallized. In thin section of a specimen containing 20% clastic quartz and feldspar of silt or very fine sand grade (0.05 to 0.1 mm), the matrix is composed of black opaque carbonaceous material and a paste of chlorite and "clay" minerals. Clastic micas are recognizable, but secondary sericite, if present, is not conspicuous. In some exposures however secondary micas are well enough developed for the rock to be termed a phyllite. In the shales exposed near the mouth of Ferrum river, there are flat lenses parallel to the foliation (Fig.3) and measuring two and a half feet in diameter. They

contain much carbonaceous matter and exhibit fine stylolites and come-in-cone structures.

The Denault Formation

The outcrop of the Denault formation determines a major overturned anticline pitching northward, at least near lake Wilson, with minor plications on both limbs. The east limb is the longer and broader of the two. It outcrops all along the centre of lake Wakuach.

The Denault formation consists dominantly of grey to buff weathering dolostone full of chert veinlets and lenticules (Fig.4). Bands of shale, silstone, and quartzite are interstratified with the dolostone. The shaly horizons, being very fissile and softer than the massive dolostone, are exposed only at water's edge (Fig.5) in the numerous finger-like lakelets which dot the band of Denault rock. Only the wider and more persistent bands of shales have been shown on the map.

Along the crest and the west limb of the anticline, clastic sediments are as abundant as the dolostone in the Denault formation. The centre of calcareous deposition must have been located near the pass which joins Geodetic Bay to the main body of lake Wakuach. Away from that centre, in all directions, the thickness of the dolostone decreases; shales and sandstones become more abundant. Along the west limb of the major fold, the dolomite disappears at the outlet of lake Wakuach. At the southern end of the east limb, only two small exposures of dolostone have been mapped.

Dolomites (or dolostones) of Denault type are exposed at a few places in the gabbro highlands, east of

lake Wakuach; the farⁿtest east of these exposures are those of lake Cramolet, at the northern limit of the map area.

All the specimens of dolostone collected effervesce, more or less vigorously, with acid, and contain calcite in various proportion, hence the name dolostone. The rock shows all the characteristics described on page 12 of the Field Manual. Where well bedded, the bedding is usually contorted, showing "b" and "a" plications (Fig. 6).

Brecciated horizons occur at various places, the best ones being along the west shore of Legacy island.

In several places, massive poorly bedded dolomite grades into fissile argillaceous dolomite and to shales containing little calcareous matter. There are also bands of dolomite containing much clastic quartz in the form of rounded spherical grains 0.2 to 0.3 mm across. The sand grains are indented at their periphery and are surrounded by concentric layers of fine grained carbonates in the manner of oolites. Fragments of dolomite are similarly mantled by the cementing carbonates as in clastic limestones. The interstices between these oversize oolites are filled with coarse carbonates.

The best exposed of the clastic members of the Denault formation are the quartzites. There is a prominent quartzite ridge some two hundred feet wide and two miles long east of lake Wilson. Other ridges are narrower but equally conspicuous. These quartzites resemble some facies of the Wishart. They are composed of glassy quartz, in round grains up to 1/16 of an inch in diameter, closely packed, well sorted, and cemented by rusty carbonates, iron oxides, or silica. In the quartzite ridge east of Wilson lake, a five-foot thick

horizon of a curious sedimentary breccia was noted. It contains discoidal fragments of black chert, up to four inches in diameter, set in a matrix of round quartz grains cemented by carbonates and chert. The chert in the fragments is impure and contains clastic detritus, in particular chloritized micas and argillaceous material. The breccia might be equivalent ~~or analogous~~ to the Fleming chert breccia.

West of lake Wilson, and farther north along the Swampy Bay river, there are large exposures of shales with bands of coarser clastic rocks ranging from siltstone to sandstone or quartzite. Since the folding is quite complex in that region, a detailed study of the structure would be required in order to ascertain whether these rocks belong to the Denault formation, or the Attikamagen shales. The medium coarse facies are made up of dark grey tough rocks which weather brown. They are composed of closely packed, subangular quartz grains, with a few feldspars, from 0.05 to 0.1 mm in diameter. Flakes of dark brown, more or less chloritized, clastic mica are interspersed amongst the quartz grains in subparallel orientations. The matrix and cement is part carbonate but mostly fine argillaceous matter.

The Ruth-Wishart Group

The rocks considered to belong to the Ruth-Wishart group outcrop specially east and north-east of lake Wakusach. As noted above, the Denault formation grades

laterally and vertically into clastic rocks. At the latitudes comprised between Geodetic Bay and Legacy island, where the thickest and most dolomitic section of the Denault is exposed, the upper part of the formation is definitely argillaceous, and along the east shore line of lake Wakuach there are numerous exposures of crumpled shales and slates containing beds 1/8 of an inch to two feet thick (Fig.6) of quartzite. In that region there seems to exist a gradational change from Denault to Wishart without any sedimentary break. Else where, as noted previously, the contact between the two may be discordant.

