MINERAL RESOURCES OF THE UPPER CHITINA VALLEY.[1]

By FRED H. MOFFIT.

INTRODUCTION.

Upper Chitina Valley is a part of the Copper River drainage basin, which has been visited infrequently and concerning which not much is known. A few prospectors and hunters have gone into it nearly every year since gold was discovered in the Nizina district but have found little aside from game to reward their labor. In 1912 and 1913, however, members of the Alaskan Boundary Delimitation Commission, while determining and marking the international boundary between Mount Natazhat and Mount St. Elias, spent several months in the district. After carrying their system of triangulation from the upper White to the upper Chitina by way of Skolai Pass and Nizina River they established a base camp near the foot of Chitina Glacier, from which they completed their surveys of this section of the boundary. As part of the work they made a topographic map, still unpublished, of Chitina Glacier and part of Chitina River. The map includes Chitina Valley eastward from Canyon Creek to the boundary line but represents only a narrow strip of territory adjacent to the river and the three principal branches of the glacier. This survey constitutes the only work done by the Federal Government in the upper Chitina Valley until 1915.

The work that serves as a basis for this report was undertaken in order to extend the knowledge of this part of Alaska by a study of its geology and by making such additions to the topographic map just mentioned as were found necessary to represent the distribution of geologic formations and the mineral resources. Both the topographic and geologic mapping were of a reconnaissance nature.

The district examined has an area of about 900 square miles. It does not include all the territory shown on the map made by the Alaskan Boundary Delimitation Commission, but on the other hand it includes a considerable area not shown on that map. The addi-

[1] A more extended account of this district will appear in a future bulletin.

tions represent the topographic mapping done in 1915, which covered an area of about 360 square miles. Most of this newly surveyed area lies north of Chitina River at the head of Young Creek, on Canyon Creek, and in the glacier valleys east of Canyon Creek. High water made it practically impossible to cross Chitina River with horses during most of the summer, and the lack of time and equipment for traveling on glaciers prevented a visit to the higher parts of the valley later in the season.

The field party consisted of five men and was equipped with a pack train and with provisions for 90 days. The party landed at McCarthy June 14 and left that place, after completing its work, on September 22. It thus had a field season of nearly 100 days, 17 of which were spent in arranging packs at the beginning of the season and repacking at its end, in traveling to and from the Chitina, and in visiting the placer mines of Dan and Chititu creeks.

The weather during the summer was exceptionally favorable. The days were warm and clear and little rain fell. Conditions, however, were favorable for forest fires, and for two weeks in July topographic work was carried on with difficulty owing to the dense smoke that was brought up the valley by westerly winds.

Mr. R. M. Overbeck assisted the writer with the mapping in the field and with the preparation of this report.

GEOGRAPHY.

The map (Pl. V) represents the region under discussion and shows its location with reference to McCarthy and the Copper River & Northwestern Railway. A trail leads from McCarthy to Clarkins Road House at the mouth of May Creek on the east side of Nizina River, from which point either one of two routes to Chitina River may be chosen. The route commonly used follows Chititu Creek to Blei Gulch, crosses the ridge to Young Creek and then, after ascending Young Creek to the bend, passes over the mountains south of Young Creek to the bars of the Chitina. This trail is well marked and good, except that it necessitates crossing two high ridges. A second trail ascends Young Creek from the Nizina for 5 or 6 miles and there crosses a low wooded ridge to the Chitina. It has been used principally by prospectors going to or returning from Kiagna River, one of the southern tributaries of the Chitina. Because it is shorter and has easier grades this trail would probably become the principal route to Chitina River if any considerable travel should develop in that direction in the future. No well-defined trail connects the Chitina ends of these two trails, and although the river bars furnish good traveling for part of the distance the river swings in against its north bank in places so that considerable timber and

brush would have to be cut if the connection were made. The only obstructions to travel on the north side of Chitina River above the Chitina-Young creek trail are glacial streams. Travel is not possible up the south side of the river above Canyon Creek.

