# GEOLOGY OF THE KING GEORGE IV MAP AREA, (12A/4), NEWFOUNDLAND

by

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## INTRODUCTION

The King George IV map area in southwest Newfoundland was mapped at a 1:50,000 scale during the 1980 field season. The newly constructed Burgeo highway runs approximately north-south through the centre of the area; however, access to most of the area is by aircraft. A number of large ponds and lakes scattered over the area provide easy access by float plane. Victoria River is easily navigable by canoe from Peter Strides Pond to approximately 3 km above Victoria Lake.

The area was mapped previously by Riley (1957) at a 1:253,440 scale. DeGrace (1973) mapped the area in the vicinity of King George IV Lake. Smyth (1979) produced a 1:50,000 scale compilation of the geology of the area based on his reconnaissance mapping and data from the Buchans Mining Company. Hudson Bay Oil and Gas Company carried out reconnaissance geological mapping in the area in 1979.

The rocks in the King George IV map area can be readily divided into five groups; namely, (1) gneiss and amphibolite, (2) ophiolite, (3) metasediments and migmatite, (4) volcanic and sedimentary rocks, and (5) gabbroic to granitic intrusions. These are briefly described below.

## DESCRIPTION OF ROCK UNITS

### Unit 1 - Cormacks Lake Complex

The name Cormacks Lake Complex was informally used by Herd and Dunning (1979) for an assemblage of granite, paragneiss and amphibolite in the southwestern part of the Puddle Pond map area (12A/5). A similar assemblage of rocks occupies the northwestern part of the King George IV map area, immediately to the south of 12A/5, and is also referred to the Cormacks Lake Complex. These rocks are bounded to the south and east by younger intrusions.

The Cormacks Lake Complex in this map area consists of biotite gneiss, quartzite, amphibolite, minor mica schist and calc-silicate rocks (Subunit 1a) and a foliated granite (Subunit 1b). The gneiss is pale gray and exhibits a thin (1 to 5 mm wide) banding produced by alternating biotite-rich and quartzofeldspathic layers. Garnet is common in places. Locally, the gneiss is rusty weathering, probably due to the presence of magnetite and pyrite. The quartzite is medium grained, pale gray and generally massive. The amphibolite is medium grained, greenish gray and in places contains a 2-5 mm thick layering produced by dark amphibole-rich layers and whitish to reddish quartzofeldspathic layers. Locally, the amphibole crystals (probably gedrite) range up to 4 cm in length. The foliated granite (Subunit 1b) outcrops adjacent to the western margin of the map area. It is reddish, medium grained and cut by thin (<1 m in width) diabase dikes that have been deformed with the granite.

Evidence of polyphase deformation is common in Unit 1. For example, in outcrops of the foliated granite, a north-northwest trending foliation has been transposed to a northeasterly one. In the gneisses, Type 1 and Type 3 interference patterns are common and the northwest trending banding, foliation and earlier folds have been folded around northeast trending fold axes. The second folds are generally tight to isoclinal and have a northeast striking axial planar foliation. This foliation

is in turn openly folded around northwest trending, steeply plunging fold axes.

No radiometric dates are available from the Cormacks Lake Complex. Herd and Dunning (1979) have suggested a Grenvillian age for the complex.

## Unit 2 - Ophiolite

Unit 2 is exposed in a number of fault bounded blocks bordering the southeast side of King George IV Lake. It consists of gabbro and sheeted dikes (Subunit 2a) and basaltic pillow lava (Subunit 2b) and represents the upper part of an ophiolite. It is probably a part of the Annieopsquotch ophiolite complex (Dunning and Herd, 1980) from which it is now separated by faulting and younger rocks but, unlike the Annieopsquotch ophiolite complex, which faces southeast, Unit 2 faces west.

Subunit 2a makes up approximately 50 percent of the unit and is composed of diabase dikes and fine to medium grained, equigranular to locally feldsparphyric gabbro. The diabase dikes vary from isolated to sheeted, fine to medium grained, and aphyric to feldsparphyric. They have chilled margins and an average thickness of 0.5 m (in places up to 10 m). They trend north to northwest and dip moderately to steeply eastwards. Epidote veining is common. Much of the medium grained gabbro between the fine grained dikes probably represents parts of large dikes that range up to 10 m in thickness.