The base of the Wishart is here considered to coincide with the thick quartzites exposed just east of lake Wakuach or at the base of the escarpment which marks the eastern boundary of the lake Wakuach depression.

The Ruth-Wishart rocks fall into three main classes: coarse arenites, including conglomerates, grits, and quartzites or sandstones; thinly bedded and fine grained arenites, some of which have been metamorphosed into hornfels; and black or grey lutites including shales, slates, and graphitic hornfels. Minor calcareous beds occur in all three types.

Coarse arenites

Conglomerates are exposed along the north-eastern shore of lake Cramolet. A very coarse ill-bedded facies containing blocks and pebbles of dolomite has been described above. It is exposed near the northern tip of the lake. Other facies, with the same composition, occur along

the same shore. (1) They constitute bands two to ten feet thick interstratified with sandstone cemented with carbonates.

A little south of the narrows, near the northern boundary of the Geren sheet, broad exposures of quartzite contain lenticular beds of conglomerate six inches to two feet thick (Fig.7). The coarser detritus, of sizes up to two inches, consists of rounded quartz, angular pink feldspar, very angular pieces of a yellow earthy calcareous rock, and pebbles of greenish phyllitic rocks. There is no distinct matrix and the cement is partly calcareous.

One exposure of conglomerate was found along the shore of the easternmost bay of lake Roze. The rock has the same matrix and cement as the North Cramolet conglomerates. The pebbles are rounded, two inches and less in diameter, and composed of calc-arenaceous and of phyllitic rocks. This exposure indicates that, even in the highest part of the map area - which incidentally lies in the axial region of an anticline - the rocks are lower Wishart. On strike with this conglomerate, to the north, bedded Denault dolomite is exposed.

These conglomerates suggest an unconformity or a stratigraphic discordance between the Denault and the Wishart in the region of lake Roze and lake Cramolet.

The lower Wishart rocks also include coarse, almost conglomeratic, grits. They are exposed in the Cramolet depression and below the lowest gabbro sills recognized near

(1) See small sketch map at one mile to one inch attached to the North-Wakuach sheet.

lake Wakuach. They are pinkish in color because, in part, of the pink angular microcline they contain and, in some exposures, of their ferruginous cement.

Quartzites and sandstones

Although the medium-grained Wishart rocks have been designated as quartzites on the maps, none of them are recrystallized. Many have calcareous cements and, in many cases, the term sandstone would be more proper.

There is a continuous and well exposed band of quartzite on the east side of lake Wakuach. It extends from a point north of the discharge of lake Musset to the northern limit of the map area. The most common type is a tough well cemented orthoquartzite composed of rounded and spherical quartz grains, 1.0 to 1.5 mm in diameter, cemented with silica, clay matter, and some carbonate. The colors are white, light grey, faint pink, or dark grey. The latter contain some half decomposed clastic micas and have an argillaceous matrix. Bedding is almost everywhere well marked, except in the grey or dark varieties.

In one thin section examined, the dominant clastic particles are round quartz grains, 0.3 to 1.0 mm in diameter, in a matrix of finer, more angular quartz, and feldspars. Many quartz grains are slightly biaxial and show strain shadows at extinction. Others have dense sagenitic webs of rutile needles. Most have been enlarged by silica in the cementing matter. In the dark grey quartzite exposed

near and north of Geodetic Bay, ^{the} chlorite^s have been recrystallized in the matrix; some flakes are yellow and moderately birefringent at their centers. The pink or reddish quartzite^s are richer in angular feldspars and their cement is ferruginous.

One band of pale grey quartzite, exposed at the nose of a syncline north of Geodetic Bay, has a pitted rusty crust which disintegrates into sand. This is due to the dissolution and oxidation of a carbonate matrix. The round clastic quartz are all indented and corroded, at their periphery and the indentures and bays are filled with carbonates.

Shales, slates, arenites, and hornfels

Above, and interbedded with, the Wishart quartzites are dark shales and slates, some of them well bedded. They contain arenaceous bands, some only a few inches, others two to three feet thick. The contact between carbonaceous shales and what is considered to be one of the lower most gabbro sills, northeast of Geodetic Bay, is exposed in a few places. The carbonaceous matter of the shale has been transformed into graphite, and cream-colored oblong nodules, some 5 mm in diameter, have developed in the rock. These nodules are completely sericitized. In cross section they look like flowers, with petals radiating from a center. In longitudinal sections, they are rudely rectangular and show a kind of parting which may represent a cleavage. They are considered to be cordierite porphyroblasts changed into pinites.

