NAIN - NUTAK

ELEVATIONS IN FEET

GEOLOGICAL SURVEY BRANCH
DEPARTMENT OF MINES AND ENERGY
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

(Joins Hebron-Cape Territok 14 N.W.)

Transverse Mercator Projection

MAP 90-44

LEGEND

RED BEDS

MIDDLE PROTEROZOIC (OR YOUNGER ?)

Siamarneklh Formation: *red and cream conglomerate and sandstone (in part, in unconformable contact with the Umiakovik Lake batholith, and in part, in thrust fault contact with it)*

DIABASE DYKES

MIDDLE PROTEROZOIC (AND YOUNGER?)

Diabase dykes, including olivine gabbro equivalent to the Harp dykes, and undivided dykes of unknown age and affinity

LATE ARCHEAN – EARLY PROTEROZOIC

Diabase dykes, comprising more than one generation (includes the Nutak dykes). Some dykes in the Nain Province are rotated parallel to the Nain – Churchill (Rae) boundary, adjacent to this tectonic junction, and display an Early Proterozoic foliation and metamorphic overprint up to amphibolite facies. (Some of the dykes of this unit are Middle Proterozoic in age, but have not been separately designated because of the lack of regionally consistent field data and geochronology)

ANOROGENIC PLUTONIC ROCKS

MIDDLE PROTEROZOIC

NAIN PLUTONIC SUITE

Granitic members: *Predominantly hornblende ± biotite ± fayalite ± clinopyroxene ± fluorite-bearing granite and quartz monzonite, but also includes monzonite, syenite, monzodiorite and quartz monzodiorite*

- UK = Umiakovik Lake batholith: *dated by U – Pb zircon at ca. 1320 Ma*
- MK = Makhavinekh Lake pluton: *characterized by ovoidal, plagioclase-mantled potassium feldspar megacrysts; dated by U – Pb zircon at 1322 ± 1 Ma*
- MT = Mistastin Lake batholith: *characterized by ovoidal, plagioclase-mantled potassium feldspar megacrysts*
- VB-N = Voisey Bay – Notakwanon batholith: *includes extensive quartz-feldspar porphyry (p)*
- SH = Sheet Hill pluton
- IV = Ivliksuak pluton: *dated by U – Pb zircon at ca. 1290 Ma*
- AL = Alagalai pluton
- UM = Umiakoviarusek Lake pluton
- TS = Tessiarsuyungoakh pluton
- M = Manvers granite: *stockworks of medium grained to pegmatoidal granite within the Kiglapait layered intrusion; contains topaz, beryl, fluorite and amazonite*

Iron-rich gabbroic – dioritic members: *Predominantly iron-rich gabbroic and dioritic rocks and related compositions, including ferrogabbro, ferrodiorite, monzogabbro, monzodiorite, monzonite; locally olivine-bearing and layered; may contain scattered ovoidal feldspar megacrysts; may exhibit co-mingling and mixing relationships with adjacent granitoid rocks*

- CL = Cabot Lake sheet: *includes a thin quartz-feldspar porphyry at its base and several composite (feeder ?) dykes*
- GN = Goodnews complex: *includes a substantial hybrid component of diorite and quartz monzonite; dated by U – Pb zircon at 1305 ± 10 Ma*
- FI = Fox Inlet intrusion
- AK = Akpaume intrusion: *includes a late-stage hybrid component of ferromonzodioritic composition*
- DI = Dog Island intrusion
- TG = Tigalak intrusion: *tr = transgressive zone of diorite and granodiorite having local accumulations of dioritic pillows*
- WH = Wyatt Harbour intrusion
- WR = West Red Island intrusion
- S = Satorsoakulluk dyke

Troctolitic members: *Predominantly troctolitic, melatroctolitic, leuctroctolitic and olivine-bearing gabbroic layered intrusions*

