CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

PAPER 54-20

TESLIN MAP-AREA, YUKON TERRITORY

(Map and Preliminary Account)

By

Robert Mulligan

OTTAWA
1955

Price, 50 cents

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TESLIN MAP-AREA, YUKON TERRITORY

PHYSICAL FEATURES

Teslin map-area lies in that physiographic division of the Cordillera known as the Yukon Plateau. The area is one of subdued, generally rounded mountains merging with broadly rolling upland interstream areas and divided into north-northwesterly trending ranges by the main river valleys. Continental ice-sheets probably covered the whole area during the Pleistocene. In the northeastern part, stoss-and-lee features indicate a generally westward ice movement. Alpine glaciation has modified the higher upland surfaces, especially in the range east of Teslin Lake and Teslin River where biscuit-board topography, with cirques opening to the northeast, is prominently displayed. Drift covers most of the area. Fluvioglacial and alluvial deposits floor the larger stream valleys almost completely and remnants of similar deposits occur high on the upland surfaces. Much of these upland surfaces and slopes leading to them are soil covered and exposures of bedrock commonly consist of frost-heaved felsenmeer and talus.

The country is well wooded up to a sharply defined timberline at 4,500 feet elevation. The valleys, for the most part, and some mountain passes and even upland areas may be travelled by horses, but muskeg and swampy ground are common obstacles. Teslin Lake and Teslin River, Nisutlin River, and (at some risk) the south-flowing part of Wolf River are navigable by small boats but riffles and bars make the rivers difficult in places to ascend under power at low water.

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GENERAL GEOLOGY

Only three map-units, 2, 5, and 8, are dated on palaeontological grounds. The remaining groups are arranged with these in what seems the most plausible sequence from a regional viewpoint. The local evidence, apparently at variance in places, is neither conclusive nor consistent enough to establish age relationships. On the other hand, lithological correlation of some questionably dated groups with those of adjacent areas is uncertain, and the implied age relationships must be regarded as tentative.

The geology of the northwestern part of the map-area is in part adapted from Lees' map (5)[1] including practically all the area north of Swift River and the vicinity of Sidney Creek.

[1] Numbers in parentheses are those of references listed on page 1.

Unit 1

Unit 1 comprises a variety of rocks of sedimentary and presumed volcanic origin, whose metamorphosed condition in general distinguishes them from those of other units. In this respect the unit corresponds to the Yukon group of adjacent areas, but, except as noted below, age data in this area are lacking. Furthermore, the grade of metamorphism is variable, and in some places the component rocks are not distinguishable with certainty on this basis from similar lithological types belonging to other units. The structure is generally highly complex, and stratigraphic subdivision is not feasible. In some places subdivision according to predominant lithological types is possible, and this has been attempted on the map.

The most abundant rock types are quartzite, quartz-muscovite and quartz-biotite schist, and gneiss: they are mainly light to dark grey in colour, occasionally in shades of brown or purple.

Dark grey or brown to black argillaceous quartzite, slate, and graphitic schist predominate in a few places. Green, generally schistose, quartz, chlorite, biotite, and epidote rocks and amphibolite occupy substantial areas; these, and albite-rich gneiss and albite-epidote-amphibolite, are believed to be largely of volcanic origin. The limestone is white or light grey in colour and moderately recrystallized. Some is interbedded with or closely associated with greenstone, but some is not. Gneisses composed of quartz, plagioclase, biotite, amphibole, epidote, and garnet, in varying proportion, underlie appreciable areas east of Deadman Creek.

Biotitic green schists assigned to Unit 1 appear in a few places to underlie fossiliferous limestone of Unit 2 conformably, and to be confined largely to the area west of this limestone. Where Unit 2 is apparently absent, Unit 1 may underlie Unit 3 unconformably (See under Unit 3). This presumed unconformity apparently postdates the deposition of Unit 2 limestone, and hence does not explain the contrast in degree of metamorphism between Unit 1 and succeeding units. In the western part of the belt of Unit 1 rocks is an area of argillaceous slate and quartzite of relatively low metamorphic grade interbedded with black and white limestone. A short distance north of this area float has been found containing fossil remnants of indefinite age. Along the western contact of the group some rocks cannot be distinguished with certainty from nearby rocks of Units 8 and 9, and may be of the same age.

Unit MD

Rocks of Unit MD outcrop in irregular bodies within that part of the area northeast of Teslin River occupied by Unit 1. The boundaries are gradational and the bodies as mapped include much Unit 1 material.