The grey-greenish arenites are finely bedded and characterized by abrupt changes in grain size from

bed to bed. It is common to see them grade, by steps, from coarse quartzites to very fine shales over a total thickness of two feet. Beds of grey fine-grained limestone, six inches to two feet thick, occur at several horizons. In general, the arenites appear little metamorphosed by the gabbro sills, and the hornfels, where present, do not extend beyond a few feet from the gabbro contact. Chloritoid porphyroblasts occur in bleached shaly beds. The chloritoids are dark green, hexagonal in outline, and 0.5 to 2 mm in diameter. They appear semi-opaque and full of inclusions in thin section, and give no interference figures. They are in fact called chloritoid only because of their shape. Such chloritoid hornfels have been observed only in two places, and are probably rare. Coarser beds have been changed into arenaceous adincoles by almost complete transformation of the argillaceous matrix into albite. Bright green chlorites are wrapped around the original quartz grains. In one specimen the albite crystals constitute about 40% of the rock and penetrate the quartz grains in such a way that the rock appears igneous; it may in effect represent a thin sill of albitite intruded amongst the arenites. In the other specimens of adinole examined microscopically, the quartz is clearly clastic in origin. In the field, the adinoles are difficult to distinguish from the unmetamorphosed arenites, and many undoubtedly have been missed.

The Ribero red sediments

The Ribero red sediments are mostly fine sandstones although some red silstones and shales with green beds also occur in the lake Cramolet exposures. They differ from the typical Wishart rocks by their purplish color, and their abundant calcareous matrix and cement. On the east shore of lake Ribero, one band six inches thick has curious concentric orbicules, some two-three inches in diameter and slightly deformed, resembling algal structures. The concentric banding in them is marked, like the bedding in the other sediments, by laminae of coarser clastic quartz.

Although the possibility that these red sediments be Sokoman in age has been admitted, they are thought to belong to the Ruth-Wishart group because they are stratigraphically close to the Wishart quartzites. Brick red quartzites, with ferruginous cements, occur among the Wishart rocks near the east end of lake le Palier. Dr. P.E. Auger (1) has found dolomite beds of the same red purplish color and containing clastic quartz amongst Denault rocks.

(1) Personal communication.

The Nimish Volcanics

The one small exposure of amygdaloidal lava found three and a half miles east of lake Wakuach in the Boulder sheet is located between two gabbro ridges and, presumably, along the axis of a synclinal fold. The rocks below the gabbro sill are lower Wishart and Denault. The lava is a grey greenish rock, rather fine grained. The amygdules,

about one cm in diameter are composed, some of calcite, some of pyrite, and others of calcite and chert. The lava contains about 40% feldspars, 30% carbonates, and 30% chlorite and white opaque granules. The feldspar laths are matted in a decussate arrangement. They are somewhat replaced by carbonates and sericite or chlorite, but polysynthetic twinning is still recognizable in most of them. A few blocky phenocrysts, 0.5 mm in diameter, are zoned; the peripheral zones are clear and quite sodic, the internal ones are all replaced by carbonates and sericite. The composition of the feldspars could not be determined accurately; the measures taken indicate An10 to An15. The chlorites, some showing anomalous blue interference colors, fill the interstices. The lava might be called a latite or an andesite.

The coarse pyroclastics exposed at lake Hutchinson are composed of angular barbed fragments of glassy lava, some containing feldspar phenocrysts. The fragments vary in size from 1/16 to 1/2 inch. In some exposures they show a rude alignment. The matrix is very fine, semi-opaque because ^{of} kaolin-like and rusty alterations. The texture suggests an accumulation of fine broken particles altered to kaolin, iron oxides, and sericites. The rock is a coarse vitric tuff, or agglomerate.

These volcanic rocks occur at different horizons in the Ruth-Wishart group, and are certainly older than the Sokoman formation.

The Sokoman formation

The only exposure of Iron Formation found is about 700 feet square. It is well bedded and dips to the north-east. The stratigraphic succession from east to west is as follows:

<u>Types</u>	<u>Widths</u>
Lean cherty Iron Formation.....	50 feet
Thin banded jaspilite.....	150 feet
Thin bedded cherty Iron Formation.....	500 feet

The lean cherty Iron Formation contains much disseminated carbonates and thin bands of clastic material, very fine, and angular, mixed with magnetite and hematite. Such horizons would thus be called "cherty metallic" Iron Formation.

The exposure of Iron Formation is limited on the east side by a 30 foot wide gully in which flows a small stream. On the east side of the gully grey shales with their foliation and bedding parallel to the bedding of the Iron Formation are exposed. There is no sign of faulting in the gully. Considering the succession in the Iron Formation, and the attitude of the band of dolomite to the north, the Iron Formations are thought to be overturned. The shales in contact with them could be of Ruth-Wishart age.

The Gabbro Sills

Thick sills of gabbro have been intruded in the folded Wishart rocks. Although the outcrops and

observed contacts of the sills are concordant generally with the attitude of the folded sediments, local discordances exist. The band of gabbro which crosses the North Arm of lake Wakuach is certainly discordant. It is probably because of similar discordances in depth that Denault rocks are exposed in the eastern part of lake Roze and that the Ribero sediments appear so far removed from the Denault dolomite. The big sills south of lake Rose branch off, thicken and peter out in various ways; they are not entirely concordant.

