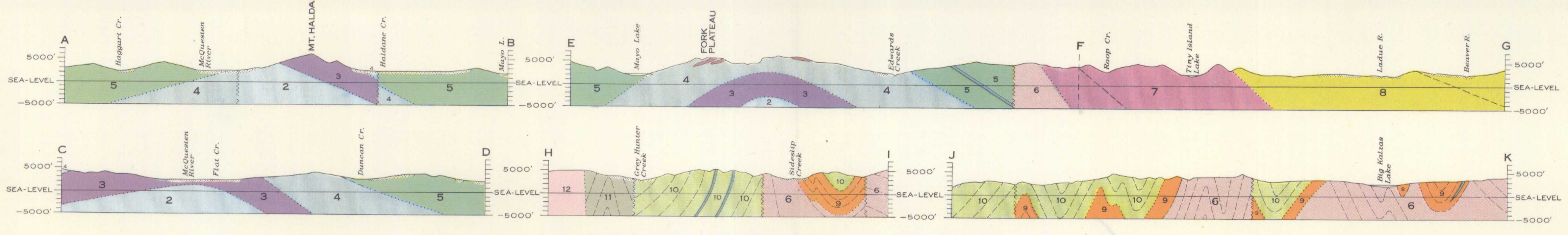
CANADA
DEPARTMENT OF MINES AND RESOURCES
MINES AND GEOLOGY BRANCH
BUREAU OF GEOLOGY AND TOPOGRAPHY



Structure-sections along lines A-B, C-D, E-F-G, H-I, and J-K.

LEGEND

CENOZOIC

TERTIARY OR QUATERNARY
PLIOCENE OR PLEISTOCENE
15 *Conglomerate, sandstone*

TERTIARY
EOCENE OR LATER
14 *14a, rhyolite, trachyte; 14b, quartz porphyry, syenite, granite*

MESOZOIC

JURASSIC OR LATER
13 *Quartz porphyry, granite porphyry*

12 *Granodiorite, granite; 12a, diorite; 12b, syenite*

TRIASSIC OR EARLIER
11 *Quartzite, slate, tuff, limestone*

PALÆOZOIC

CARBONIFEROUS OR EARLIER
MISSISSIPPIAN OR EARLIER
10 *Chert, shale, conglomerate, sandstone, slate, limestone*

9 *Slate, quartzite, sandstone, limestone*

PALÆOZOIC (?)
8 *Slate, quartzite, sandstone*

PRECAMBRIAN AND/OR PALÆOZOIC

YUKON GROUP
7 *Slate, schist, quartzite*
6 *Quartzite, slate, schist*
5 *Schist, quartzite*
4 *Schist, quartzite*
3 *Quartzite, schist*
2 *Schist, quartzite*