Subunit 2b is composed of basaltic pillow lava and minor pillow breccia. The pillow lava is fine grained, green, rarely vesicular and varies from aphyric to feldsparphyric. In places, it is highly epidotized. The individual pillow structures range from perfectly rounded to bun and toe shaped and measure 15 cm to 1.5 m across. The smaller pillows are generally more rounded than the larger ones. Most of the pillows have a thin selvage and are generally closely packed with little interpillow material which, where present, is red and rarely green chert or aquagene tuff. Thin beds (1-2 cm, some up to 30 cm thick) of mafic tuff were found associated with the pillow lava in places. In a few outcrops, the pillow lava has been intruded by diabase dikes.

For the most part, Unit 2 appears to be undeformed. However, in places, it is cut by northwest trending 2-5 cm wide shear zones, which are intensified in fault zones.

Unit 2 is considered to be part of the oceanic basement on which the Middle Ordovician Victoria Lake Group (Unit 4) was deposited.

## Unit 3 - Sedimentary rocks, metasediments and migmatite

Unit 3 occupies much of the southwestern and the central parts of the King George IV map area. It has been divided into four subunits (3a, 3b, 3c and 3d) on the basis of rock type. Subunit 3a, north of Peter Strides Pond, is bordered to the north by the Rogerson Lake Conglomerate (Unit 5), but the contact relationships are not known; it is intruded by Subunit 9c in the extreme southeast corner of the map area. Thinly bedded (<3 cm in width) gray, green and black argillite, slate and mudstone with thin interbeds and lenses of sandstone, locally tuffaceous, constitute Subunit 3a. The bedding has a northeasterly strike and steep dips. South of Victoria River, the metamorphic grade increases with the development of chlorite schists and garnet-biotite schists. These have been designated as Subunit 3b. Subunit 3b has been intruded by granitic rocks of Unit 6.

Subunit 3c occurs in the southwestern part of the map area, where it is separated from Unit 7 to the north by a major fault. In the south, it grades into migmatite of Subunit 3d. A linear, northeast trending granitic intrusion (Unit 6) has divided Subunit 3c into two

LEGEND

DEVONIAN AND YOUNGER

11 *Medium to coarse grained, massive, hornblende, biotite gabbro*

10 *Medium grained, weakly foliated, biotite granite*

9 *Massive to locally foliated granite, diorite and minor gabbro:* 9a, *Fine to medium grained diorite and minor gabbro;* 9b, *equigranular to megacrystic (K-feldspar), hornblende-biotite granite;* 9c, *megacrystic (K-feldspar), biotite granite with minor, equigranular, biotite and "two-mica" granites (locally garnetiferous)*

8 *Gabbro, diorite, monzogabbro, monzodiorite and minor granitic rocks*

DEVONIAN AND OLDER

7 *Conglomerate and volcanics:* 7a, *Purple to gray, pebble to boulder conglomerate with intercalated sandstone, argillite, and minor limestone;* 7b, *green mafic volcanics;* 7c, *red, flow-banded rhyolite, breccia, feldspar porphyry, and tuff; red crossbedded sandstone, siltstone and minor conglomerate*

6 *Granite and granodiorite:* 6a, *Reddish, medium grained, foliated biotite granite;* 6b, *gray, medium grained, foliated granodiorite*