The type rocks vary widely in appearance and composition. Hornblende is a characteristic, and in amphibolitic varieties, the chief, constituent. It commonly occurs in blurred grains and bunches with subparallel orientation and contrasts with the light-coloured components to produce a gneissic texture. Elsewhere it occurs as well-formed prisms approaching 1/2 inch in length in random orientation in a finer grained light or greenish groundmass. The hornblende characteristically has a poeciloblastic or sieve-texture, enclosing quartz, feldspar, and other minerals. Quartz in partly recrystallized clastic grains is present in all but a few amphibolitic varieties, and makes up more than 50 per cent of some specimens. Feldspar is generally in minor amount or absent, but is a major constituent in some places, especially in the southernmost body in which a dioritic texture is best developed. Except in a few specimens in which potash feldspar is present it is glassy sodic plagioclase. The plagioclase rarely shows twinning but is commonly zoned, with included foreign material confined mainly to certain zones. This, like the sieve-texture of the hornblende, may indicate a secondary origin for these minerals. Biotite, chlorite, epidote, and clinozoisite occur in varying proportion, in some places to the exclusion of hornblende. Garnet is a minor, but not uncommon, constituent except in the southernmost body. Some specimens also have a little sphene.

At the north end of the southernmost body the rocks are largely hornblendite and possibly pyroxenite. Some of these are so serpentinized as to mask the original identity of some constituent minerals, possibly including enstatite. A sample of asbestos reported to be from this area proved by X-ray methods to be tremolite.

The rocks of Unit MD are believed to be in large part derived from those of Unit 1 but of a higher degree of metamorphism. However, some parts of the southernmost body, at least, may represent sheared and altered diorite of intrusive origin. Likewise, the northern bodies, not seen by the writer, may be in part or entirely intrusive. South of Sidney Creek rocks of the unit, though they grade imperceptibly into and include much material of Unit 1, occur in recognizable zones, substantially as mapped by Lees (5, map-unit No. 7). For these reasons his map-unit has, with minor changes, been retained.

The rocks resemble, in some respects, the amphibole-gneisses farther south mapped as Unit 1e. They are certainly older than the granitic intrusions to the east, and their condition may be the result of a distinctly earlier period of metamorphism or intrusion.

Unit 2

Unit 2 consists essentially of intermittent bands of fossiliferous limestone lying in a northwesterly trending belt between rocks of Unit 1 on the west and those of Unit 3 on the east. These bands consist in some places of 1,000 to 1,500 feet of relatively pure limestone, in others of thin sandy and cherty limestone beds with many interbeds of quartzite and phyllite. Thicknesses vary abruptly both along and across the strike and in places the bands appear to pinch out entirely. They may also be cut out by local unconformity (See under Unit 3). The several fossil collections suggest an appreciable time range within the middle Mississippian. The part mapped as 2A consists chiefly of contorted phyllite and quartzite lying in uncertain stratigraphic relationship to thin, lenticular, sandy, crinoidal limestone beds, or in places interbedded with them. It includes, along Thirty-Mile Creek, some arkosic grits like those of Unit 3.

Unit 3

Rocks typical of Unit 3 are dark argillaceous slates, quartzites, and phyllites, but chert, conglomerate, and arkose are locally abundant. Some fine-grained, greenish and mottled rocks of uncertain origin are also present and cannot be distinguished with certainty from green schists of Unit 1. Apparently non-fossiliferous cherty limestone (2 ?), outcropping in an anticline in several passes in Englishmans Range, may properly belong in Unit 3.

Rocks of Unit 3 lie mainly east of, and are separated in most places from those of Unit 1 by, fossiliferous limestone (Unit 2). They are characteristically less metamorphosed than rocks of Unit 1. For these reasons they are dated as Mississippian or later and are correlated with part of Lord's group B (6, p. 8).

At the base of Unit 3 black slate, quartzite, and chert overlie fossiliferous limestone of Unit 2 at most places with apparent conformity. However, at a point 10 miles south 73 degrees west from the outlet of Fish Lake, conglomerate (3b), consisting of greenstone cobbles with a few limestone blocks, appears to overlie the limestone. About 1 mile north of this point the rocks include peculiar greenstones (3c) with chert. About 3 miles southeast of it black slate overlies limestone (Unit 2) and is in turn overlain by a large mass of chert conglomerate and chert. South of Thirty-Mile Lake arkosic grits (3a) with some large fresh feldspar fragments appear to overlie the limestone. South of English Creek, chert, phyllite, quartzite, and a little conglomerate may lie directly on greenstone resembling the green schist of Unit 1. These occurrences suggest an erosional unconformity at or near the base of Unit 3, but its precise stratigraphic position is uncertain. Horizon markers above the base are lacking and the top is not recognized. A probable minimum thickness of 2,500 feet of strata of Unit 3 is exposed in Thirty-Mile Range.