1 *Schist, quartzite*

DEVONIAN OR LATER
Diorite, gabbro

PALÆOZOIC OR EARLIER
Greenstone, schist

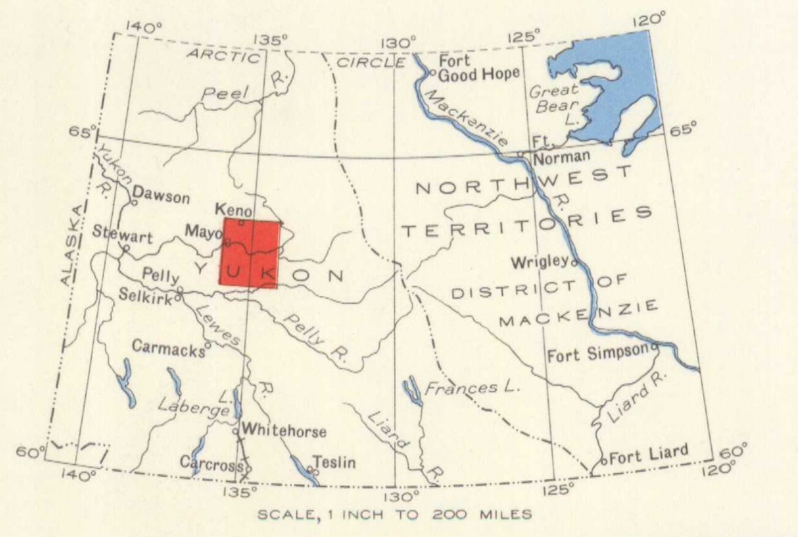
P *Limestone; P, Palæozoic (?)*

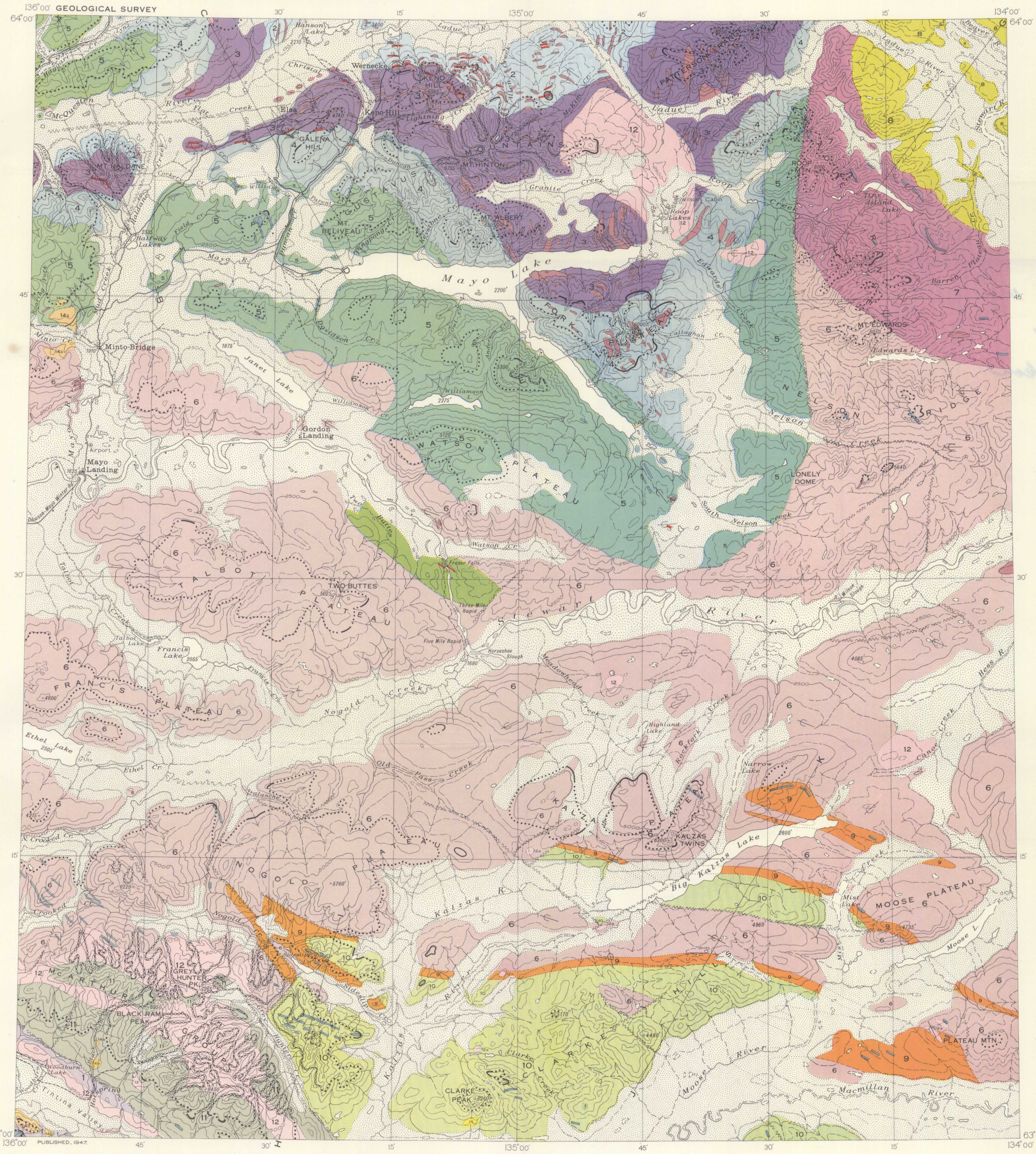
Heavily drift-covered area
Fault
Limit of last glaciation
Limit of Pleistocene alpine glaciers
Glacial striæ

Road and buildings
Road not well travelled
Trail and winter road
Church
Post Office
Airport
Lake and stream (position approximate)
Fall and rapid F. R.
Sand or gravel
Contours (interval 500 feet) 5000
Contours (position approximate) 5000
Height in feet above mean sea-level 2600′

Geology by H. S. Bostock, 1938, 1939, 1940, and 1941.