The intrusion of the sills has been accompanied by faulting and fracturing of the sedimentary rocks. Minor cross faults, with displacements of some 10 to 20 feet, have been noted. The fault planes are well marked, and the sharp edges of the raised blocks project in the gabbro. The latter is not cut by the faults, but covers them as a thick coat of paint covers cracks in a rough surface. Xenoliths of sedimentary rocks and contact breccias, help in locating the boundaries of some sills where contacts are not exposed.

The bottoms of the sills are relatively well exposed (Fig.8), but only one good exposure of the top of a sill has been observed. It is located three quarters of a mile east of the southern tip of lake Hutchinson. Thick-bedded quartzites rest directly on the gabbro (Fig.9), and are traversed, perpendicularly to the bedding, by dykelets of gabbro which can be traced to the sill. Similar dykelets and minor sills have also been found below some other large sills.

Several progressive petrographic and structural changes are observed in the gabbro as one proceeds from the lower sills and discordant bodies to the upper sills. These changes, when well known and observed, may be useful in establishing the stratigraphic horizons of the sedimentary rocks enclosing the sills. In the lower gabbros, jointing is blocky and irregular. Many joints appear to be due to warping and flexing rather than to contraction on cooling. For instance, the closely spaced fan joints in the thick sill just south of lake Ribero are clearly tension fissures produced by flexing. In the upper sills, near the center of the large synclinal basins, perfect columnar jointing is developed. The hexagonal columns, some two to six feet in diameter, extend into the sedimentary rocks and were clearly caused by contraction on cooling. The columns are normal to the bedding of the sedimentary rocks and their plunge is therefore a measure of the strikes and dips of the bedded rocks underneath the sills. Even in the lower sills, the intersections of the master joints seem to be perpendicular to the bedding of the arenites.

The lower gabbros are generally darker and coarser grained than the upper ones. Ophitic and subophitic textures are conspicuous at all levels, but are perhaps clearer in the middle gabbros. At all levels, the feldspars are too saussuritized for identification. The few optical data obtained suggest that their compositions are much the same in all the gabbros: circa An 50. In the lower gabbros, the pyroxenes - mostly augite with some doubtful remnants of hypersthene - are

much uralitized. In some specimens, only relics of pyroxene are recognized, and the fibrous borders of the large hornblende crystalloblasts invade the feldspars. It is largely because of the secondary hornblende that the lower gabbros are dark in color. The light grey-greenish color of the upper gabbros is not due to a more feldspathic or dioritic composition as was first supposed but to an almost colorless pyroxene, near diopside in composition, unaltered, which constitutes nearly 50% of the rock.

Variations in texture and composition occur within any one sill. Since none of the sills are exposed over their whole thickness, some showing their basal part, others their medium or upper parts only, no general rule may be established for such variations, and only unrelated examples can be given. In a specimen from the central part of a lower sill, the augite is serpentized and converted to bastite and chlorite instead of hornblende. In a specimen of an upper gabbro, the pale pyroxene is much uralitized.

All the gabbro specimens examined in this section contain interstitial quartz. In some, rounded quartz grains project into the other constituents. The main accessory minerals noted are apatite, magnetite and opaque leucoxene. Biotite, or rather penninite replacing biotite, has been noted in only one specimen taken at the base of a sill. At the contacts of lower sills, particularly where sulphide mineralization occurs,

the gabbro is pale green and has a greasy luster. In thin sections of such facies, the gabbroic texture and pyroxene remnants are still recognizable in spite of the heavy carbonation and silicification. Other contact facies are not so altered. The rock is fine grained, and the feldspars occur as slender needles in decussate arrangements against a background of altered pyroxenes.

"Red rock" differentiate occurs at one place, about 1/4 of mile from the west shore of lake Ribero, near the top of a large sill. The coarse, microcline-rich, granophyre is injected in a crude lit-par-lit fashion into bedded siltstones. There has been some recrystallization, particularly of chlorites, in the siltstone, and the rock assemblage has the appearance of a granitic gneiss.

Pleistocene glacial deposits

Glacial striae trend due south, or 10° to 15° east or west of due south. Dips of friction cracks, on some quartzite surfaces, and quarrying along the edges of such cracks suggest that the ice flowed southward. The stoss-and-lee topography across some east-west trending gabbro ridges leaves little doubt that, at the peak of glaciation, the ice moved southward. From the southern shore of lake Cramolet, morainic slopes rise gently to the top of the first gabbro ridges. The south flanks of the ridges, however, are steep and quarried: large angular blocks of gabbro have been plucked away and carried on to the north flank of the next ridges. The stoss-and-lee topography and the plucking are naturally more striking in

those ridges which have their dip slope toward the stoss side.

The eskers traced along the southern shore of lake Cramolet converge toward the center of the lake. The glacial streams which formed them probably flowed northward in the waning stages of the glaciation. In the lake Wakuach lowlands, the drift has been washed and reworked by post-glacial lakes and streams, including the present ones. West of the upper Mitchéchau river, and also east of the lower Swampy Bay river, there are flat gravel plains (Fig.10) dissected by old meandering stream channels. The gravels are ill sorted and have a brown sandy clay matrix. These plains are outwash aprons formed at the front, or periphery, of large masses of wasting ice lying, to the south in the case of the Mitchéchau plains, to the east perhaps in the case of the lower Swampy Bay deposits. In the Mitchéchau plains, where present streams, in some cases following and deepening older channels, have cut through these outwash deposits, they have exposed underlying shales and also "Blocks" of big boulders (Fig 11) representing perhaps old ground moraines.