East of a remarkably straight and sharply defined line that is presumed to mark a fault the rocks (3A) are chiefly highly silicified quartz-muscovite schists (quartz-biotite schist east of Thirty-Mile Lake), with some quartzite and argillaceous slate. Their age is unknown. Near the eastern boundary of the map-area conglomerate and limestone (3B) are associated with serpentine and diorite. The conglomerate contains granitic pebbles. These rocks are much less severely deformed than nearby rocks (3A), and are believed to be much younger, perhaps of Permian or later age.

Unit 4

Unit 4, confined to the southwestern part of the map-area, consists chiefly of argillaceous and quartzitic siltstone and sandstone with abundant intercalated greywacke, and chert. The rocks, though folded and dipping at all angles, are little altered and rarely schistose. The siltstones include shaly, black, argillaceous; massive, fine, dark, hard, cherty; and fine-banded, light and dark grey varieties. Cleavage at an angle to distinct bedding is nowhere developed. The sandstones are well-cemented, massive, hard, quartzitic types in light to dark grey, buff, green, or reddish colours. Graded bedding is uncommon and most of the sandstones contain argillite and chert fragments. Thus they merge in character with the greywackes. In many places irregular argillite fragments, reaching a size of several inches, make up most of the rock, giving it a conglomeratic aspect. Rocks classified as greywackes are distinguished from the sandstones by commonly being slightly coarser grained and possessing a greater variety of constituents. Many are green and most contain mineral and rock fragments that are probably of volcanic origin, and thus resemble tuffs. However, all contain more or less rounded clastic quartz grains, and some, limestone grains. They are chiefly if not entirely water-lain and are everywhere interbedded with rocks of obviously sedimentary origin. Chert occurs in various colours. Some is massive but most is banded, in beds 2 to 4 inches thick separated by thin, shaly, commonly greenish partings. Most of these are distorted and some shattered into pseudoconglomerate. Chert is widely distributed throughout the group and in some areas, marked 4a on the map, is predominant among the exposed rocks. Light to dark grey limestone occurs in a few isolated outcrops, chiefly with chert. Conglomeratic greywacke (4c) southwest of Squanga Lake contains, in addition to mud and chert fragments, rounded pebbles and cobbles of various rocks including granite.

Rocks of Unit 4 differ little from the common rocks of Unit 8 except in the abundance of chert. The chief point of difference from Unit 9 is the absence of the volcanic members typical of the latter unit. The age of Unit 4 is not firmly established. A fault separates it from Unit 5 on the west at the only place where an exposed contact was observed. West of Teslin Lake the field evidence (See under Unit 5) suggests that Unit 4 may be younger than Unit 5, but it is not conclusive. On the other hand, Gwillim (4, p. 17B) states that rocks (evidently corresponding to Unit 4) in Atlin map-area appear to be overlain by limestone that is correlative with Unit 5. In the same area Aitken (1) has also concluded that an assemblage of rocks, similar to Unit 4 in its abundance of banded chert, is overlain by limestone that is probably equivalent to Unit 5.

Unit 5

Unit 5, confined to the area west of Teslin Lake and south of the Alaska Highway, consists essentially of limestone, in three separate masses. Two of these carry fossils of probably Permian age but the age of the third remains in doubt.

The limestone mass forming the prominent mountains east and southwest of Little Atlin Lake extends into the contiguous Whitehorse, Bennett, and Atlin map-areas, where also it is widely exposed. This mass is, almost everywhere, uniformly light grey or white and massive, but in a few places it is dark grey or banded and has discernible bedding structures. A few thin lenses of dark cherty and reddish argillaceous rock outcrop in the mountains west of Lubbock River. Some slate, chert, and greenstone lie southeast of the serpentine body east of Mount White, and the exposed rocks northwest of the nearby diorite body consist of interbedded chert and limestone. Limestone exposed along the valley walls southwest and north of Squanga Lake is provisionally included in Unit 5. A single fusilinid collection from east of Little Atlin Lake corroborates the Permian age established in adjoining areas.

