

- LEGEND**
- ORDOVICIAN**
- MIDDLE ORDOVICIAN**
- 15 OTTAWA FORMATION: sandy shale, fine-grained grey limestone, sandy limestone
- LOWER ORDOVICIAN**
- 14 OXFORD AND MARCH FORMATIONS: dolomite and limestone, sandy dolomite
- LOWER ORDOVICIAN OR CAMBRIAN**
- 13 NEPEAN FORMATION: sandstone and conglomerate

- PALAEZOIC**
- 12 Diabase and porphyritic andesite dykes
- 11 Granitic rocks: coarse-grained leucocratic red monzonite, syenite, quartz monzonite, granodiorite; 11a, monzonite; 11b, quartz monzonite
- 10 Poorly foliated monzonite and intermixed granitic and metamorphic rocks, associated fine-grained biotite schist
- 9 Fine- to medium-grained, massive, quartz-feldspathic granulate, granite in part
- PRECAMBRIAN**
- 8 Gabbro, gabbroic anorthosite
- 7 Diorite, quartz diorite
- 6 Pyroxene gneiss, pyroxene-biotite gneiss, minor amphibolite
- 5 Stratiform quartz-biotite-feldspar gneiss, cordierite and sillimanite gneiss; 5a, lit-par-lit biotite gneiss
- 4 Garnet-sillimanite gneiss, garnet-hypersthene gneiss, garnet-cordierite gneiss, lit-par-lit garnet gneiss
- 3 White to buff quartzite
- 2 Interlayered quartzite and siliceous crystalline limestone, mostly finely laminated; lime-silicate rock
- 1 Crystalline limestone and dolomite, siliceous limestone, skarn; includes fragments of white pegmatite, garnet gneiss, rusty quartz-dioptase gneiss, and diorite; 1a, white granite

- Geological boundary (defined, approximate)
- Bedding (inclined, vertical)
- Bedding, top known (inclined, overturned)
- Foliation (horizontal, inclined, vertical)
- Gneissosity (inclined, vertical)
- Lamination (direction and plunge, horizontal, vertical)
- Minor fold (arrow indicates plunge)
- Linemant (from air photographs)
- Fault (defined, assumed)
- Shear zone (width indicated)
- Mylonite (lineation, dip of laminae)
- Anticline (defined)
- Syncline (defined)
- Fossil locality
- Glacial striae (direction of ice movement known)
- Quarry or mineral pit

- ABBREVIATIONS FOR METALS**
- Apatite ap
Magnetite mag
Barite ba
Mica mi
Galena gn
Quartz crystals q
Graphite gf
Silica sc
Hematite hem

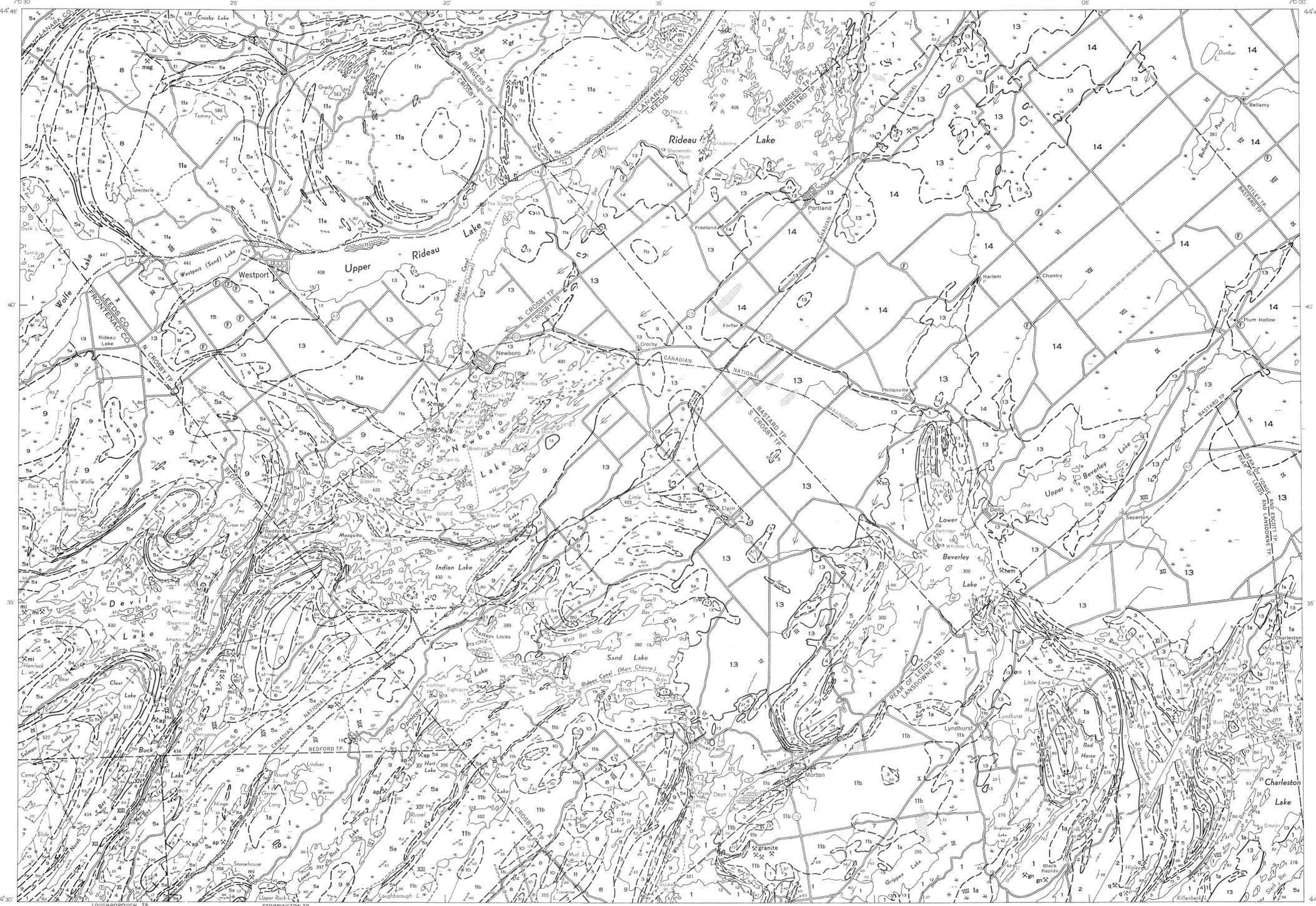
Geology by M. E. Wilson, 1928, 1929; G. M. Brownell, 1927, 1928, H. R. Wynne-Edwards, 1957, 1958; Compiled by H. R. Wynne-Edwards, 1958

