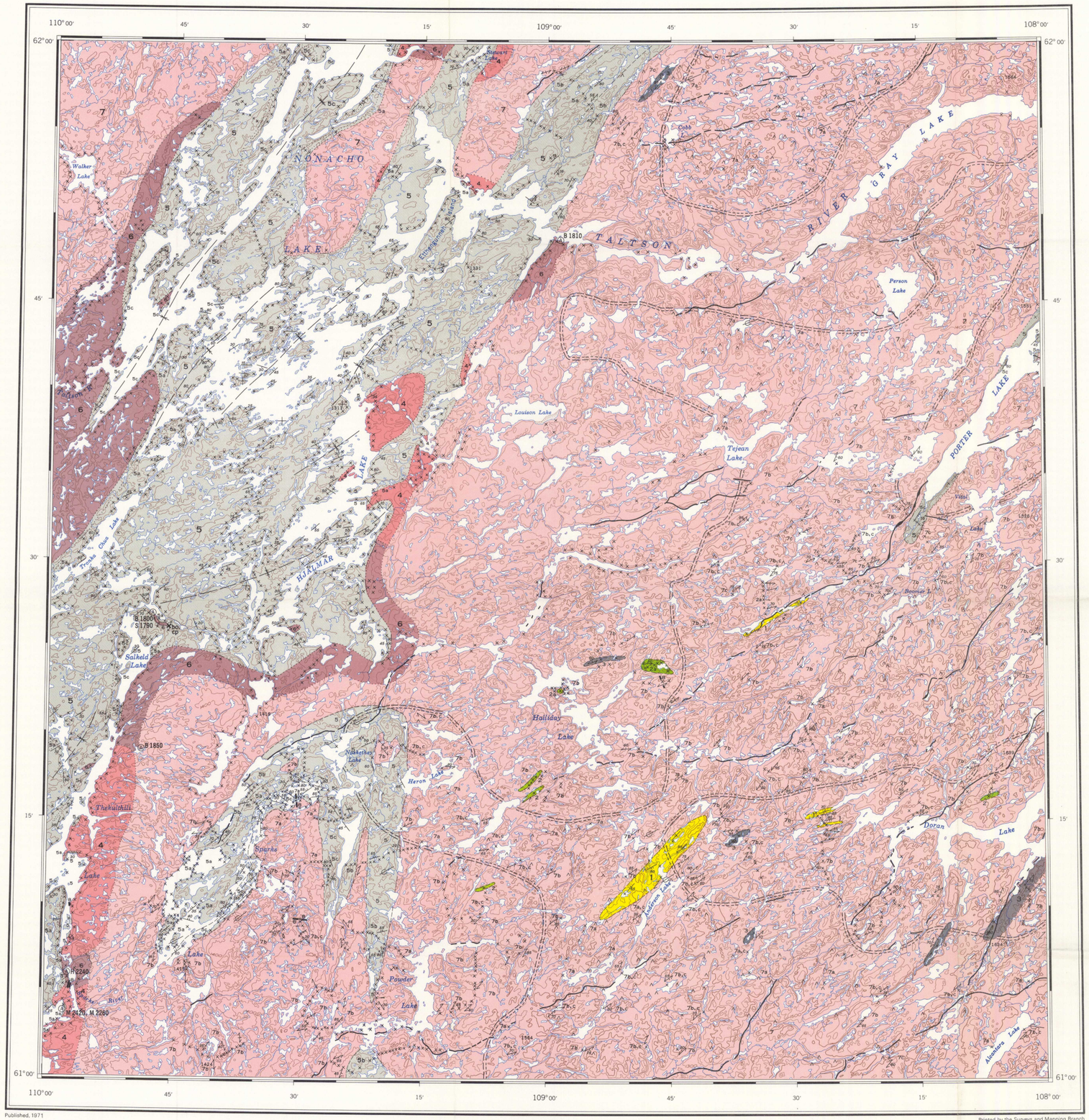
GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES



LEGEND

PROTEROZOIC

- 8 — *Diabase and basalt*
- 7 — *Granite, granodiorite and allied rocks; 7a, massive; 7b, gneissic; 7c, inclusions and thin bands of metasedimentary rocks and amphibolite (1, 2, and 3) common (probably at least in part older than unit 5)*
- 6 — *Granite, granodiorite and allied rocks*
- NONACHO GROUP
- 5 — *Conglomerate, arkose, quartzite, greywacke, and slate; 5a, chiefly conglomerate; 5b, chiefly arkose; 5c, chiefly quartzite and greywacke*