To summarize, in the gabbro highlands only the passage of a thick ice sheet advancing southward is recorded. In the lowlands, except for not too reliable friction crack observations, only the wasting away of masses of ice retreating southward or eastward, in the waning stages of the glaciation, has left traces.

STRUCTURAL GEOLOGY

Folding

The predominant structures of the region are the open synclinal basins which outcrop in the highlands. They are well outlined by the topography and by the gabbro outcrops. Between lake Wakuach and lake Cramolet there are three such synclines, the largest being the one centered about lake Roze. The North Arm of lake Wakuach lies along a limb of this syncline. The intervening anticlines are less conspicuous and sharper than the synclines.

Lake Cramolet occupies the crest of an anticline, or rather, of an anticlinorium made up of close folds of relatively small amplitudes. Another large synclinal basin, with its axial plane parallel to the trend of lake Cramolet, occupies most of the area east of that lake.

In the lowlands, the folding pattern is clear only in the northern part of the area. The outcrop of the Denault rocks is a section of a north-plunging overturned anticline, with many folds of smaller amplitude along both limbs. These plications are more conspicuous on the west limb than on the east limb because of the overturned position.

The folding has been more intense in the lowlands than in the gabbroic region. It is interesting to observe that the rocks underlying lake Cramolet are close-folded, of Denault-lower Whshart age, and cut by an apparently discordant mass of "lower" gabbro. Structurally, the lake Cramolet depression is a patch of lowlands.

Because the rocks are much plicated in the lowlands, more openly folded in the highlands, it is almost certain that the intrusive sills controlled the folding to some extent. Joints due to warping and flexing occur in the lower sills but otherwise the gabbros show little sign of having been deformed. To account for all these facts, the following explanation is advanced. Intrusion of the gabbro took place after the rocks had been gently folded into open anticlines and synclines by a thrust from the north-east. The stresses were relaxed during the crystallization of the gabbro sills which extended only a certain distance from widely spaced feeder "chimneys" or fissures. The gabbro plateau east of lake Roze may mark the emplacement of such a feeder. The narrow discordant bodies of the lowlands did not nourish big sills around themselves. After solidification of the gabbros, folding was resumed. Such blocks of ground which had acquired a strong gabbro armature remained undeformed, and the weaker gabbroless blocks were squeezed between them. Shearing has been observed at the base of one gabbro block. Along the east shore of lake Wakuach, breccias and fault gouge have been observed at two places in the shales. Bands of quartzite two feet thick have been plicated and broken (Fig.12).

Faulting

Apart from the relatively minor breaks already mentioned, and similar ones in the band of Denault rocks, no faults are exposed within the map area. One fault of some importance is indicated in the region of lake Parker by apparent offsets in some gabbro ridges. The northward extension of this fault to the north shore of lake Cramolet must be regarded as

very uncertain: the fault may die out near the southern shore of the lake. Southward, the fault disappears and changes into a flexure.

At the north end of lake Cramolet, a gabbro hill is sliced off by a fault. The west half of the hill is 50 feet lower than the east half. Along the break the gabbro is broken up into rubble. A rectilinear valley extends to the north-north-east from the hill and marks the continuation of the same fault.

ECONOMIC GEOLOGY

Iron

A few patches of bog iron, which are indicated on the map, occur in the southwestern part of the map area. Their extent is small and they have no commercial value. The iron oxides are believed to result from the oxidation of pyrite in the underlying shales.

Although the Sokoman formation is rusty where exposed, no concentration of iron oxides has been observed.

Copper mineralization

Sulphide mineralizations have been noted close to some gabbro contacts, in the region south and southwest of lake Roze. At one place, pyrite, chalcopyrite, and pyrrhotite occur as stringers and patches replacing a thin bed of grey limestone. The contact of the limestone with the overlying hornfels is stained green with malachite. At another point, one and a half mile south of lake Roze, a band of quartzitic adinole

contains disseminated sulphides and is copper stained. Pyrite-chalcopyrite-quartz veinlets, and magnetite veinlets one inch thick, cross the contact between the andiote and the overlying gabbro. At another spot, close to lake Wakuach, in the Wakuach sheet, the same sulfides plus some bornite were found in irregular quartz-epidote-actinolite veinlets in the gabbro. None of these occurrences have any commercial possibilities. The mineralized zones are less than one foot wide, the sulphides are not abundant and their distribution is very erratic. They indicate that copper-bearing solutions were evolved from the gabbroic magma, but of the great number of gabbro-sediment contacts visited, only four or five were mineralized.

