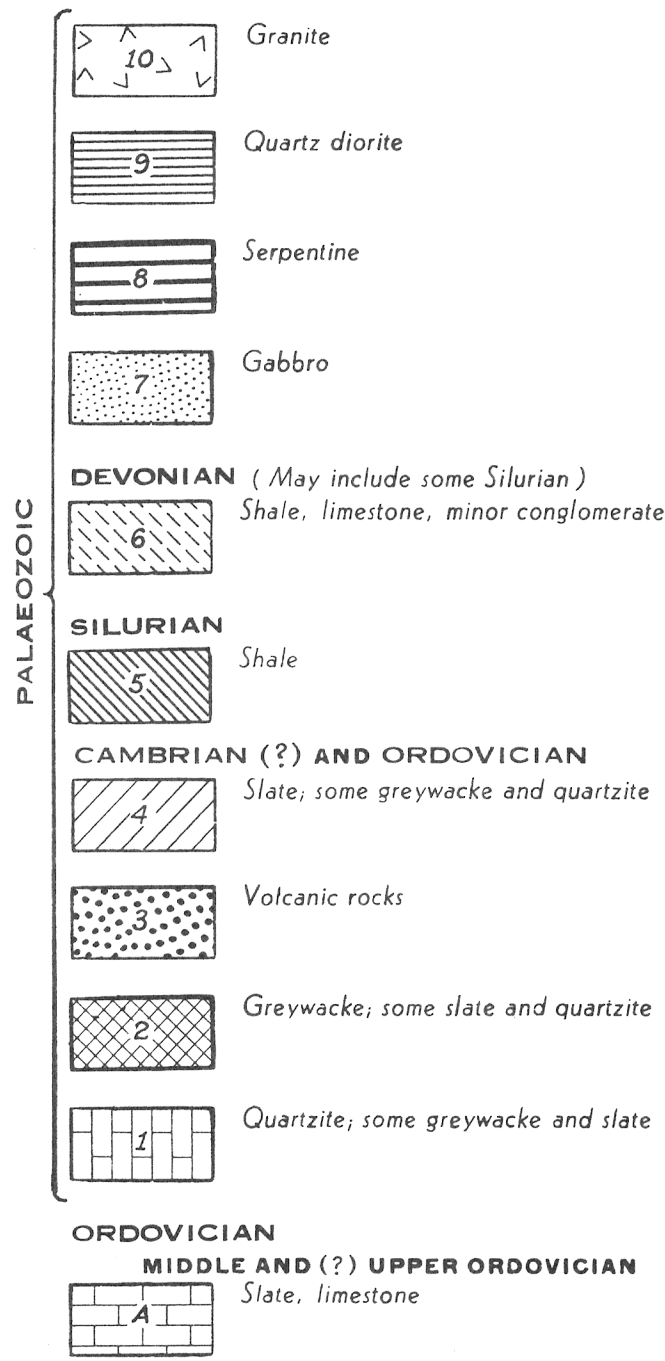
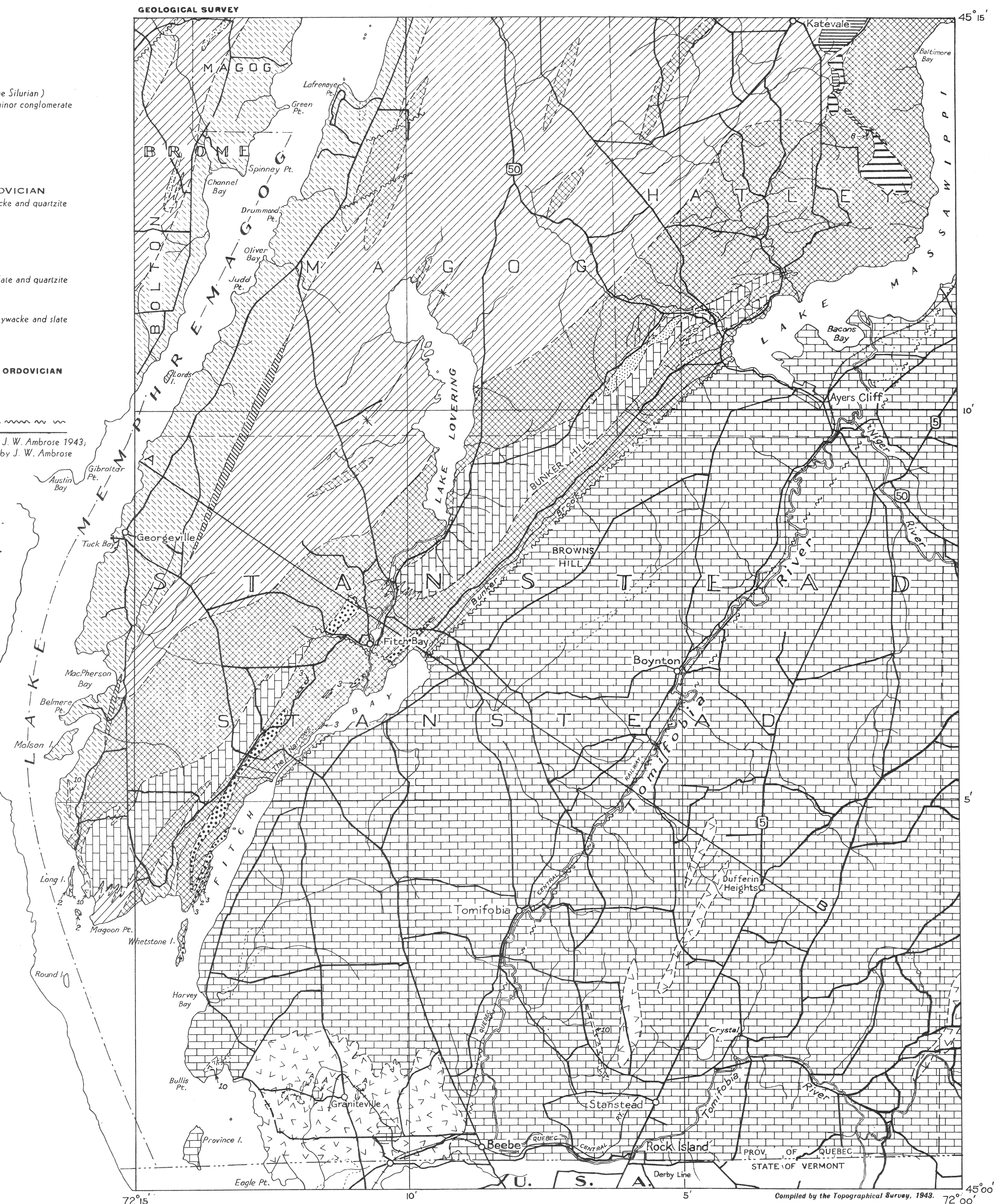
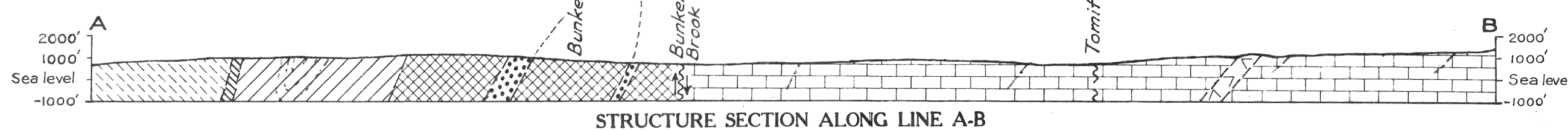