West of the southern part of Teslin Lake, a band of limestone 1,000 feet or more wide, carrying a similar fauna, enters the area from the south, and is correlative with the Teslin formation of Tuya-Teslin map-area (7). Nearby to the west a narrower band of similar limestone is intermittently exposed. The bands dip generally to the southwest but are bordered on both sides by common rocks of Unit 4. They disappear northward under drift-covered lowland, the last exposure being in a shallow canyon where the limestone appears to be overlain by flat-lying chert. Similar limestone forms an isolated exposure 4½ miles farther northwest.

These limestone outcrops may represent the core of a fold. If so, it is thought to be more probably an anticline. This would imply that Unit 5 underlies and is older than Unit 4, but the evidence is not at all conclusive.

Limestone (5?) forms a prominent low ridge about 13 miles northwest of Teslin, from which point it can be traced as a much-broken band for some 18 miles toward Squanga Lake. Banding in the limestone and bordering rocks dips mainly southwesterly but is highly erratic in places, and the strata may be overturned. The rocks lying immediately east of the limestone are in some places argillites and quartzites not unlike some members of Unit 4 to the west, but for the most part the area northeast of the limestone is underlain by the nondescript green altered volcanic (?) and cherty rocks characteristic of Unit 6. No fossils other than crinoid fragments have been found in this limestone band and, in view of the uncertain age of Unit 4, the possibility of an upper Triassic (Unit 7) age must be considered for this band.

Unit 6

Unit 6 comprises a variety of volcanic and nondescript rocks, with much chert and minor associated sedimentary rocks.

The commonest rock is dark grey or green in colour, very fine grained and massive, and quite without structures indicative of either volcanic or sedimentary origin. In a few places a vague ropy or fragmental appearance on brownish weathered surfaces and small-scale orbicular structures on greenish fresh surfaces suggest that the rocks were originally viscous, acidic to intermediate flows. Some fresh-looking rhyolitic rock, however, occurs near the western boundary, at about latitude 60 degrees 30 minutes. Many rocks of Unit 6 are thought to be pyroclastic or mixtures of pyroclastic and sedimentary rocks. In many places they are streaked with chert and grade imperceptibly into massive chert. Practically all are much altered; over wide areas they are partly recrystallized, dioritized, or serpentinized and contain numerous small to large diorite and peridotite, pyroxenite, and serpentine bodies. These types represent the group almost exclusively north of the Alaska Highway except where otherwise indicated on the map. They are also conspicuous west of Teslin Lake, from 5 to 16 miles south of its outlet, and occupy a small area south of Squanga Lake where they are in apparent fault contact with rocks of Unit 4.

Andesitic greenstones and minor associated sedimentary rocks (6a) border Teslin Lake and Teslin River on the west for some 24 miles. Much of the lava is massive and aphanitic but much is porphyritic with phenocrysts of altered hornblende, augite (?), and feldspar up to $\frac{1}{4}$ inch long. Breccia and agglomerate are fairly abundant and most of the intercalated fine clastic rocks are probably tuffaceous. Similar rocks also predominate west of lower Nisutlin River. The rocks (6b) forming the upper part of Streak Mountain, however, are chiefly dark, basic-looking, altered flows, diabasic in appearance, that are probably basaltic.

The structural and age relationships of these rocks to each other and to those of other groups are uncertain. Greenstone and chert typical of Unit 6 occur north of the Alaska Highway on the west boundary of the map-area between Permian limestone of Unit 5 and presumed Upper Triassic rocks of Unit 7. For this reason Unit 6 is tentatively considered to be Permo-Triassic in age.

Unit 7

Unit 7 is recognized only near the western boundary of the map-area where it consists of argillaceous sandstones with some black argillite and massive but discontinuous white limestone bands. The limestone bands may be locally as much as 500 feet thick and Unit 7 as a whole may total 2,000 or 3,000 feet. Unit 7 appears to overlie Unit 6 but the relationship is not certain. It extends into Whitehorse area, where it is more widely exposed and where fossils collected from the limestone (8, p. 5) are dated tentatively as Triassic.

Unit 8

Rocks of Unit 8 underlie much of the northwestern part of the map-area along both sides of Teslin River. Some rocks southeast of Streak Mountain have been tentatively included in this unit.