ARCHAEAN

- 4 — *Granite, granodiorite and allied rocks*
- 3 — *Biotite-feldspar-quartz paragneiss, biotite-quartz paragneiss, hornblende-feldspar-quartz paragneiss, hornblende-biotite-feldspar-quartz paragneiss; includes minor granitic rocks, lit-par-lit gneiss and migmatite; rare mica schist and sillimanite gneiss*
- 2 — *Amphibolite, hornblende-plagioclase gneiss; 2a, gabbro, diorite; 2b, pyroxenite*
- 1 — *Quartzite and greywacke, commonly feldspathized*

Rock outcrop (observed from ground, observed from air)
Geological boundary (defined, approximate, assumed)
Limit of area surveyed with aircraft
Bedding, tops known (horizontal, inclined, overturned)
Bedding, tops unknown (inclined, vertical)
Gneissosity, schistosity (inclined, vertical, dip unknown)
Syncline (approximate)
Fault (assumed)
Glacial striae
Esker
Isotopic age, K-Ar method, millions of years (B-biotite, H-hornblende, M-muscovite, S-sericite) — Ⓐ B 1810
Mineral occurrence (bo: bornite; cp: chalcopyrite) — cp×

Geology by J.F. Henderson, 1936, F.C. Taylor, 1958

Geology compiled by F.C. Taylor

Geological cartography by the Geological Survey of Canada

Base-map at the same scale published by the Surveys and Mapping Branch in 1962

Copies of the topographical edition of this map may be obtained from the Map Distribution Office, Department of Energy, Mines and Resources, Ottawa

Magnetic declination 1970 varies from 25°21′ easterly at centre of east edge to 27°32′ easterly at centre of west edge. Mean annual change -5.1′

Elevations in feet above mean sea-level

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada.

Published, 1971
Copies of this map may be obtained from the Geological Survey of Canada Ottawa

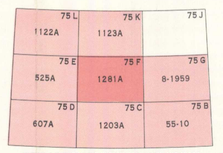
Printed by the Surveys and Mapping Branch

MAP 1281A
GEOLOGY
NONACHO LAKE
DISTRICT OF MACKENZIE

Scale 1:250,000

Miles 4 0 4 8 12 Miles
Kilometres 6 0 6 12 18 Kilometres

INDEX MAP



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

DESCRIPTIVE NOTES

The centre of the map-area is about 135 miles north of Uranium City, Saskatchewan, the closest aircraft base and 180 miles east-southeast of Yellowknife, Northwest Territories. Large lakes such as Nonacho, Hjalmar, Sparks, Porter and Doran Lakes and the Taltson River provide ready access by water to many parts of the area but much of the centre and the south are only easily reached by aircraft as lakes and rivers are small, making travel by water arduous. The land surface is free of snow about the end of May; the break-up of the large lakes occurs in mid-June and that of the small lakes slightly earlier.

The northeast half of the map-area was mapped by Henderson and the southeast by Taylor. A light aircraft was used to examine much of the southeastern part that was not readily accessible by water. Traverse lines were flown at two mile intervals and spot landings for ground observations were made along these lines.

The land surface is chiefly gently rolling with scattered steep-sided hills of bedrock. Local relief is about 300 feet. The area is lightly forested with black spruce, tamarack, jack pine and white birch; there are many open treeless areas.

During the Pleistocene an ice-sheet, moving west-southwest, covered the entire map-area and left glacial striae, friction cracks and ice polish on some outcrops. Drift, morainal deposits, eskers and outwash cover much of the eastern part of the map-area but in the west surficial deposits are relatively scarce and outcrop is abundant.

All bedrock is Precambrian and the map-area lies entirely within the Churchill structural province. Except for the Nonacho Group and dyke rocks most rocks are gneissic and contacts are chiefly gradational. Composition is variable in the gneissic rocks both along and across strike.

Probably the oldest rocks are quartzite and greywacke (1), amphibolite and hornblende-plagioclase gneiss (2) and paragneiss (3), that occur as narrow bands within the granitic rocks. The quartzite and greywacke are grey to dark grey, the former rarely white or pink, fine- to medium-grained and show no primary structures other than bedding. Almost all are feldspathized so that contacts with granitic rocks (4 and 7) are gradational.