5 ROGERSON LAKE CONGLOMERATE: *Gray to purple polymictic conglomerate and minor sandstone*

ORDOVICIAN AND OLDER

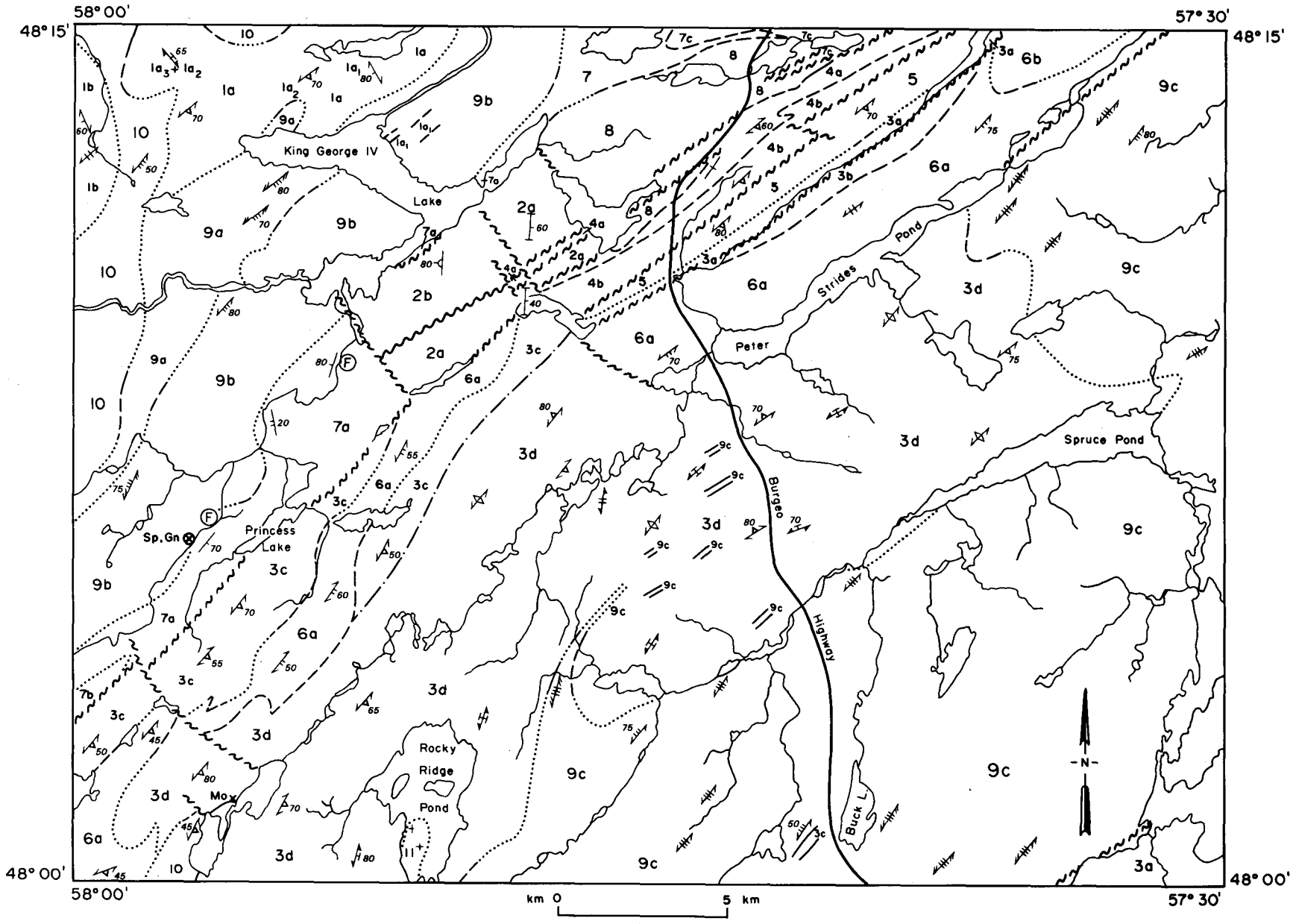
4 VICTORIA LAKE GROUP: 4a, *Mafic to intermediate pillow lava, breccia, agglomerate, and tuff;* 4b, *intermediate to silicic tuff, breccia, minor quartz (feldspar) crystal tuff, and unseparated graywacke and shale*

3 *Sedimentary and metasedimentary rocks and migmatites:* 3a, *Slate, argillite, graywacke, and minor mafic and felsic tuff;* 3b, *mica schist, chlorite schist, semipelitic schist, and minor mafic and felsic tuff;* 3c, *quartzite, mica schist, semipelitic gneiss, metasediments, and minor amphibolite;* 3d, *migmatite, granodiorite, and unseparated granitic sheets*

2 *Sheeted dikes, gabbro and pillow lava:* 2a, *Sheeted dikes and fine to medium grained gabbro;* 2b, *mafic pillow lava and breccia*

1 CORMACKS LAKE COMPLEX: $1a_1$, *Medium grained, pale gray quartzite;* ($1a_2$), *medium to coarse grained, gray amphibolite;* ($1a_3$), *coarse grained mica schist and gneiss;* 1b, *medium grained, reddish, foliated grainte*

*Mylonite foliation related to $S_3$ (inclined, vertical)* . . . . . 