The upper Chitina Valley is a region of rugged mountains. On the north the highest peaks rise to a height of 15,000 feet or more. To the east and southeast Mount Logan and Mount St. Elias reach heights of 19,539 feet and 18,024 feet respectively. Many lesser peaks stand well above the snow line. The relief of the region is great, for Chitina River at its source is only 2,000 feet above the sea.

All the larger valleys tributary to Chitina Valley above Canyon Creek are occupied wholly or partly by ice. For this reason it is impracticable or impossible to travel with horses any considerable distance away from the bars of the main river. For this reason, also, travel is difficult in warm weather, when the streams are flooded by the melting ice

Chitina River follows a course slightly north of west from the glacier almost to the Tana, its largest tributary above the Nizina. There it swings nearly to the northwest and so continues to the mouth of the Nizina. Kiagna River, Goat Creek, and an unnamed stream coming into the main valley near the glacier are the largest southern tributaries above Tana River. They are torrential streams, fed by melting snow and ice and flowing in deep, canyon-like valleys. Canyon Creek and the short streams flowing from beneath the "first" and the "second" glaciers are the principal northern tributaries above the Nizina. Canyon Creek flows out from its upper valley to the Chitina through a chasm more than 2,000 feet deep. This stream and the "first glacier" stream can be forded with little difficulty where they spread out on the bars just before joining the Chitina. The "second glacier" stream, frequently called Short River, is a raging torrent, wholly impassable with horses in times of high water like midsummer in 1915, though a crossing, difficult and at times somewhat dangerous for horses, can be made on the ice at its head.

The flood plain of upper Chitina River is from 3 to 4 miles wide and is broken only by a few spruce-covered islands, the tops of rocky points that project through the deep gravels. Nearly all this wide flood plain was covered by the river during high water in the late part of July and the early part of August, 1915. Along the margins of the plain are low benches, parts of an older flood plain, overgrown with pea vine and brush or with scrubby timber. The gravels of the flood plain and the low benches are saturated with water, which flows through them with a strong current and issues at the surface in numerous clear-water streams that unite to form deep channels and finally lose themselves again in the milky water of the river.

The experience of a few weeks in one summer does not warrant a very definite statement about the climate of this region. The valley is a basin hemmed in on all sides but the west by high mountains. The precipitation takes place in large part on the mountains themselves and there maintains the snow fields and supplies ice to the glaciers. No evidence was seen in the lower valleys to indicate much snowfall in winter or much rain in summer. On the other hand, it is believed that the precipitation is light in both winter and summer. The streams, however, are kept full in summer by water from melting snow and ice in the high mountains. It is reported that very little snow fell in Chitina Valley in the winter of 1914–15.

The summer of 1915 was remarkably dry and warm. Practically no rain fell till late in August, and for ten days in July the thermometer indicated a temperature near or above 85° F. in the middle of the day.

Spruce timber covers the lower slopes of the mountains to an elevation of more than 4,000 feet, fully 1,000 feet higher than the timber line in most of the Copper River basin. Probably no better timber can be found in the interior of Alaska than that which grows in parts of the upper Chitina Valley. Fine, straight trees from 18 inches to 2 feet in diameter and from 75 to 90 feet high were seen at a number of places. This timber seems to indicate that the winds are less severe here than on Copper River, but the members of the Alaskan Boundary Delimitation Commission's party report that they experienced such winds early in the spring. Spruce also grows on the benches bordering the river, but for the most part it is neither large nor of good quality. Areas of dead trees, untouched by fire, were noticed, and are thought to have resulted from the ravages of insects.

Grass is not at all plentiful in this part of Chitina Valley, even at timber line, where in most of the Copper River basin it grows abundantly, yet excellent feed for horses is provided by the pea vine that covers many acres of the old river flood plain. This plant furnishes forage not only in summer but throughout most of the year, so that horses are driven here and turned loose for wintering.

GEOLOGY.

The principal rocks in the upper Chitina Valley include shale, slate, arkose, limestone, conglomerate, sandstone, altered basaltic lava, tuffs, and granite. They range in age from Carboniferous to Cretaceous. Their general distribution is represented on the sketch map (Pl. V, p. 130). All the rocks are folded and much faulted. Some of them are locally schistose. Deformation and alteration, however, are much greater in the older formations than in the younger.