The unit consists of siltstones and sandstones, both more or less argillaceous, greywacke, conglomerate, a little black limestone, and some associated volcanic rocks. The siltstones and sandstones vary in colour from black to light grey or buff. Most are well bedded and many are finely banded. Some argillaceous varieties are fissile but secondary cleavage is rarely developed. The greywacke varies in colour from light grey or buff to brown, green, and black and is similar to that of Unit 4. Greywacke is interbedded with all the other rocks but is most abundant and massive where conglomerate and volcanic rocks occur. Limestone, in thin lenticular beds, is a minor constituent of Unit 8. Most of it is very dark, but parts of some bands are light grey or white. In some places the limestone is very fine grained, and grades into argillite or siltstone; in others it has a coarser, granular texture (partly masked by recrystallization) and appears to be composed of clastic grains. This last type is closely associated with the conglomerate of Unit 8, which characteristically contains pebbles of similar limestone, and in places such limestone may grade into conglomerate along the strike. The conglomerate is composed chiefly of rounded pebbles, cobbles, and boulders of greenstone, greywacke, chert, quartzite, and granitic rocks, as well as black and grey limestone. The finer interstitial material is generally greenish greywacke, but in some places limestone occurs in masses of such size and irregularity that it is not clear whether they represent fragments or matrix. Again in places the interstitial material may be lava or tuff, and the rock may be, properly speaking, an agglomerate. Individual conglomerate beds are lenticular and are probably nowhere more than 100 feet thick but they occur in persistent zones (8a) as much as 3,000 feet in breadth. Repetition of zones, and to some extent repetition of conglomerate beds within the zones, may be due to folding and strike faulting. Some closely associated volcanic rocks (8c) are included in this map-unit. They are generally greenish and dense, rarely porphyritic or amygdaloidal, commonly fragmental and difficult to distinguish from greywacke. Those north of Teslin River at the west boundary of the map-area include relatively fresh amygdaloidal black basalt.

The rocks in the area south of Streak Mountain are roughly comparable to those of Unit 8 elsewhere. Grey limestone pebbles are not uncommon in the conglomerate, but neither black limestone pebbles nor limestone bands were observed. This assemblage is bounded by andesitic greenstone on the east, and on the west appears to grade into nondescript dark rocks typical of Unit 6. The beds dip steeply near the contacts and definite data as to stratigraphic relationship are lacking.

Indeterminate fossil remains, including ammonite fragments, occur in limestone masses forming part of the conglomerate of Unit 8. Similar conglomerate in Whitehorse map-area appears to lie not far above uppermost Triassic horizons. Unit 8 may include rocks of the Upper Triassic Lewes River group, Lower Jurassic Laberge group, or both.

Unit 9

Rocks of Unit 9 underlie a strip northeast of Teslin Lake from its outlet to Fox Creek, and what are probably metamorphic equivalents extend southward to Morley Bay.

The group is made up of interbedded sedimentary and volcanic rocks. The volcanic rocks differ from any seen elsewhere in the map-area and serve to distinguish the unit. They are mainly porphyritic, the most prominent constituent being partly altered augite in well-formed phenocrysts, mostly about ¼ inch long. Altered plagioclase and hornblende phenocrysts, generally smaller, are prominent in a few places. The groundmass is fine grained and greenish. Interbeds of fine to coarse pyroclastic material of similar composition are fairly numerous and some tuffs are present among the coarser sedimentary members. Some thin augite porphyry bodies among the bedded rocks are probably sills and some are certainly dykes. Towards the eastern boundary of the strip, the rocks (9b) are apparently chiefly volcanic, but are considerably sheared and altered and are less distinctive.

The sedimentary members consist of argillaceous siltstone, sandstone, and greywacke indistinguishable from those of either Units 4 or 8, and a small amount of chert, some of which is banded like that of Unit 4. Greywacke grades into conglomerate in places, but not the characteristic limestone-conglomerate of Unit 8. These sedimentary rocks are interbedded with the volcanic members, but also form bands (9c), in places possibly 1,000 feet or more thick, in which flows are relatively scarce.

No fossils have been found in the rocks of this unit. Augite-porphyry lavas are prominent among the rocks of the Shonektaw formation of Tuya-Teslin map-area, which is believed to overlie the Upper Triassic or younger Nazcha formations (7, pp. 18-20). The Nazcha formation in turn bears some resemblance to Unit 8. By analogy, Unit 9 is tentatively considered to be somewhat younger than Unit 8. No granitic intrusions were seen in the area occupied by the unit but the rocks surround a lens of peridotite as though intruded by it. The rocks are highly deformed and considerably altered and are undoubtedly older than the granitic intrusions.