Amphibolite and hornblende-plagioclase gneiss (2) form rare thin bands, less than 500 feet wide for the most part, in the granitic rocks. In most places these are too small to map and occur as elongate xenoliths. They are probably derived from mafic volcanic rocks or sills that pre-date the granitic rocks. These rocks are grey-green, fine grained, devoid of structure except for a weak gneissosity, and are composed primarily of hornblende and plagioclase with locally developed biotite. Small plutons of gabbro and diorite (2a) are present near Halliday Lake. These are highly contaminated with granitic rocks and are poorly defined. They are dark grey-green to light grey-green, fine- to coarse-grained rocks, locally showing hornblende grains up to ½ inch long, with a granular, ophitic, or schistose texture.

Two small outcrops of dark greenish grey medium-grained pyroxenite (2b) are present near Powder Lake. Veins and irregular patches of quartz and feldspar occur throughout the pyroxenite suggesting that it pre-dates the granite.

A group of mainly grey gneissic rocks probably derived from sedimentary strata and considered to be paragneiss (3) are characterized by abundant biotite and hornblende or rare sillimanite. Quartz and feldspar are commonly the dominant minerals with the proportion of feldspar to quartz covering a wide range but with quartz the commoner. Locally the ferromagnesian minerals are dominant. These paragneisses are weakly to strongly foliated and in places show mineral banding. Within them the presence of a few relatively unmetamorphosed bands of quartzite and greywacke support a sedimentary origin for these rocks. Much of the paragneiss is feldspathized and gradation into granitic rocks is common. *Lit-par-lit* gneiss and migmatite are included with this rock unit and these are especially common near the contacts with granitic rocks.

The age of units 1, 2, and 3 is not known. Burwash and Baadsgaard[1] determined the age of hornblende from a small hornblende-plagioclase gneiss (2) body near Sparks River, to be 2,240 m.y. They interpreted this as a relict date and suggested that the time of the hornblende crystallization was probably 2,500 to 2,600 million years ago, that is during the Archaean. Whether all the rocks of map-units 1, 2, and 3 are the product of Archaean sedimentation or crystallization is not known; probably all have been affected at least in part by the Hudsonian orogeny.

The granitic rocks are assigned to three units: those older than the Nonacho Group (4), those younger (6), and those whose age relative to the Nonacho Group is unknown (7). Henderson[2] mapped a nonconformity between the Nonacho Group and granitic rocks in several places but chiefly along the east shore of Thekulthili Lake. Characteristically an angular conglomerate, formed of blocks of granite up to 3 feet in diameter in an arkosic matrix, forms the base of the Nonacho Group. This conglomerate, from 1 foot to 6 feet thick, is overlain by quartzite. The contact between the two is abrupt. Beyond the map-area conglomerate truncates pegmatite dykes in the granite[3]. The existence of a pre-Nonacho granite is indicated by the presence of numerous granitic boulders in the Nonacho conglomerate. Two of these have been dated by Burwash and Baadsgaard[1] at 2,260 and 2,420 m.y. These ages they interpret as relict dates and consider that the granite of the boulders crystallized during the Archaean.

Elsewhere the Nonacho-granite contact shows the granite to be the younger rock (Henderson[2]). Evidence for a post-Nonacho granite consists of metamorphism of argillaceous sedimentary rocks to phyllites and micaceous schists, and the presence of veins of quartz and apophyses of pegmatitic granite cutting the sedimentary rocks.

Field work in the southwestern part of the map-area by McGlynn[4] showed the oldest rocks to be granitic gneiss, migmatite and massive granitic rocks that form the basement rocks of the Nonacho sediments. Nowhere did McGlynn find any granite post-dating the Nonacho Group. In any case, all granitic rocks in the area are lithologically similar and the present classification into pre- and post-Nonacho Group can only be used where the two are in contact. Hence most of the granitic rocks mapped (map-unit 7) are not assigned an age relative to the Nonacho Group

A few age determinations of micas in gneissic granitic rocks range from 1,790 to 1,850 m.y. showing those sampled to be products of or affected by the Hudsonian orogeny. The granitic rocks (4, 6, 7) range in composition from granite to granodiorite, although locally, syenitic or dioritic facies are present. Quartz content ranges from 15 to 30 per cent and either or both biotite and hornblende are present. They are light grey to pink, rarely red, medium- to coarse-grained, with textures ranging from massive to gneissic; some have porphyritic and augen textures. Narrow bands and patches of older rocks (1, 2, 3) are commonly present particularly in the southeast part of the area. Small, irregular pegmatites and aplites occur sparsely.