58° 00'
57° 30'
48° 15'
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King George IV Lake
Princess Lake
Sp. Gn
Mo
Rocky Ridge Pond
Strides Pond
Peter
Spruce Pond
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separate belts. Semipelitic metasediments, gneiss and mica schist are the predominant rock types in Subunit 3c. It also contains minor quartzite, amphibolite and calc-silicate rocks. The metasediments are medium grained, pale gray and either massive or contain a weak foliation and banding. The gneiss shows a millimetric banding produced by quartz-rich layers and micaceous layers. The biotite schists are coarse grained and commonly contain garnet and staurolite.

Subunit 3d, consisting of pale gray, medium to coarse grained, crudely to moderately banded (2 to 20 mm wide) migmatite, occupies much of the southern part of Unit 3 and is well exposed along the Burgeo highway. Intercalated with the migmatite are 0.5 m to a few tens of metres wide granodiorite and granitic sheets. The migmatite has a granodioritic to tonalitic mineralogy and locally grades into massive-looking granodiorite sheets. In places, angular to lensoid blocks of amphibolite and psammitic rocks occur within the migmatite and are considered to represent parts of premigmatitic terrain.

The most common structures in Unit 3 are the northeast striking, moderately to steeply dipping banding and foliation. The foliation is axial planar to tight to isoclinal minor folds of the banding in the gneisses and the migmatites. It also overprints the granodioritic and most of the granitic sheets that are intercalated with the migmatite and becomes mylonitic in places. This foliation seems to predate a set of west-northwest to northwest trending open folds, kink bands and minor shear zones.

Unit 3 can be correlated both in rock type and regional stratigraphy with the metasedimentary-migmatite terrains in the southern part of Noel Paul's Brook, Lake Ambrose and Victoria Lake map areas (Kean, 1977; Kean and Jayasinghe, 1980) and the Granite Lake area (Dickson, this volume). The unit is pre-Devonian since deformed metasedimentary clasts that are most likely to have been derived from the unit occur in Lower Devonian conglomerates (Unit 7) in the area.

## Unit 4 - Victoria Lake Group

Unit 4 is a narrow (< 2.5 km in width) northeast trending band of volcanic rocks and minor sedimentary rocks in the northern part of the map area. It is a southwesterly extension of the Middle Ordovician and older (?) Victoria Lake Group (Kean, 1977) in central Newfoundland. Unit 4 is faulted against the Rogerson Lake Conglomerate (Unit 5) to the south. A fault contact with Unit 2 and an intrusive contact with Unit 8 define its northern limit. Parts of the unit are well exposed along the Burgeo highway.

Unit 4 can be divided into two subunits (4a and 4b) on rock type. Subunit 4a consists mainly of dark green to apple green, fine grained mafic pillow lava. The pillows are generally round and less than 0.5 m in diameter with selvages varying from 0.5 to 1 cm in thickness. The pillows generally display a low degree of vesicularity. Interpillow material is rare and, where present, is aquagene tuff. Minor intercalated units of bedded mafic tuff are found in places. The pillow lava is overlain to the north by fine grained mafic tuff and intercalated mafic and felsic tuff. The individual tuff beds are generally less than 2 cm in thickness and are locally intercalated with rare beds of red argillite. Locally, felsic volcanics containing quartz "eyes" are present and are probably crystal tuffs. Gray chert, similar to that associated with the Annieopsquotch ophiolite complex (Dunning, personal communication, 1980), occurs in the extreme northeast of the subunit. The proportion of mafic to felsic tuffs varies from outcrop to outcrop but, overall, the mafic rocks predominate over the felsic. In places, fault slivers of red sandstone, conglomerate and massive, mafic lava (Unit 7) occur within the unit.