Unit 10

Rocks of Unit 10 occur mainly in the west-central part of the map-area, where they form several large stock-like bodies and many small irregular masses and stringers, many of which are too small to show on the map. Most of these intrusions are spatially related to the volcanic rocks of Unit 6. Two bodies lie farther to the northwest in an area of Unit 8 and one east of Teslin Lake in the area of Unit 9. One large stock and one small body are exposed in the northeastern part of the map-area and a small body north of Sidney Creek is mentioned by Lees.

The larger masses form prominent brown hills, broadly rounded, but with a rough surface due to jointing and frost-heaving.

The unit consists of ultramafic rocks; peridotite, pyroxenite, and serpentine. Parts of all and probably all of most bodies are thoroughly serpentinized but the typical rocks of the Hayes Peak area and also those east of Teslin Lake and in the northeastern part of the map-area are remarkably fresh. These are medium-grained, brown weathering, rather soft, green to black or mottled rocks. They commonly show conspicuous silvery flashing cleavage faces, apparently of distorted pyroxene crystals that in places stand out in relief on the rough weathered surface. They range in composition from peridotite to dunite and are composed of fresh, granular olivine broken by serpentine-filled fractures, and enstatite in highly cleaved and distorted crystals apparently partly altered to pale antigorite. Talc and bladed amphibole are common secondary minerals, and some primary clinopyroxene and amphibole are occasionally present. Chrysotile asbestos, apparently derived direct from olivine, forms rare cross-fibre veins up to 1 inch thick on Hayes Peak, but was not noted elsewhere. Chromite is scarce.

Pyroxenitic facies, consisting mainly of augitic pyroxene, serpentine, and in places, some fresh olivine, occur among the peridotites, commonly within their contact zones, and at many other localities. Greenish and light weathering, massive, soft serpentinites and hard hornfels-like rock are common variants. Most are apparently interbanded with the more characteristic varieties.

Ultramafic bodies appear to intrude, and thus to be younger than, the rocks of Units 8 and 9. Diorite stringers cut ultramafic rocks on the south face of Hayes Peak. Granite was not seen to cut ultramafic rocks, but conspicuously delimits ultramafic bodies in several places and shows no alteration near the contact. On this basis the ultrabasic rocks are confidently believed to antedate the granite.

Unit 11

Diorites of Unit 11 like ultramafic rocks of Unit 10 are widely associated with the volcanic rocks of Unit 6, and many small bodies are present in addition to those mapped. Similar diorite is associated with ultramafic rocks and the conglomerate and limestone (Unit 3B) near the eastern map-boundary north of Wolf River.

The central parts of larger bodies are light to moderately dark, medium grained, and homogeneous, with typical dioritic texture. Border zones and entire small bodies are typically greenish, full of inclusions, and generally grade imperceptibly into volcanic greenstones. Local dark, coarse-grained, border facies appear to be mafic segregations resulting from the dioritization of the greenstone. Specimens of typical diorite consist of secondary minerals, evidently derived chiefly from hornblende and plagioclase feldspar.

The diorite of Unit 11 intrudes, and is younger than, the greenstone of Unit 6. It has been seen to cut ultramafic rocks (Unit 10) but is believed to be closely related to them in age. It was not seen in contact with granite (Unit 12), but is believed to be older.

Unit 12

Granite, granodiorite, and minor dioritic facies (Unit 12) form masses of various sizes distributed throughout the map-area. Specimens from different bodies differ somewhat in composition but, except for those bodies separately designated (Units 12a and 12b), their essential characteristics are the same.

The body surrounding the north end of Atlin Lake, part of a large batholith extending southward, is composed of medium-grained, rather dark, hornblende-biotite granodiorite and quartz diorite. The three stocks west of Teslin River consist of medium-grained, hornblende-biotite granodiorite. The body west of Hayes Peak is medium- to coarse-grained biotite granite with lavender-coloured quartz.

The series of bodies extending along Big Salmon Range from Mount Morley to Sidney Creek are mainly medium-grained, in part porphyritic, biotite granite, with occasional biotite granodiorite and diorite border facies. The quartz is noticeably lavender to smoky coloured. In places cataclasis has obscured this feature; such rocks are sub-gneissic, the foliation striking parallel with the bedding of the enclosing rocks. A little red garnet is present in some granites, both gneissic and homogeneous, and sphene is a fairly prominent accessory.