The Nonacho Group (5) is composed of conglomerate, arkose, quartzite, greywacke and slate. Each rock type commonly grades into the others, although in places, contacts between rock types are abrupt.

The conglomerate consists of subangular to well-rounded cobbles and pebbles or rarely boulders up to 1 foot in diameter, of both massive and gneissic granitic rocks, quartzite, maroon slate and vein quartz. The quartzite fragments are fine to medium grained, grey, buff or less commonly red to purple weathering. The matrix is medium to coarse grained, pale red, or rarely grey to green arkose or feldspathic quartzite. Although the conglomerate is commonly massive, numerous beds and lenses of sandy arkose ranging in thickness from a few inches to several feet are present throughout.

The slate is massive to poorly bedded, greyish red or less commonly dark grey, and most commonly occurs as interbeds in arkose and quartzite. These interbeds are from 6 inches to 6 feet thick. In some places they contain mud cracks and in others show intraformational breccias on the top surface where shale fragments reach 2 feet in greatest dimension. In the Sparks Lake area shale beds are locally 100 feet thick.

The arkose is medium to coarse grained, chiefly angular to subangular, primarily massive but locally well-bedded, crossbedded and ripple-marked. This pale red to greyish red rock commonly contains scattered pebbles of white vein quartz and lenses and thin beds of pebble-conglomerate and slate. Superficially massive arkose may have the appearance of granite but widely scattered quartz or slate pebbles reveal its sedimentary origin.

The greywacke and quartzite are fine to medium grained, grey to dark grey rocks. Much of the greywacke is massive but some shows bedding or locally a gneissic structure. Bedding in the quartzite averages 2 to 3 feet in thickness and ranges up to 7 feet. Ripple-marks and cross-bedding occur locally. Like the arkose the quartzite and greywacke contain lenses of conglomerate, but these are rare and small.

Dark grey basic dykes, chiefly showing a diabasic texture and ranging from diorite to gabbro in composition, are the youngest rocks (8). Near Thekulthili Lake the dykes are fairly numerous and several more than 100 feet thick are present. North of Nonacho Lake they are scarce and small and in the eastern half of the map-area none are known.

The regional structural trend throughout the map-area is to the northeast, although local variations are common. Whereas most of the structural history is beyond the scope of the mapping within the Nonacho Group (5) some structural elements are recognizable. Much of the Nonacho Group lies in open, gently plunging folds but in some places, such as the northwestern part of Nonacho Lake, folding is more severe and beds are in part overturned.

Except for two assumed faults near the south end of Sparks Lake, no faults were mapped but many lineaments, particularly in the southwest part of the area, may be fault zones.

No deposits of minerals in sufficient quantities for economic exploitation have as yet been discovered in the map-area. A few occurrences of base metal sulphides have been located in or associated both with rocks of the Nonacho Group and with granite (6). The principal showing, the F.D. group, lies southeast of a southeasterly protruding bay of Salkeld Lake. Work on this group, which has been described by Baragar[5], has involved mapping, trenching, diamond drilling and geophysical surveys. Sulphide minerals, predominantly bornite and chalcopyrite, occur in silicified meta-arkose, granite, and hornblendic and biotitic rocks. Lesser amounts of sphalerite and galena are also present.

[1] Burwash, R.A., and Baadsgaard, H.: Yellowknife-Nonacho age and structural relations in the Tectonics of the Canadian Shield; Roy. Soc. Can., Spec. Publ. No. 4, pp. 22-29. (1962)
[2] Henderson, J.F.: Nonacho Lake, District of Mackenzie, Northwest Territories; Geol. Surv. Can., Map 526A. (1939)
[3] Henderson, J.F.: Nonacho Lake area, Northwest Territories; Geol. Surv. Can., Paper 37-2. (1937)
[4] McGlynn, J.C.: Report of Activities, May to October, 1965; Geol. Surv. Can., Paper 66-1, pp. 32-3 pp. 32-33. (1966)
[5] Baragar, W.R.A.: Mineral Industry of District of Mackenzie and part of District of Keewatin, 1961; Geol. Surv. Can., Paper 62-1. (1962)

MAP 1281A
NONACHO LAKE
DISTRICT OF MACKENZIE

N.W.T. Nonacho Lake
1:250,000
Map 1281A

1281A