Subunit 4b consists of intermediate to felsic tuff, lapilli tuff, breccia and sericite schist derived from them. These range in color from green to buff and white. The tuffs are generally aphanitic to fine grained and are mostly quartz-feldspar crystal tuffs and crystal-lithic tuffs. The lapilli tuff and breccia contain angular to subrounded clasts of white weathering, green to gray chert, dacite and rhyolite, minor mafic volcanic and rare red chert. The clasts range from a few millimetres to 30 cm in size and are set in a fine to medium grained tuffaceous sandstone matrix composed of quartz, feldspar and lithic fragments. These rocks grade into the fine grained tuffs and are interbedded in places with green and gray-black argillite and slate. Locally, mafic volcanics and quartz-eye rhyolite occur interbedded with the above rocks. Unit 4 is intruded by undeformed gabbro and diabase.

The unit is variably deformed; in places the rocks are highly foliated whereas in other places they are massive. The foliation strikes northeasterly and dips steeply.

## Unit 5 - Rogerson Lake Conglomerate

Unit 5 is a southwesterly extension of the Rogerson Lake Conglomerate in central Newfoundland (Kean and Jayasinghe, 1980). It consists mainly of grayish to purplish, polymictic conglomerate. Intercalated with the conglomerate are up to 1 m thick beds and lenses of sandstone. The clasts in the conglomerate are mostly subrounded to rounded and consist of mafic and felsic volcanics, red and gray chert and sandstone, gray siltstone, black argillite and shale, and minor granite and porphyry. The matrix is gray to red sandstone which is arkosic in places.

Unit 5 contains a strong northeast trending fabric which is in part related to faulting. Clasts become flattened and attenuated to the south as a major fault is approached.

## Unit 6 - Granite and granodiorite

Unit 6 consists of two linear intrusive bodies that have been emplaced into Unit 3. The westerly of the two extends from the southwestern corner of the map area to the center of the area and consists of red medium grained granite (Subunit 6a). The other occurs north of Peter Strides Pond and consists of red medium grained granite (6a) and pale gray, medium grained granodiorite (6b). Subunit 6b is interpreted to be a phase of 6a.

Unit 6 postdates the banding in the country rocks because apophyses of the granites truncate the gneissic banding in Unit 3. Large (up to 3 cm long) cordierite crystals occur in pelitic rocks adjacent to the westerly intrusion and are believed to be related to the granite emplacement. Unit 6 contains a strong foliation, defined by quartz and mica. The foliation strikes in a northeasterly direction and is generally mylonitic. Unit 6 was intruded postmylonitization by subunit 9c.

## Unit 7 - Conglomerate, sandstone and volcanic rocks

Unit 7 occupies a 1 to 2.5 km wide belt that extends from the southwestern part of the map area to northeast of King George IV Lake. It has been divided into three subunits, 7a, 7b and 7c. Subunit 7a consists of gray, locally red, granule to boulder conglomerate and minor interbedded sandstone. The conglomerate is clast supported, unsorted and unstratified. Grading is common. The clasts are subangular to rounded and consist of red and gray chert, massive and foliated granite, gabbro, mafic volcanics, flow banded rhyolite, quartz-feldspar porphyry, felsic tuff, vein quartz, black argillite, rare paragneiss with folded banding, and a reddish brown weathering rock that could be ultramafic. The sandstone interbeds vary from a few centimetres to 1 m in width and commonly show cross-bedding. The contacts between

the sandstone beds and the overlying conglomerate beds show scour and fill features. In places, up to 1 m thick, black argillite beds were found in the unit. These contain plant fossils, located on a brook southwest of King George IV Lake, that have been tentatively dated as Lower Devonian (W.B. Forbes, personal communication, 1980).

Subunit 7b consists of dark green, mafic volcanics. They show weakly developed pillow structures, are highly vesicular and are locally rich in pyrite. Subunit 7c is composed mainly of red, minor black, flow banded rhyolite, rhyolite breccia, and vitric tuff and lesser sandstone, conglomerate and siltstone. The rhyolite is commonly feldsparphyric and contains calcite-filled vugs. The breccia contains angular to rounded clasts of rhyolite, felsic tuff and minor gabbro and sandstone, set in a matrix that varies from red siltstone to rhyolite and vitric tuff. The clasts range from 0.5 to 30 cm. Red sandstone beds up to 0.75 m thick showing cross-bedding, ripple marks and mud cracks overlie the felsic volcanics. Conglomerate beds ranging up to 15 cm in thickness and thinner beds of siltstone occur interbedded with the sandstone.