- KG = Kiglapait intrusion: *a trough-like well-layered mafic intrusion varying from early-formed troctolite to late-stage ferrosyenite. Sm – Nd isochron age is 1305 ± 22 Ma. Zones shown are, border zone (b) – olivine gabbro; lower zone (l) – troctolite; upper zone (u) – olivine gabbro to ferrosyenite; upper border zone (ub) – troctolite to olivine gabbro, transgressive anorthosite and gabbro (t), and ferrodiorite/ferrosyenite (fr)*
- HT = Hettasch intrusion: *an asymmetrical basin-like layered mafic intrusion of dominantly leucotroctolitic composition. Zones shown are, lower zone (l) – leucotroctolite and anorthosite; and upper zone (u) – leucogabbronorite; the lower zone is locally characterized by radiating clusters of plagioclase ('snowflake' texture)*
- BI = Barth Island intrusion: *polyphase layered intrusion ranging in composition from troctolite to quartz monzonite*
- NW = Newark Island intrusion: *a polyphase layered intrusion dominated by troctolite and hybrid cumulate troctolite – monzonite; contains several troughs (tr) of granite-hosted gabbroic pillows, and zones of silicic (granitic) cumulates (sc). U – Pb zircon age is 1305 ± 5 Ma*
- BD = The Bridges intrusion: *layered gabbro, olivine gabbro, troctolite and anorthosite; layered rocks exhibit widespread indications of recrystallization (may not be related to the Nain Plutonic Suite)*
- NI = Nukasorsuktokh Island intrusion: *diffusely-layered troctolite and olivine gabbro*
- RB = Reid Brook intrusion: *well-layered troctolite, melatroctolite and massive leucotroctolite*
- J = Jonathon intrusion: *leucotroctolite, olivine leuconorite, leuconorite; locally characterized by 'snowflake' texture*

Anorthositic members: *Predominantly medium- to coarse-grained norite, leuconorite and anorthosite; some gabbroic and troctolitic variants; locally contain iridescent plagioclase (labradorite)*

- SBS = Susie Brook slab: *leuconorite characterized by steeply-dipping layering exhibiting deformational structures; contains coarse orthopyroxene exhibiting lamellae and blebs of exsolved plagioclase*
- BLM = Bird Lake massif: *anorthosite and leuconorite, locally containing very coarse orthopyroxene having plagioclase exsolution lamellae; moderately-dipping layering*
- LM = Lister massif: *coarse to very coarse, pale-grey to white anorthosite and leuconorite, diffusely layered*
- SL = Slambang leuconorite: *leuconorite and olivine leuconorite*
- PMR = Port Manvers Run anorthosite: *layered anorthosite, leuconorite and leucotroctolite, locally well-laminated plagioclase*
- TL = Tunungayualuk Island leuconorite: *massive to layered leuconorite; includes a megabreccia zone gradational into adjacent anorthosite*
- NR = North Ridge gabbro: *gabbro and olivine gabbro; exhibits recrystallization textures and a local lineation (may not be related to Nain Plutonic Suite)*
- PI = Paul Island intrusion: *layered to massive anorthosite, leuconorite and leucotroctolite*
- NK = Needles Knoll anorthosite: *massive to foliated leuconorite and anorthosite*

LATE – TO POSTTECTONIC PLUTONIC ROCKS

EARLY PROTEROZOIC

Pink to white, aplitic to medium-grained granite, locally weakly foliated; late-tectonic intrusions in the Churchill (Rae) Province (one intrusion yields ca. 1760 Ma (U – Pb zircon method))

Medium- to coarse-grained, grey, locally fluorite-bearing biotite granite and granodiorite; posttectonic intrusions in the Nain Province (Saddle Island intrusion yields ca. 1770 Ma (U – Pb zircon method); Wheeler Mountain granite may be older)

VARIABLY DEFORMED SUPRACRUSTAL ROCKS

EARLY PROTEROZOIC

MUGFORD GROUP: *massive and pillowed basalt, volcanic breccia, mafic and ultramafic sills, associated with lesser sandstone, conglomerate, chert and argillite (rests with marked unconformity on Archean gneisses of the Nain Province)*

FALLS BROOK GROUP: *contact metamorphosed (by Kiglapait intrusion) banded silicate iron formation, calc-silicate rocks and basic flows and sills (in disconformable contact with Snyder Group)*

SNYDER GROUP: *contact metamorphosed (by Kiglapait intrusion) quartz arenite, arkose, pelite, quartz-pebble conglomerate, Fe – Mg rich siltstone, marble, calcareous quartzite, rusty graphitic schist; includes a variety of undivided pre- and post-metamorphic minor intrusions; (unconformity with Archean basement locally preserved)*