So far as known the oldest rocks are coarse fossiliferous arkose, more or less altered limestone, tuffs, and lava flows. Possibly some of the conglomerate should be included with them. They are the prevailing rocks east of Canyon Creek and north of Chitina River, and of them the lava flows and their associated tuff beds are the most abundant. The arkosic beds and much of the massive limestone are believed to underlie the lava flows and if this conclusion is correct are probably the oldest rocks of the region. Large exposures of the limestone are present near Chitina Glacier and along the "second glacier." In places the limestone is recrystallized and it nowhere yielded fossils. The arkose lies deep within the high mountains and is imperfectly known, although it must have considerable development there, for the glaciers bring down numerous fossiliferous bowlders derived from it.

The lava flows and closely associated rocks represent in part if not wholly the eastward continuation of the Nikolai greenstone of the lower Chitina Valley. They are well exposed between Canyon Creek and Chitina Glacier and show a lower part that consists of fine-grained basalts and tuffaceous beds overlain by an upper part made up of coarser-grained amygdaloidal flows. This corresponds well with the section of the Nikolai greenstone and underlying tuffs and basalts of the Kotsina-Kuskulana district. Like the greenstones in that district, these rocks are copper bearing.

The next younger rocks are limestone (the Chitistone limestone) and shale (McCarthy formation), both of which are of Upper Triassic age.

The known Jurassic rocks are gray and brownish sandstones, exposed in a few isolated areas. They were not distinguished in the field from the lithologically similar Cretaceous sandstones found near them and were separated from the Cretaceous rocks on the evidence of the fossils. Their principal exposures occur west of the mouth of Canyon Creek and on the tops of the high mountains between the "first glacier" and Chitina Glacier. They rest unconformably on the older rocks and are of unknown thickness.

The sandstones west of Canyon Creek are folded and faulted, but those east of the "first glacier" lie horizontally and appear to be little disturbed.

The rocks definitely known to be Cretaceous include brown and grayish sandstone and a great thickness of black and red shales. These rocks are best exposed on Young Creek. With them are included a succession of conglomerates, sandstones, arkoses, and shales that have their greatest development in the ridge between Young Creek and Chitina River but are exposed in some of the higher mountains north of Young Creek. These rocks overlie the black and red shales, but their age is not definitely determined. They have a

thickness of not less than 2,000 feet south of Young Creek. This succession of coarse fragmental beds is the youngest of the hard-rock formations that has been recognized in the district.

The prevailing structural lines of the sedimentary rocks in this district in general parallel the course of Chitina River, but have a tendency to swing a little more to the northwest. The principal fault lines also have this direction.