Base-map surveyed by the Topographical Survey, 1937.
Cartography by the Drafting and Reproducing Division, 1946.





MAP 890A

MAYO

YUKON TERRITORY

Scale, $\frac{1}{253,440}$ or 1 Inch to 4 Miles

Miles 4 0 4 8 12

Approximate magnetic declination, 36° East.

PHYSIOGRAPHY

Plateaus bounded by broad, steep-walled valleys are characteristic of the map-area. Their surfaces are, in general, long, smooth slopes lying between 4,000 to 5,500 feet above sea-level, but in Ladue Range and Clarke Hills the plateau features are dissected into many relatively small segments. Areas above 5,500 feet are hilly and rolling, and in the more mountainous parts generally sweep upward with steepening slopes to peaks that are themselves commonly crowned or bordered by small, smooth surfaces. North-facing slopes, particularly those above 5,000 feet, are generally steep as compared with south-facing slopes.

Most of the map-area was covered in Pleistocene time by the ice of one, last, well-marked advance, whose deposits are fresh. In a few places not covered by this ice there are modified deposits and features of erosion believed to be of earlier glacial origin. During and, perhaps, for some time after the last advance, alpine glaciation was active in some mountainous areas above 5,500 feet, and three or more small pockets of stratified ice still exist in McArthur Group.

The ice spread over the map-area from the east as an unbroken sheet. It divided against the higher ridges, and passing westward around them coalesced in the valleys beyond to divide again into valley tongues that were augmented to only a slight extent by local, alpine glaciers. On the east the maximum level reached by the ice was more than 5,000 feet, but this decreased to approximately 3,500 feet in a distance of 64 miles or less to the west. In places the upper limit is well marked, as on the northeast side of Fork Plateau, where a continuous embankment of drift, shown as a solid line on the map, walls off the unglaciated upper part of the plateau.

On several of the plateaus, and notably on Kalzas and Moose Plateaus, deposits of deep soil, peat, and muck occur above or at the limit of glaciation.

Along Ladue, Stewart, and Kalzas Rivers, and lower Nogold Creek, the valleys are partly floored by bedded clay and silt deposits that cover gravel and till. In Ladue Valley and to a less extent in the Stewart-Nogold Valley they are slaty blue, due probably to the presence of material derived from graphitic Yukon schists.

Overlying almost all the superficial deposits of the map-area is a thin sprinkling of fine, white, volcanic ash that thickens perceptibly southward.

GEOLOGY

Six members of the Yukon group (2-7) form a sequence whose relationships are known in part, but which cannot be correlated with the isolated strata (1) in the southwest. The latter are possibly the equivalent of rocks of the Yukon group found southwest of Tintina Valley. They consist of quartzite, micaceous, graphitic, and chloritic schists, and gneiss, all poorly exposed. The limestone in the southwest corner may represent an overlying formation.

Five of the members of the Yukon group (2-6) appear to form a continuous series. The upper part of the uppermost of these (6) underlies Palæozoic beds (9) in most places between the upper reach of Kalzas River and the east border of the map-area north of Plateau Mountain, but is not present to the northeast beneath younger Yukon group strata (7) or the Palæozoic? rocks (8), which, in turn, are absent in the south. No break has been detected between the upper Yukon members (6,7), but the position of the upper beds of the lower of these (6) in the south relative to those of the uppermost member (7) is uncertain.