RAMAH GROUP: *generally moderately- to steeply-dipping, massive to strongly-foliated, polydeformed quartzite, conglomerate, pelitic (muscovite – biotite) schist and amphibolite (metagabbro); (unconformity with variably refoliated Archean basement locally preserved)*

GNEISSIC ROCKS OF THE ARCHEAN AND PROTEROZOIC OROGENS

EARLY PROTEROZOIC AND ARCHEAN (CHURCHILL (RAE) PROVINCE)

Aplitic to pegmatoidal leucogranite gneiss having biotite-rich schlieren; characterized by zones of anomalous radioactivity

White, garnetiferous granitic gneiss, may be metasedimentary in part

Foliated to gneissic gabbronorritic to monzonoritic rock; varies from mildly deformed having relict igneous structure to intensely foliated; locally characterized by porphyritic texture (where least deformed) and augen structure (where strongly deformed). May be equivalent to the ca. 2300 Ma Pallatin intrusive suite of the George River area to the west, in Quebec.

Mafic gneiss, derived from gabbro, ultramafic – gabbroic – leucogabbroic layered mafic intrusions, and from rocks of presumed volcanogenic origin

Metasedimentary gneiss largely derived from pelitic to semipelitic rocks, but having belts dominated by metaquartzite (q), marble (m) and calcareous meta-arkose (cm)

Quartz – feldspar – biotite – garnet ± sillimanite gneiss and related anatexite (Tasiuyak gneiss)

Metamorphosed and migmatized 'snow-ball'-textured gabbro, leucogabbro and anorthosite; cross-cut by metamorphosed basic dykes in vicinity of Long Pond

Quartzofeldspathic gneiss and migmatite derived largely from tonalitic to granitic intrusive rocks; varies from massive to weakly foliated meta-igneous rocks to well-layered gneisses. Includes metaplutonic rocks of several generations, some of which are Archean in age but structurally and metamorphically overprinted during the Early Proterozoic; cross-cut by metamorphosed basic dykes in the Long Pond – Kogaluk River area. (Members of this unit within Tasiuyak gneiss are predominantly lineated enderbitic and charnockitic rocks; one of these has been dated by U – Pb zircon at 1909 $^{+20}_{-21}$ Ma)

Gneisses of the Archean – Proterozoic boundary zone, interpreted to be Nain Province rocks having an intense Early Proterozoic structural and metamorphic overprint

ARCHEAN (NAIN PROVINCE)

Metamorphosed and variably migmatized gabbro, leucogabbro and anorthosite; minor ultramafic rocks

Mafic gneiss derived from volcanic, volcanogenic and intrusive rocks (includes members of the Upernavik and Nulliak supracrustals)

Metasedimentary gneiss derived from pelitic, semipelitic, carbonate, and quartzitic rocks (includes members of the Upernavik and Nulliak supracrustals)

Quartzofeldspathic gneiss and migmatite derived largely from tonalitic to granitic intrusive rocks (includes the Early Archean Ukak gneiss and its migmatized equivalents and a varied array of Late Archean orthogneisses)

(Joins Indian House 24 S.E.)

(Joins Naskaupi 13 N.W.)

Kilometres 10 0 20 40 60 80 100 Kilometres
Nautical Miles 5 0 10 20 30 40 50 Nautical Miles
Statute Miles 5 0 10 20 30 40 50 60 Statute Miles

SCALE 1:500,000

ELEVATIONS IN FEET

NAIN - NUTAK

N.T.S. No. 14 S.W.

Base Map, 6th Edition 1974

Produced by the Surveys and Mapping Branch, Department of Energy, Mines and Resources.
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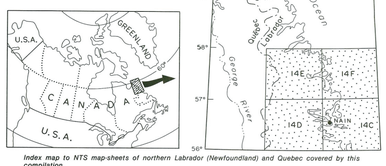
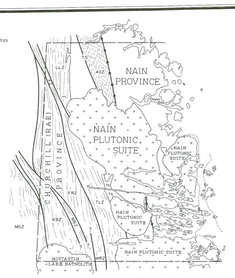
The boundary between Quebec and Newfoundland in this area is the crest of the watershed of the rivers flowing into the Atlantic Ocean. to date of publication it has not been surveyed nor monumented



Index map to NTS map-sheets of northern Labrador (Newfoundland) and Quebec covered by this compilation.