Non-metallics

Some gravels in the fluvio-glacial deposits would be suitable for road construction or railroad ballast. Many of them are too coarse and too ill sorted to be of any use.

The probability of finding mineral deposits of economic value in this part of the area where the bed rock is known is very slight.



Fig. 1 - The great muskeg area of the south-west.
View looking south-west from a point one
mile east of the lower Mitchechau. The hills
in the background are outside the map area.

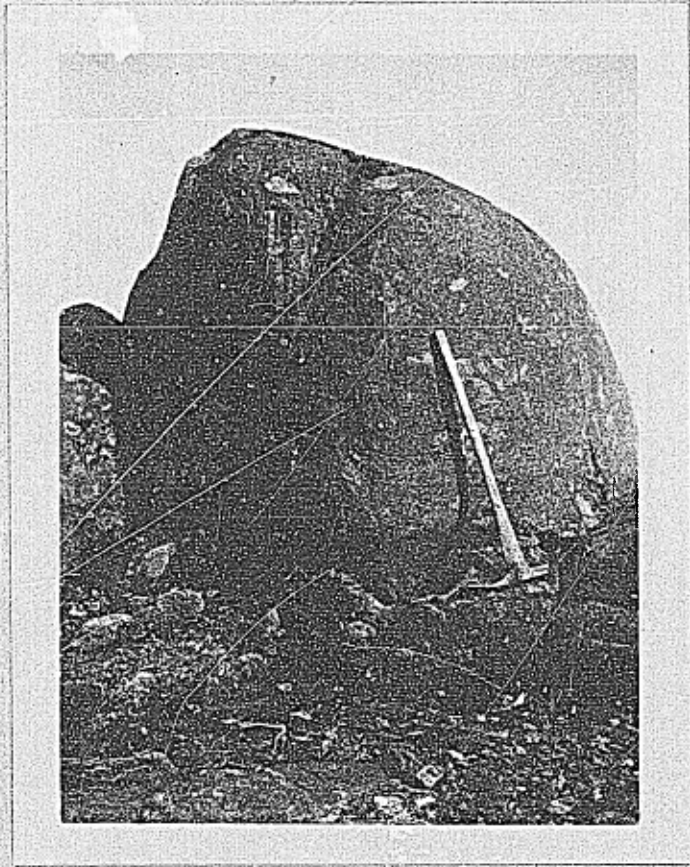


Fig. 2 - Coarse conglomerate containing dolomite pebbles,
north end of lake Cramolet.

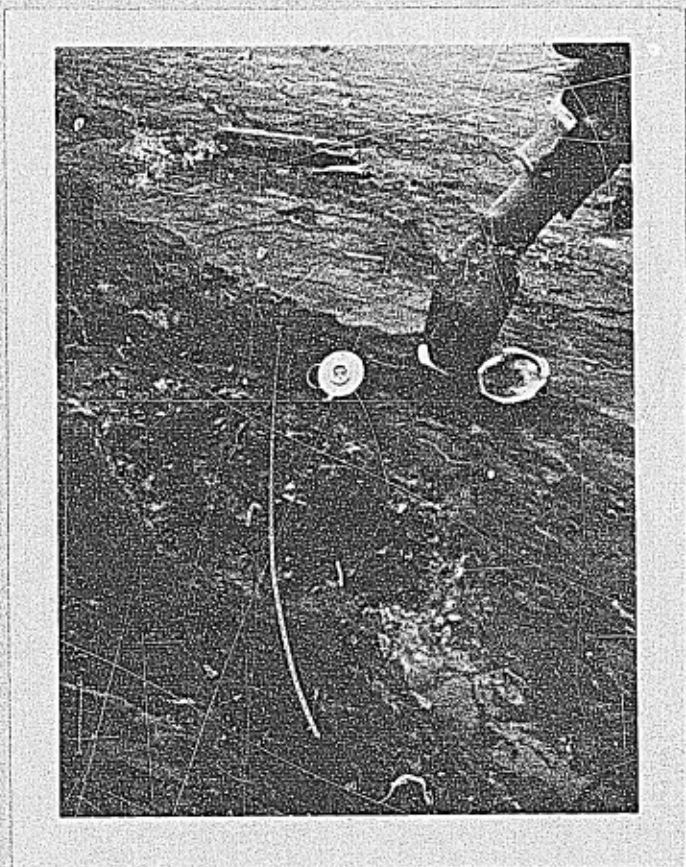


Fig. 3 - Carbonaceous lenses in the Ferrum river shales.



Fig. 4 - Bedded dolostone with thin beds and veinlets of quartz and chert.