The stock east of lower Nisutlin River is medium-grained, pinkish biotite granite with dark smoky quartz. That south of Thirty-Mile Lake is coarsely porphyritic granite with abundant smoky quartz. The mass touching the north boundary east of Nisutlin River is coarsely porphyritic granodiorite with blue-green alkaline amphibole, biotite, and abundant quartz. The two stocks west of Thirty-Mile Lake range from diorite to granodiorite in composition. The most westerly of these has coarse pyroxenite-hornblendite facies, especially at the southern tip.

The Englishmans Range intrusion is coarse, commonly porphyritic, biotite granite with smoky quartz. The granite body extending west from Quiet Lake has already been described by Lees (5, p. 18).

The large stock (12a) forming Mount Bryde is a heterogeneous mass, in part banded, of dark and light, medium- and fine-grained, intrusive rocks. The darkest rocks are hornblendites and hornblendite-pyroxenites. The hornblende is green and similar hornblende forms borders and patches in otherwise colourless augite of the pyroxenites. Lighter facies are probable gabbros and diorites composed of augite, green hornblende, highly altered plagioclase feldspar, and occasionally a little quartz. The lightest facies is probably granodiorite, composed of altered plagioclase, quartz, green hornblende, biotite, and probably some potash feldspar.

The composite body (12b) lying southeast of the mouth of Thirty-Mile Creek is likewise heterogeneous. The western part consists of alkaline rocks ranging from syenite to black gabbro or even peridotite. The syenite is light pinkish, and medium to fine grained. It consists chiefly of potash feldspar and a little plagioclase, green alkaline amphibole, a little pyroxene and brown biotite, and rarely quartz. Apatite and sphene are prominent accessories. Darker, fine- to coarse-bladed facies contain potash and plagioclase feldspar in about equal proportion, pyroxene, green amphibole, brown biotite, and a little olivine. These are typical monzonites both in composition and textural appearance. The one gabbroic facies examined proved to be a peridotite, composed chiefly of augite with nearly 10 per cent olivine. The central part of the mass is light-coloured hornblende granodiorite and the easternmost tongues more nearly diorite in appearance and composition.

All these bodies appear to be contemporaneous and probably belong to the Coast intrusions of Jurassic or Cretaceous age.

Garnet, epidote, and diopside skarns occur along contacts with limestone west of Hayes Peak and in Big Salmon and Englishmans Ranges. A few small metallic sulphide deposits were seen in the latter localities.

Unit 13

Within the map-area Unit 13 consists of sills, dykes, and irregular masses, in most cases too small to represent accurately on the map. They are most numerous on the ridge east of Nisutlin Bay (See note on map). A few dykes appear about 4 miles northwest of the mapped body touching the southern map-boundary west of Teslin Lake. This mapped body consists of volcanic rocks that in part resemble the dyke facies, and it is flanked on the east by dykes indistinguishable from those occurring elsewhere. An area of volcanic rocks touching the northwest corner of the map-area, and a dyke crossing the northern map-boundary on Slate Mountain, both mapped by Lees, are included in this unit although their relationships to each other and to other members of the unit are not known.

The porphyries of Unit 13 are characterized by euhedral, white feldspar phenocrysts up to $\frac{1}{2}$ inch in length, with or without quartz or hornblende, in a fine-grained, grey, greenish, or purplish groundmass. The phenocrysts are closely spaced as a rule; where widely scattered the rock becomes a felsite that resembles the groundmass of the porphyries. The dyke rocks generally have a light-coloured, weathered appearance in the outcrop. The volcanic rocks have fewer and smaller phenocrysts, and groundmass colours vary more commonly to purple and black. Some are amygdaloidal and most are coarsely fragmental. The feldspar phenocrysts where fresh enough to determine are mostly andesine and the rocks are probably dacites. Potash feldspar is also present in some, and some dykes in particular have a granophyre groundmass. These might be described as granite porphyry.

Rocks of Unit 13 were not seen in contact with granite, and their relative age is unknown. The volcanic rocks south of the map-area occur only on top of the ridge, and may overlie unconformably rocks of Unit 4.

STRUCTURAL GEOLOGY

Folds

With the possible exception of volcanic rocks of Unit 13 just at the south edge of the map-area, all the bedded rocks are folded. The trend of fold axes is generally northwest parallel with the regional trend of formations, but local deviations are common. The degree of deformation is highly variable; in some parts broad open folding is prevalent, elsewhere tight, possibly isoclinal, folding with probable overturning is indicated.

Within Unit 1, in particular, structures are too complex as a rule to permit reliable interpretation. In the southeast corner a southward-plunging anticline is delineated.