Together the members of the Yukon group (2-7) form a great succession of metamorphic strata, predominantly of sedimentary origin and composed of rocks rich in quartz. Their aggregate thickness is believed to be around 75,000 feet. The principal rock types are quartzite and schist, together with limestone, which has been mapped separately. Many variations are, however, represented. These recur at frequent intervals, and their relative prominence serves in part to distinguish the separate members. No distinct horizon marker has been recognized, and the positions of contacts, particularly in areas of poor exposures are drawn arbitrarily. The most easily recognizable contact is that between the second and third lowest members (3,4), as shown northwest of Mayo Lake where blocky quartzite beds of the lower member (3) give way as the dominant type to graphitic schist accompanied above by a persistent horizon of limestone lenses.

The base of the lowest member (2) lies to the north of the map-area. This member consists of quartz-mica, mica, graphite, and chlorite schists, with minor thin beds of quartzite. The overlying member (3) contains similar schists, but about one-third of it is composed of relatively pure, blocky fracturing quartzite. These two members (2,3) contain almost no limestone. The quartzite is a medium-grained, white to blue-grey rock, low in impurities such as mica, and forms beds from a few inches to several feet thick separated by seams or beds of schist. It is resistant to weathering, and forms most of the peaks of Gustavus Mountains and Mount Haldane. Groups of these quartzite beds were traced for many miles. Individually they vary in thickness, and pinch out notably towards the base of the section on Galena Hill.

The succeeding member (4) is composed mainly of schists, of which graphitic types are prominent. Quartzite beds, similar to those of the underlying member (3), and quartz-mica, mica, and chlorite schists are also important constituents. Bodies of crystalline limestone follow an horizon about 500 feet above the base of the member. The overlying member (5) is composed predominantly of interbedded, brownish, quartz-mica schist and schistose quartzite. These are characteristically dotted or closely packed with lenticular pebbles of quartz and altered feldspar, usually ⅛ to ½ inch long, giving the rock the appearance of crushed and altered porphyries. In a number of places the pebbles are as much as 1½ by 2½ inches in size, and are composed of white, cherty quartz, chalky feldspathic material, and light brown carbonate. The matrix is of smaller particles of the same materials, and these and the larger pebbles are wrapped in a mass of brown mica, giving the planes of schistosity a lumpy appearance. The limestone masses in this member are commonly crystalline, except that the larger bodies are finer in grain and show some evidence of bedding.

The bulk of the succeeding member (6) consists of quartzite interbedded mainly with quartz-mica schists. Most of these rocks are pebbly, as in the underlying member (5). In the area south of Stewart River and west of Fraser Falls some of the quartzites are of finer grain, less micaceous than usual, and blocky. South of Nogold-Stewart Valley the pebbles are commonly of opalescent quartz, the beds are less metamorphosed, and in places a gradation in the size of the pebbles is apparent in individual beds. Near the contact of this member with overlying Palæozoic beds (9), in areas east of the head of Kalzas River, brown quartzitic beds containing pebbles of white, glassy or cherty quartz show still less evidence of metamorphism. On Nogold Plateau and west of the upper parts of Nogold Creek these fresher, brown beds are missing and beds resembling those at lower horizons to the north are exposed. Around the heads of Crooked Creek this member (6) contains groups of thick, pebbly quartzite strata interbedded with pebbly mica schist, graphitic and talcose schists, and several horizons of limestone lenses. No similar grouping of these rocks has been recognized elsewhere. Faults and drift have obscured their stratigraphic relations to the rest of the member, but they appear to belong to the upper part.

No distinct change marks the contact between the upper members (6,7) of the Yukon group, their common boundary being drawn to include all the purple slate beds with the youngest member (7). The basal part of this member is composed of dark purplish grey, slaty schist and grey slate interbedded with pebbly quartzite. About midway of the member is a blocky, blue-grey, persistent, pebbly quartzite band perhaps 100 feet thick. Where it crosses Roop Mountain it contains pebbles more than ¾ inch long. It is succeeded by friable, mica and chlorite schists, overlain by grey and purple slate and graphitic schists. In the bend of Ladue River it consists mainly of graphitic schists and slates resembling those of an older member (4), and perhaps representing fault slices of that member. The highest beds include much friable schist and slate, sandstone, and grit. The associated limestones are crystalline and similar to those of lower members.