Cartography by the Geological Survey of Canada, 1959

Approximate magnetic declination, 12° 05' West

Air photographs covering this area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa, Ontario

In response to public demand for earlier publication, Preliminary Series maps are now being issued in this simplified form, thereby effecting a substantial saving in time. There is no loss of information, but the maps will be clearer to read if all or some of the map-units are hand-coloured.



DESCRIPTIVE NOTES

The Palaeozoic sediments in the northeastern part of the Westport map-area are in the Ottawa-St. Lawrence Lowland. The Precambrian rocks form a part of the Frontenac Axis, a narrow neck of the Canadian Shield that connects the Laurentian Plateau with the Adirondack Mountains of New York State. Most of the drainage is southward to the St. Lawrence, but the Rideau Lakes drain northward to Ottawa River. The two systems are joined at Newboro by the Rideau Canal (Ottawa to Kingston).

Flat-lying Nepean sandstone (13) unconformably overlies a Precambrian erosion surface of low relief, similar to the present erosion surface in the western part of the area. In many places a zone of deep weathering is preserved below the Nepean sandstone. A quartz-pebble conglomerate of varying thickness is commonly present at the base of the Nepean formation, which is otherwise white to red, pure silica sandstone. Greenish arkose and arkosic conglomerate overlying Precambrian rocks around Rideau Lakes are correlated with this formation. The arkosic nature of these sediments is attributed to rapid deposition at the base of a scarp along the Rideau Lake fault. The Nepean sandstone passes upward through sandy dolomite into thick-bedded, buff-weathering dolomite (March and Oxford formations, 14). Isolated outcrops of sandy shale and limestone near Westport overlie the Oxford formation and are correlated with the Ottawa formation (15). The contact between these rocks and the Oxford formation is not exposed.

Apart from pyroxene gneiss (6) which may be of meta-volcanic origin, units 1-6 consist of metamorphosed sedimentary rocks. Crystalline limestone (1) is a coarse calcitic marble with individual grains averaging 3 mm in diameter. It generally contains between 5 and 10 per cent MgO. Small amounts of graphite, phlogopite, diopside, serpentine, and scapolite are common. Numerous blocks of lime-silicates, gneisses, and white pegmatite have been distributed through the crystalline limestone during tectonic flowage. A layering marked by trains of graphite or lime-silicate minerals is the only structure visible in the crystalline limestone, except in the noses of major folds where bedding may be preserved.

Pure quartzite (3) is common in the southeastern part of the map-area. Disseminated iron-oxide grains in this rock are concentrated along the base of beds which grade upward into pure quartzite. This feature has been used in determining stratigraphic tops of beds. The quartzite is separated from the crystalline limestone in many places by a finely laminated zone of interbedded quartzite and limestone (4). The dolomitic varieties of this rock contain talc and tremolite.

Gneisses (4, 5, 6) consist of quartz, oligoclase, string perthite, and biotite, with garnet-sillimanite and pyroxene or hornblende-rich members. Quartz-feldspar-hypersthene gneiss and hypersthene-garnet gneiss are common south of Devil Lake. East of Lake Opinicon, hypersthene is not present, cordierite-sillimanite and cordierite-garnet assemblages being common. West and north of Lake Opinicon the rocks are metamorphosed to granulite facies; to the east they are in amphibolite facies. All the gneisses contain interlayered granite, and are highly granitic in the area of granite facies.