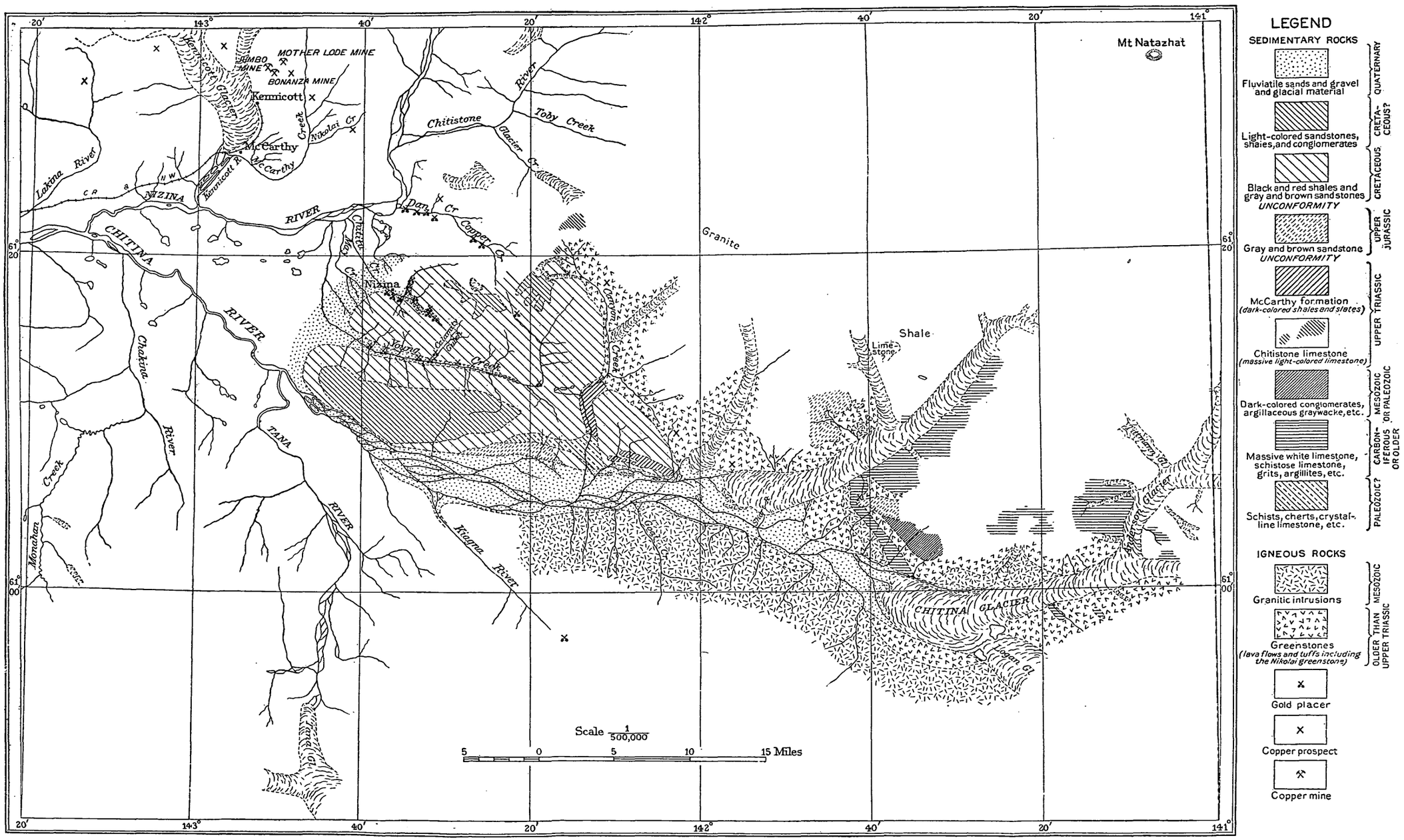
Granite is the prevailing rock south of Chitina River and east of the Kiagna. It forms most of the mountains there, but is associated in places with lava flows that are correlated with the basalts north of the river. Intrusions of granite in the sedimentary rocks and lava flows north of the river form several granitic bodies of large size. The numerous quartz porphyry dikes of Young Creek are of Upper Cretaceous or later age and are believed to be younger than the large granite bodies north and south of Chitina River to the east. They are thought to have a genetic relation to the gold mineralization of the Cretaceous shales.

Immense quantities of gravel have been spread over the floor of Chitina Valley, forming the present flood plain and older flood plains only a few feet above it. The larger tributary streams also have built up wide fan-shaped accumulations of gravel at their mouths, yet elevated bench gravels are singularly absent in the valley. It is evident that if they ever existed they were swept out by the former Chitina Glacier. Morainal deposits are present at the ends of the glaciers, but other than these are not conspicuous in the valley.

MINERAL RESOURCES.

Upper Chitina Valley has not given particular promise of becoming an important mineral-producing district, yet it should be stated that the valley has not been well prospected. Both gold and copper have been found there, but neither has been produced in paying quantity.

Native copper and copper sulphides, such as chalcocite, chalcopyrite, and bornite, are present in fracture planes and shear zones in the basaltic lava flows. These minerals were seen in places distant from the contact of the flows with the limestone and also near the contact. In their occurrence they resemble the deposits of the same minerals in the Nikolai greenstone farther west in Chitina Valley. Copper minerals were noted in greenstone on the west side of the "first glacier" near its foot, between the "first" and "second glacier," and east of the lower end of the "second glacier." A number of claims have been staked, but so far as the writer knows only those west of the "first glacier" have had assessment work done on them. Native copper and sulphides are found in fractured greenstone at this place.