The undivided Palæozoic rocks (8) consist at the base of conglomeratic quartzite carrying flattened pebbles of white and blue-black, cherty quartz and limestone commonly as much as 2½ to even 8 inches long. Grey slate is interbedded with this quartzite, above which, to lower reaches of Ladue River, the beds are primarily of black and grey, siliceous slate, commonly graphitic and pyritiferous, and grey quartzite. The ridge between Ladue and Beaver Rivers consists of black and grey slate with some greenish slate and sandstone at the southeast end, and blue-black and graphitic slate and cherty quartzite at the northwest end. Black and grey slate and sandstone with belemite-like concretions form the hill in the bend of Stewart River. North of Beaver River the rocks are grey, siliceous, friable slate, sandy slate or shale, and sandstone. The Palæozoic rocks (8) seem to rest conformably on Yukon group strata (7), and particularly northeast of Ladue-Stewart Valley, except at the northwest end, show a distinct decrease in metamorphism, and are probably correlative with part of the Palæozoic section farther northeast beyond the map-area.

The outstanding feature of the rocks of the lower Palæozoic group (9) is the presence of bright red and green slates. East of Kalzas River these slates form an easily recognizable horizon marker between underlying brown Yukon quartzite (6) and overlying chert beds (10). Associated with these coloured slates is, in places, much grey and black slate, some cherty slate, and quartzite beds. North of the east end of Big Kalzas Lake the group (9) includes some quartzites with dune crossbedding, and beds of limestone that are not notably crystalline and contain intraformational conglomerates.

The upper Palæozoic group (10) is apparently conformable with the underlying strata (9) and consists mainly of varieties of chert. In its lower part the chert is in distinct beds, a few inches to several feet thick, separated by seams and thin beds of grey shale. The middle part of the group (10) is of grey to black, cherty slate and quartzite, which commonly show no bedding and break into polygonal fragments about an inch long. Some fine, siliceous, tuffaceous beds are also present. Beds of black shale form the lower part of the upper half of this group (10), and are exposed along an east-west belt at the north base of the ridge northeast of Clarke Peak. They are succeeded by interbedded chert conglomerate, tuffaceous sandstone, chert, slate, and limestone, the last being fetid and only slightly crystalline. Conglomerate, together with a mass of coarse, chert-pebble quartzite, is the notable feature of the upper part of the Palæozoic succession, and forms Clarke Peak, where the beds are many feet thick and the pebbles of grey, black, green, and brown cherts, white quartz, and some jasper are as much as 2 inches long. The coarser pebbles are well rounded, but the fine material is angular. South of Clarke Peak black shale and grey sandstone are followed, south of the map-area, by limestone beds containing Mississippian fossils. Southeast of Sideslip Lake red and green slates similar to those of the lower Palæozoic group (9) outcrop among the strata of the upper group (10) to which they are thought to belong.

The relation of the Triassic, or older, beds (11) to the underlying Palæozoic formations is not known. The strata consist mainly of dark grey slates, and along intrusive contacts and in roof pendants they are altered to hornfels and to andalusite and other schists that commonly carry iron sulphides. They include also quartzite, pebble-conglomerate, thinly bedded limestone, sandstone, and shale.

Except along Tintina Valley the granitic intrusive rocks (12) are normally fresh, medium- to coarse-grained granodiorites. Orthoclase phenocrysts are commonly present, but some of the smaller, and parts of the larger, bodies are of uniform grain. The rocks consist of varying proportions of quartz, orthoclase, plagioclase, biotite, and hornblende, and all appear to be related to one period of intrusion. The intrusive rocks (12) along and in Tintina Valley, however, consist more nearly of coarse, uniform-grained granite, exposures of which seem to be more altered than those of the granodiorite intrusions in other parts of the map-area, and may prove to be older. Small intrusions of dioritic rocks (12a) and a small body of syenite (12b) are believed to be of approximately the same age as most of the granodiorite (12).

The porphyritic intrusive rocks (13) consist of fine-grained, acidic dykes and sills intrusive into all rocks with which they come in contact. In many places they resemble phases of the larger, batholithic intrusions (12) and may be closely related to them.