LEGEND



Geology by F. A. Kerr, 1923, and J. W. Ambrose 1943;
Geological compilation and notes by J. W. Ambrose

County Boundary
Township Boundary
Road
Marsh



DESCRIPTIVE NOTES

The southeast half of the map-area is occupied by a series of slates, limy slates, and limestones (A). No fossils have been found in these rocks, but southeast across the strike the limy strata become interbedded with and finally give way to graphitic slates lithologically identical with slates west of Lake Memphremagog that contain Middle Ordovician graptolites. These graptolite-bearing slates grade downwards into an interbedded series of slates, greywackes, and quartzites, in which the latter two types finally predominate. A similar downward transition was observed between the graphitic slates in the southeast corner of the Stanstead area and strata farther southeast, beyond the map-area. Again, the youngest rocks exposed in the middle of a syncline that crosses Lovering Lake are graphitic Middle Ordovician slates associated with limy slates and limestones. That is to say, the youngest Ordovician rocks exposed in this part of the area are very similar lithologically to the strata in the southeast corner of the map-area. Thus the graphitic slates of the series (A) are, on the basis of lithologic similarity and stratigraphic succession, of Middle Ordovician age, and the conformably overlying limy members of the series are of the same or later age. They much resemble Devonian rocks exposed along the shores of Lake Memphremagog, but that they are not correlative with them is indicated by the fact that the Devonian strata characteristically carry poorly preserved fossils, whereas series (A) is non-fossiliferous. Again, Ellis (Geol. Surv., Canada, Ann. Rept. 1886, pt. J, p. 12) reports that Silurian fossils were found at North Halley in beds overlying this series, and although the writer was unable to discover the fossil-bearing outcrop, the report seems to confirm the cumulative evidence that the series (A) is, in part at least, Middle Ordovician, though the upper part may include Upper Ordovician strata.

The northwest half of the map-area is underlain by quartzites (1), greywackes (2), volcanic rocks (3), and slates (4), of Ordovician age, with, possibly, some Cambrian beds at the base. This series is overlain with marked unconformity by shales and limestones of Silurian and Devonian age. The quartzites (1) lie at or near the base of the series as exposed. They are best exposed along the crest of Bunker Hill ridge, from Massawippi Lake to Lake Memphremagog, and pass gradually, and by interfingering, both along and across the strike into impure quartzites, greywackes, and graphitic slates. Greywackes (2), with some quartzite and slate, underlie a belt about 2 miles wide that extends from Magoon Point to the north end of Massawippi Lake. They appear as well in more or less isolated lenses through the slates. The volcanic rocks (3), including pillowed lavas, amygdaloidal flows, and breccias, are altered to greenstones. The flows outline a narrow anticline northeast of Fitch Bay. A few thin beds of quartz-sericite schist, probably derived from rhyolite flows, are scattered throughout the group, but none is large enough to be shown on the map. Graphitic slates (4) overlie greywackes on the southeast and are truncated against Silurian and Devonian rocks on the northwest. A northeast-striking synclinal axis crosses Lovering Lake; the slates along the axis are less metamorphosed than those farther away, and in addition contain beds of limestone. Their structural position places them as the youngest exposed rocks of the series.

Silurian shales (5) are known in only two outcrops, one near MacPherson Bay and the other northeast of Georgeville. Fossils collected from these two localities, though poorly preserved, suggest a Middle or Upper, rather than Lower Silurian age. More Silurian rocks may be present along the base of the Devonian sections in both the Lake Memphremagog and the Sargents Bay synclines of the adjoining Mansonville map-area, but the layer cannot be more than 200 or 300 feet thick. The presence of these two Silurian outcrops, lithologically identical with, and adjacent to, rocks of Devonian age may explain the apparent contradiction that arose as a result of persistent reports of the discovery of both Silurian and Devonian fossils from the same localities.

Lower (?) and Middle (?) Devonian shales and limestones (6) occupy a narrow belt along the shores of Lake Memphremagog, where they form a syncline with vertical or west-dipping limbs. The base of the Devonian section west of the lake is marked by a thin but persistent bed of conglomerate; east of the lake such a basal conglomerate bed is known only on the lakeshore near Magoon Point.

The unconformable nature of the contact between the Ordovician rocks (1-4) and the Silurian and Devonian shales and limestones (5 and 6) is demonstrated by the relatively unmetamorphosed character of the younger rocks, by the comparatively undeformed shales and limestones of the younger series, and by the truncation of contacts and structures in the older rocks against Silurian and Devonian beds.