Unit 7 is openly folded (locally overturned) without an associated penetrative fabric; however, the sandstone and argillite beds contain a northeast trending, steeply dipping cleavage, spatially associated with faults.

### Unit 8 - Gabbro and diorite

Unit 8 has been emplaced into the Victoria Lake Group and Unit 7 in the northern part of the map area. It is in assumed fault contact with the ophiolitic rocks (Unit 2) in the west. The unit is composed of medium grained, locally feldsparphyric, gabbro, diorite, quartz diorite, monzodiorite, monzogabbro, minor granitic differentiates, and granite. The monzodiorite is distinctive because of its red mottled appearance imparted by K-feldspar crystals. Diabase dikes intrude these rocks. No penetrative tectonic fabric was seen in the unit but, locally, it has been sheared along minor faults.

### Unit 9 - Granite and minor hornblende gabbro and diorite

Unit 9 occupies the whole of the southeastern part and much of the northeastern and the northwestern parts of the area. It comprises a variety of rock types including hornblende gabbro and diorite, K-feldspar megacrystic biotite (± hornblende) granite and biotite (± muscovite) granite. Subunit 9a is a gray, medium grained, variably deformed, hornblende gabbro and diorite that is gradational into gray, equigranular to K-feldspar megacrystic, hornblende-biotite granite (9b) in the western part of the area. Subunit 9c is a K-feldspar megacrystic, locally equigranular, biotite granite intruded by garnetiferous, two-mica leucogranites. All of the above rocks were intruded posttectonically by undeformed, fine grained, white and pink granite and aplite dikes, and tourmaline bearing pegmatites.

Unit 9 is variably deformed. It is cut by a steeply dipping, northeast striking, mylonitic foliation in the vicinity of some of the major shear zones in the area (*e.g.* near Peter Strides Pond and Buck Lake). The mylonitic fabric is defined by elongate quartz grains and biotite flakes and is wrapped around deformed feldspar crystals. Sheets of Unit 9 intrude the migmatites (Unit 3) and have been folded with the development of an axial planar fabric. Apart from these areas, Unit 9 appears to be undeformed.

### Unit 10 - Granite

Unit 10 comprises two intrusive bodies close to the western margin of the map area. The larger of the two has intruded Units 1 and 9. The other has been emplaced into Units 3 and 6. Unit

10 consists of medium grained, red, mafic-poor granite. The main mafic mineral is biotite, however, in one outcrop, adjacent to the southern margin of the map area, orthopyroxene crystals with amphibole rims occur. Muscovite was seen in places. Except for a weak northeast trending L>S fabric defined by quartz and mica seen in a few outcrops, Unit 10 appears to be massive.

### Unit 11 - Biotite-hornblende gabbro

Unit 11 is a small body of unfoliated, medium to coarse grained, biotite-hornblende gabbro exposed on a few islands and along the shore in the southern part of Rocky Ridge Pond.

## ECONOMIC GEOLOGY

The most significant mineralization in the area is associated with the Victoria Lake Group and the granitic rocks of Units 9 and 10. Except for minor pyrite and magnetite showings, no economic mineralization was found in the other units, although the ophiolitic rocks of Unit 2 have a potential for Cyprus-type massive sulphides.

In the Victoria Lake Group, disseminated pyrite and minor chalcopyrite and sphalerite occur associated with the felsic volcanic rocks.

Float of altered green granite, similar to the marginal phase of Subunit 9b, containing galena, sphalerite, pyrite and gold associated with quartz veins occurs southwest of Princess Lake*. Float of Unit 10 containing disseminated molybdenite occurs west of Rocky Ridge Pond.

* Assays: 5% Zn, 1.5% Pb, 42 ppm Cu, 25 ppm Au (average of 5 assays), 8 ppm Ag.

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