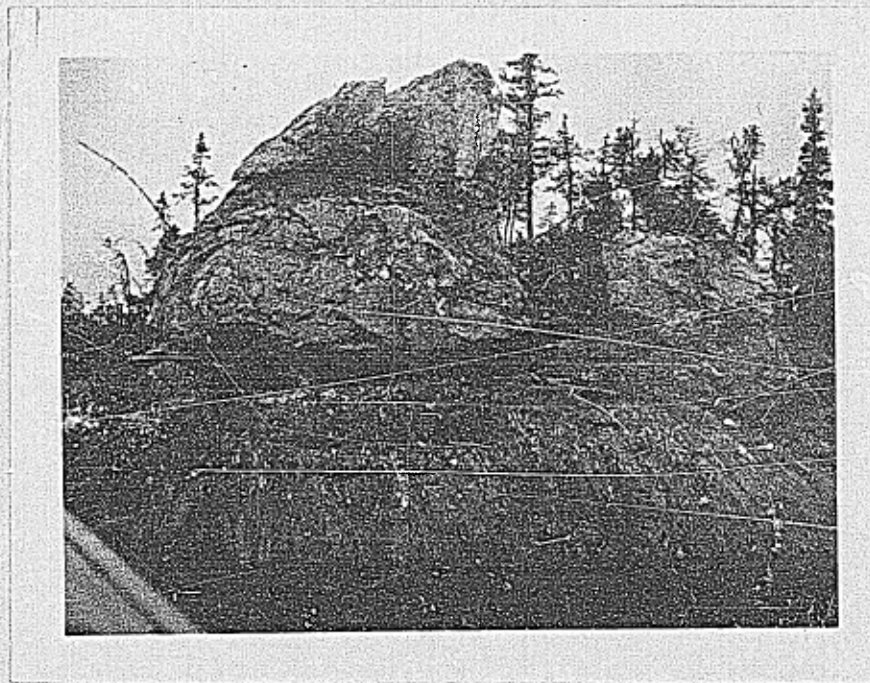


Fig. 5 - Shales exposed at the end of a narrow lake in the band of Denault dolomite. The large blocks are bedded dolostone.

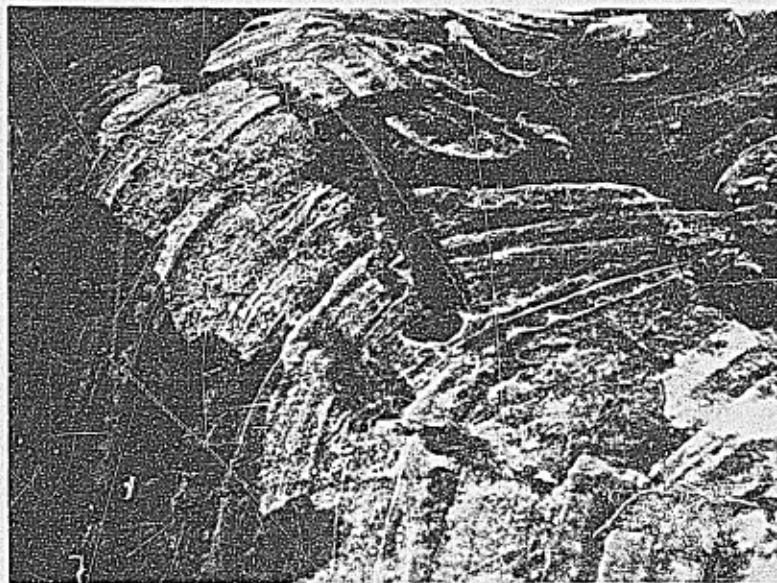


Fig. 6 - Contorted bedding in dolostone.



Fig. 7 - Band of conglomerate in quartzite, near the narrows of lake Cramolet. Bedding in the quartzite in truncated by the base of the conglomerate.



Fig. 8 - Hornfels and arenite are exposed just above the top of the scree. The rock above the higher dark line is gabbro. The stream in foreground is the outlet of a chain of small lakes flowing east into lake Wakuach.



Fig. 9 - Quartzite resting on gabbro (extreme right). The ridge in the background is a gabbro exposure.

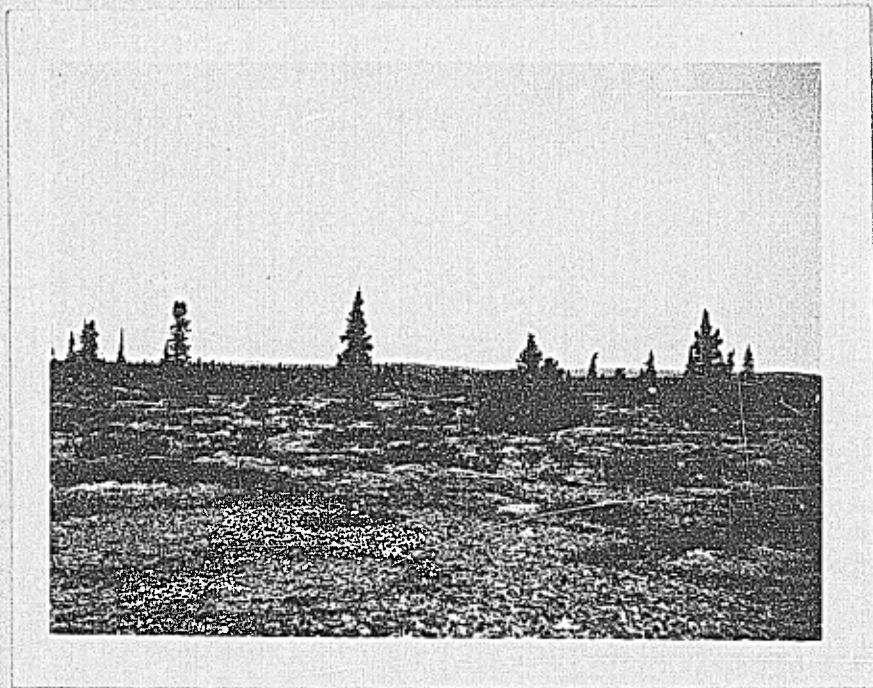


Fig. 10 - Gravel plain, west of upper Mitchéchau river.