Diorite (7) and granitite (9) resemble certain phases of the gneisses, but are massive and coarser in grain. Hornblende is the commonest mafic mineral of the diorite. The granitites consist of quartz and oligoclase with lesser amounts of fine string perthite. The gabbros (8) are coarse grained and massive, and contain about 60 per cent andesine as well as pyroxene, biotite, magnetite, and ilmenite. All the gabbros are iron rich and considerable concentrations of iron oxide occur in the gabbro near Newboro.

Large bodies of granitic rock (11) cut the gabbro and are typically coarse grained and massive. They consist essentially of albite-oligoclase and microcline in roughly equal proportions. Biotite is the common mafic mineral. Where the plutons are enveloped in siliceous rocks, there is a zone of granite intermixed with pre-existing material (10).

Foliation in the gneisses is defined by interfaces between layers of different composition and is parallel to, and apparently coincident with, the original bedding planes. Layers between these foliation surfaces are homogeneous. They vary in thickness from a fraction of an inch in sillimanite gneisses, to many feet in the thick quartzites. There is a prominent corrugation or mullion structure on many foliation surfaces which is commonly accentuated by trains of mineral segregations. This lineation is parallel to the adjacent major and minor fold axes.

Three consecutive stages of deformation are recognized:

1. A stage when all the metamorphic rocks behaved plastically, forming upright similar folds with dominantly northeastward-plunging axes, typified by the structures around Devil Lake. At Bedford Mills the fold axes plunge 30° NE, but flatten as they are followed southwest. Southwestward plunges are common east of Buck Lake and elsewhere. The gneisses around Crow Lake outline a broad, doubly plunging dome, with quartz monzonite (11) forming the crest.
2. A stage when linear zones of crystalline limestone behaved plastically and moved differentially against more rigid gneiss units. Examples are the crystalline limestone around Lake Opinicon and Lyndhurst. Mylonites were produced in the gneisses along the borders of these zones. The syncline at Morton and the anticlinal buckle at Little Long Lake are interpreted as complementary drag-folds against the limestone around Lyndhurst. The concordant plutons (11) north of the Rideau Lakes and at Lyndhurst lie as flexures in linear belts of crystalline limestone, and there is evidence that their position is controlled by steeply plunging concentric structures formed there by flowage of the limestone at this stage and before the emplacement of the granites.
3. A stage of local cataclasis and faulting during which movement was confined to narrow zones such as those through Morton and Westport. These three stages appear closely related. Palaeozoic sediments are downfaulted against the Precambrian by subsequent movement on the fault through the Rideau Lakes.

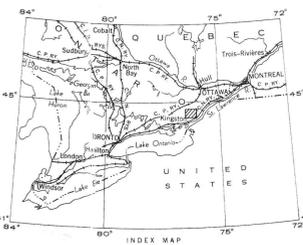
Numerous deposits of large mica and apatite crystals were worked in the 19th century, but little work is in progress at present. These occur at or near the boundary between crystalline limestones and siliceous rocks and are most abundant in the noses of major folds. In some cases they occur in veins crosscutting crystalline limestone and white pegmatite, but in general their relationship to other rocks is not evident. Associated minerals are pyroxene, scapolite, graphite, sphene, and calcite. Quartz crystals occur in vugs in brecciated Precambrian rocks near Black Rapids.

Iron ore was mined from the Chaffey and Matthews properties one mile west of Newboro from 1858 to 1871. Interest in these deposits was renewed in 1957 and development work is currently underway. The ore occurs as concentrations of titaniferous magnetite and ilmenite in gabbro.

Wilson, A. E.: Geology of the Ottawa-St. Lawrence Lowland, Ontario and Quebec. Geol. Surv. Canada, Mem. 241, 1946.

Wynne-Edwards, H. R.: The structure of the Westport Concordant Pluton in the Grenville, Ontario; J. Geol., vol. 65, p. 639, 1957.

Harrison, J. M., and Fottier, Y. O.: Occurrences of Quartz Crystals, Leeds County, Southeastern Ontario; Geol. Surv. Canada, Paper 44-8, 1944.



MAP 28-1959
GEOLOGY
WESTPORT
LEEDS, FRONTENAC AND LANARK COUNTIES
ONTARIO

Scale: One Inch to One Mile = $\frac{1}{63,360}$ miles

1 1/2 0 1 2 3

COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOLOGICAL SURVEY OF CANADA, OTTAWA

- LEGEND**
- Main highway
- Other roads
- Trail
- Railway
- Post Office
- County boundary
- Township boundary
- Concession numbers
- Intermittent stream
- Marsh
- Sand and gravel
- Height in feet above mean sea-level 278

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MAP 28-1959
WESTPORT
ONTARIO
SHEET 31 1/2