PRELIMINARY GEOLOGICAL MAP OF THE NAIN PLUTONIC SUITE AND SURROUNDING ROCKS (NAIN – NUTAK, NTS 14 S.W.)

Copies of this map may be obtained from the Publications and Information Section, Geological Survey Branch, Department of Mines and Energy, P.O. Box 8700, St. John's, Newfoundland, A1B 4J6.



Generalized trends based on regional aeromagnetic patterns.

TECTONIC FRAMEWORK

Subdivisions in Churchill (Rae) Province, based on the interpretation of aeromagnetic patterns in conjunction with geological mapping, are as follows:

- TG = Tasiuyak gneiss
- LLZ = Lac Lomier Zone (Complex)
- TLZ = Tasiuyak Lake Zone
- FRZ = Fraser River Zone
- KBZ = Konrad Brook Zone (Complex)
- MDZ = Mistinibi – Dihourse Zone
- FZ = Falcoz (mylonite) Zone
- MBZ = 'Moonbase' (mylonite) Zone
- MRZ = Mistastin River (mylonite) Zone
- ASZ = Abloviak Shear Zone

NOTES

1. *This map was produced from colour separations generated by computerized scanning of an original hand-coloured overlay sheet, combined with a separate composite overlay of the drainage, geological data and other black-line art-work.*
2. *This compilation represents the efforts of a group of individuals. The compiler's final choice of contacts between some units is based on a combination of criteria, and may not necessarily coincide with unit boundaries from any one source of data. These criteria include degree of detail in source, the change in interpretation and/or unit assignments based on the most recent work, and extrapolations based on aeromagnetic patterns in the lesser known regions.*
3. *The legend lists only the predominant rock-types in each of the units shown.*
4. *Listing of units in some parts of legend does not necessarily correspond to stratigraphic order.*
5. *The map-area transects the junction between the Archean Nain Province and the Early Proterozoic Churchill (Rae) Province; the latter comprises significant amounts of reworked Archean crust. The junction is best displayed northward from Umiakovik Lake as a zone of strongly retrolisted Archean gneiss associated with infolded Early Proterozoic Ramah Group rocks, and several prominent zones of black ultramylonite.*
6. *Archean metamorphic grade in the Nain Province varies from upper amphibolite to granulite facies. An Early Proterozoic overprint has been superimposed upon the Archean assemblages, increasing in intensity from greenschist to amphibolite facies between the coast and the junction between the Nain and Churchill (Rae) provinces.*
7. *Metamorphism within the Churchill (Rae) Province varies between upper amphibolite and granulite facies.*
8. *The Mistastin River mylonite and the Falcoz mylonite zones are characterized by the presence of numerous pink granitic sheets of presumed syntectonic development, and metamorphic fabrics developed at amphibolite facies. The 'Moonbase' mylonite zone was developed at granulite facies.*
9. *The map area includes all the type examples of, and is the type area for, the Nain Plutonic Suite.*
10. *The Middle Proterozoic plutons of the Nain Plutonic Suite are surrounded by pyroxene hornfels thermal aureoles up to 1.5 km in width. The aureoles are well displayed by the transformation of garnet and sillimanite in Tasiuyak gneiss to cordierite + hypersthene and cordierite + hercynite, respectively. Osumilite occurs in some parts of aureoles adjacent to the anorthositic members of the suite.*
11. *Subdivisions of the Precambrian time scale encompass the age ranges recommended by A.R. Palmer (1983; Geology, Volume 11, pages 503, 504).*

DATA SOURCES

Major sources of data used for lithological subdivisions:

1. *E.P. Wheeler II, 1926-1974. Manuscript maps on file with the Wheeler Collection archives at the Department of Geology and Geography, University of Massachusetts, Amherst, Massachusetts and with the Geological Survey Branch, Department of Mines and Energy, St. John's, Newfoundland; scale 1:63,360. (Mainly the plutonic rocks and adjacent gneisses).*
2. *S.A. Morse, (Editor), 1971-1981. Maps and reports in the Nain Anorthosite Project Field Reports, Department of Geology and Geography, University of Massachusetts, Amherst, Massachusetts, Contributions 9, 11, 13, 17, 26, 29, 38 and 40. (Mainly the coastal plutonic rocks and the Snyder Group – Falls Brook Group supracrustal rocks).*
3. *F.C. Taylor, 1979. Geological maps of NTS 14C (Nain), 14D (Tasiusuak Lake) and 14E/F (North River – Nutak), Geological Survey of Canada, Maps 1437A, 1438A and 1436A; scale 1:250,000. (Mainly the gneisses of central Churchill (Rae) Province, and plutonic rocks south of Voisey Bay).*
4. *B. Ryan, 1985-1987. Field work by Geological Survey Branch, Department of Mines and Energy, St. John's, between Voisey Bay and the Quebec border, south of latitude 56°30'.*
5. *I. Ermanovics, 1987-1989. Field work by the Geological Survey of Canada, Ottawa, north of latitude 57°30'.*
6. *R.F. Emslie, 1987 and 1989. Field work by the Geological Survey of Canada, Ottawa, on the northern margin of Umiakovik Lake batholith and adjacent rocks.*
7. *M. Bélanger, 1983. Région du Lac Brisson, Ministère de l'Energie et des Ressources, Québec, DP. 84-20. (Gneisses and plutonic rocks west of the Quebec – Newfoundland border in Lac Mistinibi area.)*

Additional data sources:

1. *DePaolo, D.J., 1985: Isotopic studies of processes in mafic magma chambers: I. The Kiglapait intrusion, Labrador. Journal of Petrology, Volume 26, pages 925-51.*
2. *Krogh, T.E. and Davis, G.L., 1972: The significance of inherited zircons on the age and origin of igneous rocks – an investigation of the Labrador adamellites. Carnegie Institution of Washington, Yearbook, 72, pages 610-613.*
3. *Krogh, T.E. and Heaman, L.M., 1989: Report on U – Pb Nauits for the 1988/89 Labrador geochronology contract. Report on file with Newfoundland Department of Mines and Energy, St. John's.*
4. *Morse, S.A., 1969: The Kiglapait Layered Intrusion. Geological Society of America, Memoir 112, 204 pages.*
5. *Simmons, K.R. and Simmons, E.C., 1987: Petrogenetic implications of Pb- and Sr-isotopic compositions for rocks from the Nain Anorthosite Complex, Labrador. Geological Society of America, Abstracts with Programs, Phoenix, Arizona, page 845.*
6. *Simmons, K.R., Wiebe, R.A., Snyder, G.A. and Simmons, E.C., 1986: U – Pb zircon age for the Newark Island layered intrusion, Nain Anorthosite Complex, Labrador. Geological Society of America, Abstracts with Programs, San Antonio, Texas, page 751.*
7. *Smyth, W.R., 1976: Geology of the Mugford Group, northern Labrador. Department of Mines and Energy, Report of Activities 1975, Report 76-1, pages 72-79.*
8. *Watson, D.M., 1980: Preliminary report on labradorite occurrences near Nain, Labrador. Department of Mines and Energy, St. John's, Open File Lab. 234, 10 pages.*
9. *Wiebe, R.A., 1988: Structural and magmatic evolution of a magma chamber: The Newark Island layered intrusion, Nain, Labrador. Journal of Petrology, Volume 29, pages 383-411.*
10. *Wiebe, R.A. and Wild, T., 1983: Fractional crystallization and magma mixing in the Tigalak layered intrusion, the Nain Anorthosite Complex, Labrador. Contributions to Mineralogy and Petrology, Volume 84, pages 327-344.*

SYMBOLS

Geological Boundary
- *defined*
- *approximate*
- *extrapolated*
- *with a high degree of uncertainty* ... ?

Fault
- *defined or approximate*
- *extrapolated*

Aeromagnetic trends

Gneissic layering/foliation
- *inclined* 60
- *vertical*
- *dip unknown*

Igneous layering/foliation
- *inclined* 40
- *vertical*

Labradorite occurrence

Mylonitic zones

Compilation by Bruce Ryan, 1989. Published, 1990.

Suggested citation: *Ryan, B. (compiler), 1990, Preliminary geological map of the Nain Plutonic Suite and surrounding rocks (Nain – Nutak, NTS 14 S.W.), scale 1:500,000. Geological Survey Branch, Department of Mines and Energy, St. John's, Newfoundland, Map 90-44.*

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