LEGEND

SEDIMENTARY ROCKS

- Fluviatile sands and gravel and glacial material — QUATERNARY
- Light-colored sandstones, shales, and conglomerates — CRETACEOUS? CRETACEOUS
- Black and red shales and gray and brown sandstones
- *UNCONFORMITY*
- Gray and brown sandstone — UPPER JURASSIC
- *UNCONFORMITY*
- McCarthy formation *(dark-colored shales and slates)* — UPPER TRIASSIC
- Chitistone limestone *(massive light-colored limestone)*
- Dark-colored conglomerates, argillaceous graywacke, etc. — MESOZOIC OR PALEOZOIC
- Massive white limestone, schistose limestone, grits, argillites, etc. — CARBONIFEROUS OR OLDER
- Schists, cherts, crystalline limestone, etc. — PALEOZOIC?

IGNEOUS ROCKS

- Granitic intrusions — MESOZOIC
- Greenstones *(lava flows and tuffs including the Nikolai greenstone)* — OLDER THAN UPPER TRIASSIC

- Gold placer
- Copper prospect
- Copper mine

GEOLOGIC SKETCH MAP OF UPPER CHITINA VALLEY.

By F. H. Moffit.

Gold is reported from at least three localities in the district—Kiagna River, the mouth of Canyon Creek, and the first southern tributary of Chitina River below the glacier. The writer was informed that float gold ore had been taken from the bars at the mouth of Canyon Creek, and that coarse gold had been obtained from the rim rock in the canyon. Efforts were made to sink a shaft to bedrock in the gravel a short distance below the mouth of the canyon. This was attempted both in winter and in summer, but was not successful.

The Indians who hunt in this region have reported gold in the gravel of the unnamed creek near Chitina Glacier, previously mentioned. It appears that no attempt has been made to confirm this report.

The presence of placer gold on Kiagna River has been known for a good many years, probably as early as 1904 or 1905, or shortly after the Nizina rush took place. A few men who crossed the glacier from Yakataga Beach worked on the head of Kiagna River for several summers after that time in the expectation of discovering gravel rich enough to be mined with profit. A small stampede took place to the Kiagna in the fall and winter of 1914, but these efforts met with disappointment and the men left the stream, so that it was deserted in the summer of 1915.

The prevailing rocks of the mountains east and south of Kiagna River are granite. The granite, however, is associated with greenstone and with shales, some of which are locally altered to schist. Most of the prospecting has been done on streams that cut the shales, yet gold is reported from the granite. The location of the shale suggests that possibly it may be the eastward extension of the gold-bearing sedimentary beds of Golconda Creek in the Bremner River district, but this, however, is no more than a conjecture.

A vein of molybdenite was found in the summer of 1915 about 8 miles up the glacier of the largest eastern tributary to Canyon Creek. The country rock is granite. The valley is narrow and inclosed by steep walls, so that the property is somewhat difficult of access. According to the statement of the locators, the vein is 8 feet wide and consists of quartz and molybdenite. The molybdenite occurs as a solid vein 12 inches thick between the quartz and the hanging wall, as stringers and bunches through the quartz, and as disseminated flakes in the quartz. There is no timber near the property, and the best source of supply is Young Creek, which is separated from Canyon Creek by a low, flat divide that is easily traversed. Any ore produced from this vein will have to be brought out in winter and hauled to McCarthy in sleds unless the value of the property should prove sufficiently great to warrant the construction of wagon roads or a railroad.

Although no mining projects have yet been established in upper Chitina Valley, it may be said that some important conditions are favorable to mining in this district. The transportation of freight into any part of Chitina Valley is now much simpler than it was before the railroad was constructed, and if there were traffic to warrant it a branch of the railroad could be built to the river and extended to the glacier without having to solve any unusual engineering problems. The chief difficulty probably would be found in crossing Nizina River. Excellent timber for mining is found all along the north side of the valley and would supply all probable needs for many years. The length of the summer season and the general climatic conditions also appear favorable.