Gabbro (7) forms one dyke 2 miles long and three small dykes west of the west end of Massawippi Lake. The rock of the larger dyke is quite massive, but in the smaller bodies it is mostly changed to chlorite schist. The rock is probably related in age and origin to the volcanic flows (3).

Small masses and dykes of serpentine (8) and quartz diorite (9) are intruded into the greatly contorted and folded slates and greywackes that occupy the elbow of Massawippi Lake. Age relations were not determined in this area, but in the Orford area to the west similar quartz diorites have been shown to be younger than the serpentine. Quartz veins with a little pyrite are common through the quartz diorite.

Granite (10), probably post-Middle Devonian, forms a stock about 3 miles in diameter at Graniteville, and several large dykes north and east of Stanstead. Two small acidic dykes cutting Devonian strata east of Lake Memphremagog are probably related to this granite. At Graniteville the granite has been quarried for building and monumental stone for about 150 years. The area, according to Burton (Que. Bur. Mines, Ann. Rept. 1931, pt. E, pp. 20-21) "has long been the largest and most important producer of granite in Canada".

Alkaline lamprophyre dykes, presumably related to the Montegregian suite, cut all other rocks in the region. They are notably fresh and unshared.

The formations of the map-area are divided by a northeast-striking fault of large vertical displacement. The fault was traced from Fitch Bay along Bunker Brook to Massawippi Lake. It extends northeast beyond the map-area along the valleys of Massawippi and St. Francis Rivers, to and beyond Ascot Corners. Throughout this length its course follows a marked depression along the foot of Bunker Hill ridge. The ridge, a fault-line scarp, emphasizes the direction of vertical displacement, for the lowermost Ordovician or Cambrian rocks on the northwest side of the fault are brought into contact with the uppermost members of the limy series, namely, upper Middle or Upper Ordovician rocks. Northwest of the fault, across a width of about a mile, the rocks are highly schistose, sharply folded, and locally intensely contorted. A west-dipping secondary cleavage is well developed in these sheared rocks, and study of it and of the associated crenulae suggests that rocks northwest of the fault may have moved upwards and somewhat to the northeast relative to those southeast of the fault. The dip of the secondary cleavage may indicate the dip of the fault, that is, steeply northwest.

A second fault of similar strike is marked by the linear depression that forms the valley of Tomifobia River. Rocks exposed along this valley are highly sheared; the shear-planes dip, in general, steeply northwest.

A southwestward-plunging anticline is outlined near Fitch Bay by pillowed lavas which permit determination of stratigraphic tops. Both limbs of the fold dip steeply west. The northeast extension of the anticlinal axis is not known, but the thick quartzite member exposed along Bunker Hill ridge may occupy the middle of the fold there.

The rocks within the elbow of Massawippi Lake are tremendously sheared and contorted. The exceptional deformation is one result of an abrupt change in strike of the bedding, a change reflected by the form of the lake.

Cross-faults displace a section of the Devonian-Ordovician contact north of Lovering Lake. Another, near the village of Fitch Bay, cuts the anticlinal axis; along it rocks on the north side moved upwards relative to those on the south.

Mining operations in this map-area are limited to granite quarrying near Graniteville. The host rocks in which occur the copper-pyrite, or lead-zinc-silver deposits known at Sufield, Eustis, Aldermac-Moulton Hill, etc., extend to within about 2 miles of the northeast corner of the map-area, but do not appear in any quantity within it. The country from Katevale east, southeast, and south to Massawippi Lake, may be worth prospecting. Quartz diorite, accompanied by some hydrothermal action, intrudes folded and sheared rocks and near it along Hermit Creek, range VI, lot 14, the occurrence of placer gold has been reported by McGerrigle (Que. Bur. Mines, Ann. Rept. 1935, pt. E, p. 23). Hermit Creek flows into the west side of Massawippi Lake just south of the head of Baltimore Bay.