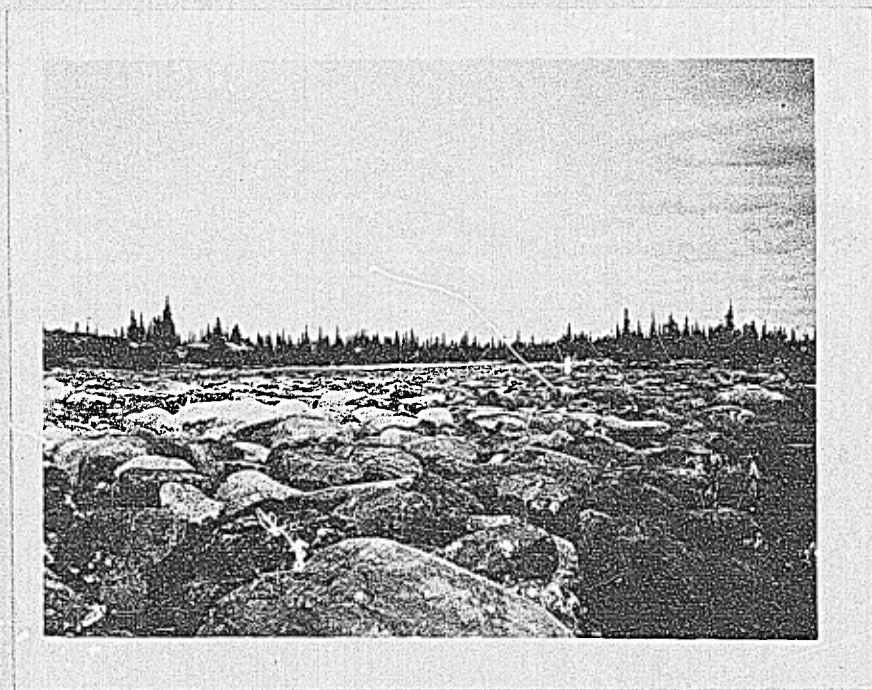


Fig. 11 - Blocks of crystalline rocks underlying outwash deposits, west of upper Mitchéchau river.

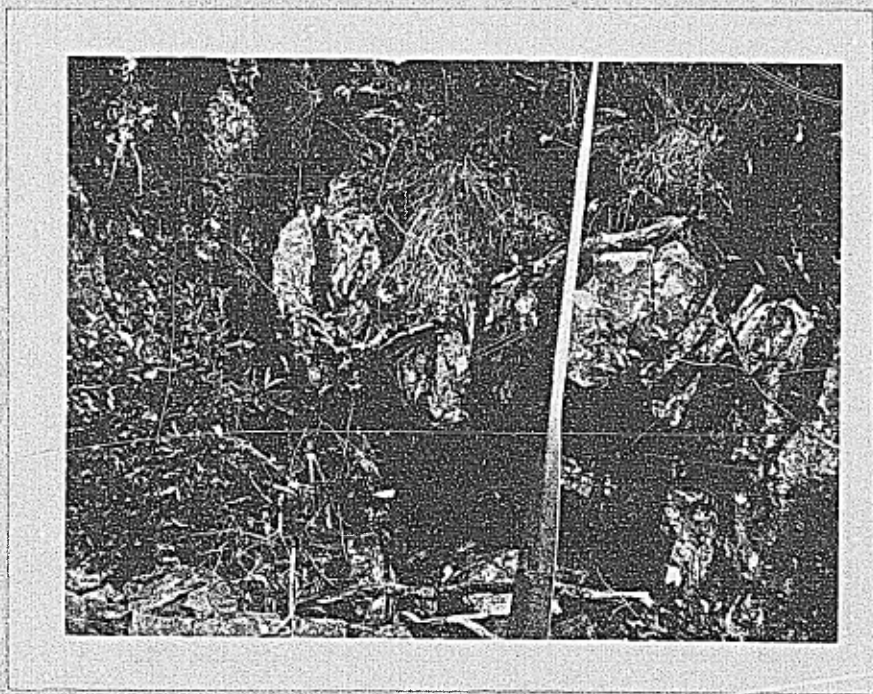


Fig. 12 - Plicated quartzite bed, east shore of lake Wakuach.
Axis of the fold strikes north.