Structures in Units 2 and 3 in Englishmans Range are clouded by stratigraphic uncertainties. Limestone outcropping in the passes appears to mark an anticline but the major structure of the range is believed to be synclinal. In Thirty Mile Range some more or less hypothetical fold axes have been delineated, although in this area of broad, open folding the distribution of outcropping strata may be due partly to topographic relief.

Rocks of Unit 4 east of the valley southeast of Squanga Lake trend northwesterly but west of it attitudes form no consistent pattern. The broad structural concept involving Units 4 to 9 is that of a broken north-northwest trending anticline plunging northward and bringing up successively younger rocks on the flanks and at the nose. This may be the explanation of the northeastward trend of rocks of Unit 7 and some other features. This concept is implicit in the present stratigraphic interpretation, but as suggested in the description of units, this interpretation may itself be incorrect.

Toward the northwest corner an anticline whose axis coincides approximately with Teslin River, may, as stated by Lees, be the dominant structure in Unit 8 but the structure is probably complex.

Faults

No important thrust faults have been recognized although a fault assumed to separate Units 8 and 9 from Unit 1 east of Teslin River may be of this type. It is shown at two points on the map despite the absence of definite field evidence.

Steep strike faults break the limestone bands in Englishmans Range and many similar faults are visible in the highly complex structures seen in cirque walls in Big Salmon Range. Large, conspicuous quartz veins or dykes follow the strike of contorted rocks in the mountains between Thirty-Mile Creek and Nisutlin River and northward. Several of these are represented on the map as assumed faults. One strike fault, expressed as a topographic lineament, is assumed to exist in the area of Unit 8 west of Teslin River.

A fault marked by a quartz stock-work separates Unit 5 from Unit 4c on the ridge southwest of Squanga Lake, but its extent and nature are not known.

Numerous cross faults are believed to be present throughout the map-area but only a few of the more probable ones are indicated on the map.

Unconformities

An unconformity, believed to exist at or near the base of Unit 3, is discussed in the description of units.

ECONOMIC GEOLOGY

No commercial mineral deposits have yet been discovered in Teslin area. Signs of prospecting are practically confined to the northwestern part of the area, along Teslin River, its tributary creeks, and Sidney and Iron Creeks. This work was done prior to 1935 when Lees mapped that part of the area, and is described in his report (5).

Placer Mining

The Iron Creek placer property, in operation at the time of Lees' visit, was evidently abandoned soon after. A wing dam and sluice-boxes still mark the site of the most recent pit, but what is probably an earlier pit is mostly covered by a mud slide. Old workings were seen on some other tributaries of Sidney Creek farther upstream. A little prospecting was done in Englishmans Range just west of the peak marked 6,386 elevation.

The greatest obstacle to placer prospecting in this area is the heavy deposit of drift and alluvial material that floors most of the creek valleys. Here and there throughout the map-area rock canyons occur, and a careful search in the vicinity of these might well reveal suitable ground and conditions for placer prospecting. The present drainage is widely disorganized as a result of damming by ice and glacial deposits, and the locations of preglacial stream channels may be deduced with some confidence. These would be favourable places to prospect, especially where crossed by present stream courses.

Lode Deposits

No important lode deposits were seen in the course of mapping, although samples of iron-stained quartz from many parts of the area showed small amounts of base metals and traces of gold and silver. Galena-bearing quartz at the 'Moose Hill' group near the creek just south of 'Cone Mountain' was reported by Lees. Most metallic mineral deposits seen (all small) were associated with limestone skarns near the contacts with granite bodies in Englishmans and Big Salmon Ranges. Most of these limestone bodies are outlined on the map. Such places are particularly favourable for prospecting but no part of the area, except possibly the interior of large granite bodies, can be considered unfavourable on geological grounds.

Non-Metallic Mineral Deposits

Cross-fibre veins of chrysotile asbestos up to 1 inch across were seen by the writer on Hayes Peak but were few and scattered and were not noted elsewhere. A concentration of heavy minerals from specimens of peridotite from that locality showed only small amounts of chromium and no more than traces of other metals. Some prospecting has been carried out recently in the ultrabasic rocks, but nothing commercial has been reported.

A discovery of asbestos south of the pass east of Cone Mountain in 1953 led to widespread staking in this area. Snow prevented examination of the deposit by the writer. The rocks are partly serpentinized, hornblende-gneiss (Unit MD). A sample of asbestos reported to come from the deposit was proved by X-ray methods to be tremolite.