Acidic flows (14a) lie in patches over the older rocks on both sides in the valley of Minto Creek. In places they resemble some of the porphyritic intrusions (13), suggesting a possible Tertiary age for both groups. In the southwest of the map-area are intrusive rocks (14b) consisting of drusy, quartz and feldspar porphyries that vary greatly in texture and grain within individual bodies, and resemble the Tertiary intrusions of Carmacks and Ogilvie map-areas.

A conglomerate (15) on the south side of Clarke Peak contains great blocks of sandstone and of other nearby formations cemented by limonite. It forms a patch on the valley slope, shows horizontal bedding, and is scored with glacial grooves. Beds of partly consolidated rusty gravels, not shown on the map, are exposed north of the small lake 2 miles east from Sideslip Lake. They are overlain by glacial material and may be of the same age as the conglomerate (15).

A small area of limestone (P) southwest of Galena Hill is thought to be younger than the Yukon group. It is fetid and exhibits little evidence of crystallization.

A considerable area of greenstone and greenish grey, chlorite-mica-quartz schist crosses Stewart River at Fraser Falls. It may be an altered intrusion.

The numerous basic intrusions commonly have the form of flattened cylinders extending down the dip of adjacent strata. Most of them are composed of hornblende-rich diorite, but to the east they include more basic types.

STRUCTURE

A great, irregular, open anticlinal structure involving most of the sedimentary strata (2-11) traverses the map-area diagonally, and has its axis approximately along a line through the head of Ladue River and the bend of Hess River. Dips are characteristically less than 40 degrees except in local minor structures and in post-Yukon strata. Members of the Yukon group also form a number of open folds that trend westerly across the main structure. Some of the important valleys, notably that of Ethel Lake, Nogold Creek, and Stewart River, follow these anticlinal structures, whereas in many places the synclines occupy the intervening plateaus. A set of close folds and fault slices within the Palæozoic groups (9,10) appears to be superimposed on the major structures, and to some extent at least involves underlying members of the Yukon group. An important fault separates the Triassic rocks (11) from early Palæozoic (10) and Yukon group strata (6). Another important fault between undivided Yukon beds (1) and the Triassic sedimentary rocks (11) is largely obscured by drift, and appears to be a zone of fracture with offshoots.

In the north, members of the Yukon group (2-5) are exposed in the south half of an irregular, dome-like structure on the main anticline. The dome is distorted by a relatively sharp anticlinal nose that projects westward from the upper end of Ladue River along McQuesten River Valley. On the south side of this nose dips commonly exceed 30 degrees but are seldom more than 45 degrees, whereas on the north side most dips are between 5 and 25 degrees. In the western part of this structure the south side has been up-thrust in a horst-like block to form Mount Haldane. On the north side the anticline is adjacent to a shallow syncline along the ridge, beyond which is a second anticline on the north side of Lynx Creek Valley.

MINERAL DEPOSITS

The map-area includes the rich, silver-lead veins of Keno and Galena Hills and neighbouring hills, the most important lode mining district of Yukon to date. Altogether this camp has produced more than $25,000,000 in silver, lead, and gold. In addition, a number of lode prospects contain ores of gold, zinc, tungsten, antimony, and copper, and a score or more of creeks and gulches carry gold placer deposits and tungsten and tin minerals.

Mining has been concentrated in that part of the map-area lying north and west of the southeast end of Mayo Lake and in adjacent parts to the north and west of the map-area. The concentration of effort here as contrasted with other parts of the map-area seems mainly to have been due to the better preservation of placer deposits from glaciation. Initially, prospectors were attracted by these placer deposits, and the lode discoveries were made incidentally. Viewing the geology and mineral deposits to the west and north together with those of the map-area, gold, tungsten, and tin deposits have been found in the vicinity of granodiorite intrusions (12) and the silver-lead deposits also show a distribution distantly related to these intrusions and more closely associated with the younger porphyries (13). Areas around the intrusive bodies in other parts of the map-area promise fair lode prospecting ground, and their neglect may have been due to the more complete destruction of their placers by glaciation. Further, the localization of the chief silver-lead lode deposits within the blocky quartzites of a lower member (3) of the Yukon group, where these rocks have been most sharply flexed along the south side of the McQuesten Valley anticline, lays emphasis on the importance of brittle wall-rocks and sharp folds in prospecting for other similar deposits in the general vicinity of intrusive rocks.