

THE RUBY PLACER DISTRICT.

By A. G. MADDREN.

INTRODUCTION.

The recent activity in the Ruby gold-placer district is, in a measure, a renewal of interest on a larger scale in a district that has received a small amount of attention from gold seekers since 1907. Late in the summer of that year a report was circulated along the Yukon that prospects of placer gold had been discovered on Ruby Creek, a southern tributary of the Yukon about 3 miles long. The discovery was made at the mouth of the creek in some fine gravel at the level of the spring high-water mark of the Yukon.

The accessibility of the locality, especially from Tanana, Rampart, and Fairbanks, attracted many men there during the later part of 1907, who, without making any actual discoveries, located extensive tracts as placer-mining ground. Most of those who came at that time were not prepared to remain longer than a few weeks. Only about 30 men remained in the vicinity of Ruby Creek during the winter of 1907-8. Some of these prospected with the crude facilities at hand on various creeks within easy reach of the Yukon. A number of holes were dug during the winter, largely with the aid of three small steam boilers, but the result of these operations was apparently not encouraging, for by July, 1908, most of the men had left the district and the only property then worked was Discovery claim, on Ruby Creek. Mining was renewed on this claim in 1909 and 1910 and carried on for a month or so in the early part of each summer, while there was enough water to sluice with, and several thousand dollars worth of gold was thus taken out of an open cut.

During the summer of 1911 the report of new discoveries attracted a large number of persons to this district. A new settlement named Ruby, the population of which has fluctuated between several hundred and a thousand or more persons, was established on the south bank of the Yukon at the mouth of Ruby Creek, the town site being on Discovery claim. The accessibility of this district, due to its location on the lower central part of the Yukon, the main route of trans-

portation into the interior of Alaska, undoubtedly led to this influx of population.

The actual discoveries of placer gold up to the time of the latest reports, however, do not seem to indicate that this will be a new bonanza field, but they have been interpreted by some to indicate the existence in this vicinity of much more extensive deposits of gold-bearing gravel. Whatever may prove to be the fact the community is in excellent condition to open up rapidly to a producing stage any mining ground that may be prospected thoroughly enough to demonstrate its value. Ground that would not pay to mine in many other districts in the Yukon Valley should be profitable here because of the accessibility of the district. It is reported that active preparations are now being made for the commercial development of several properties.

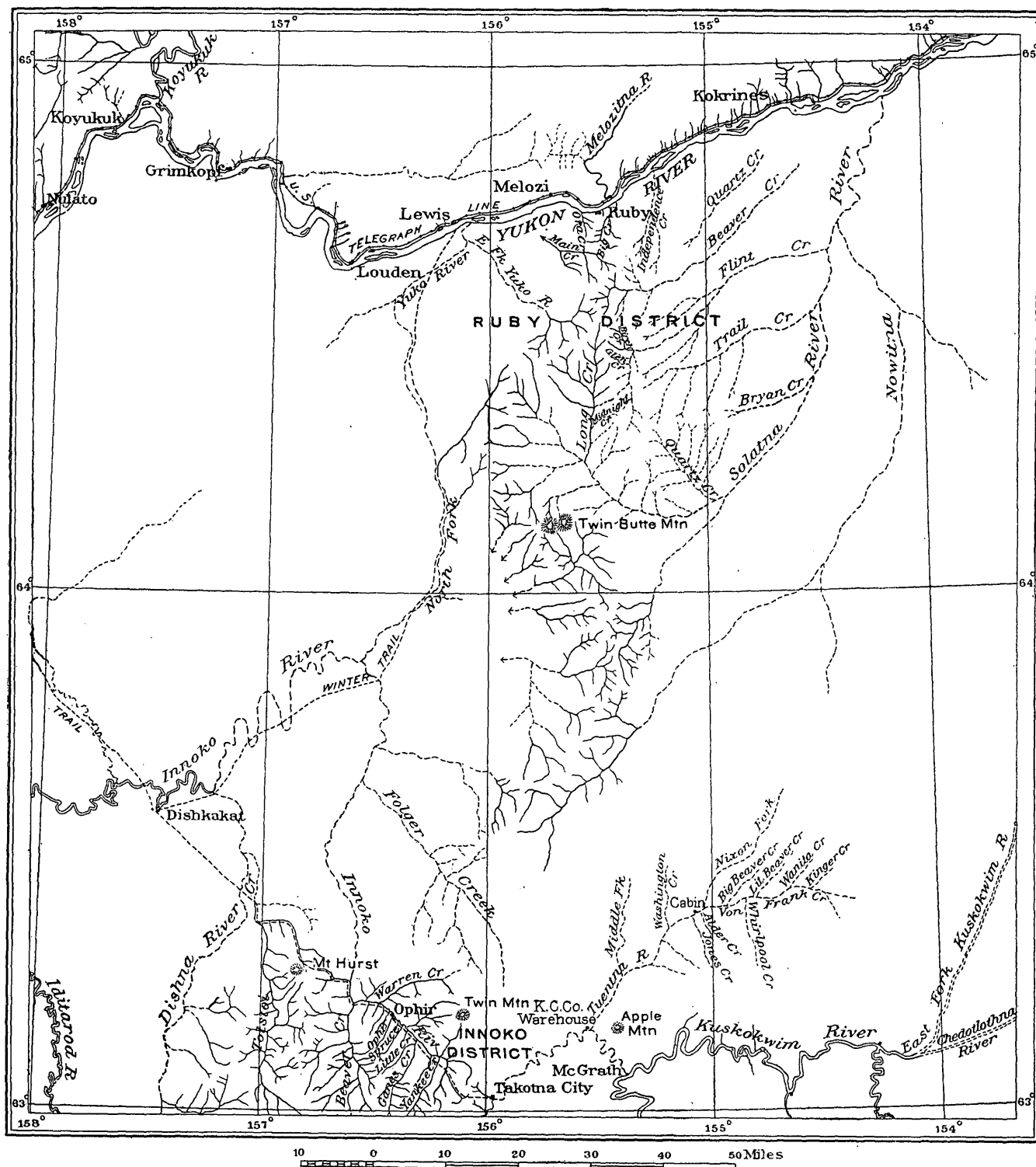
The writer ¹ spent seven days in making a hasty examination of this district in July, 1908. In 1910 the most mountainous part of the district, lying along the divide between the basin of Nowitna River and the basins of the Yuko and North Fork of the Innoko, was traversed topographically by a survey party under C. G. Anderson. H. E. Birkner, a member of this party, made some geologic observations along the route traveled. The following statement is based on the above official investigations, supplemented by information derived from various sources, but especially from notes on the most recent developments furnished by Mr. Harry G. Abercrombie, accompanied by a sketch map of the drainage of the district, showing the names of the creeks. A drainage map of the district (Pl. XIV) has been prepared, which is based on Mr. Anderson's survey, 1910, and Mr. Abercrombie's sketch map.

GEOGRAPHY.

LOCATION AND EXTENT.

The area known as the Ruby placer district (see map, Pl. XIV), from the name of the small stream on which gold was first discovered in it, lies along the south bank of Yukon River, about 175 miles below the town of Tanana and 110 miles above Nulato, the two nearest large settlements on the Yukon. On the northwest it is bounded by the valley of Yuko River and on the southeast by the valley of Nowitna River. That part of the Kaiyuh Mountains included in the Ruby district may be deemed to extend southward to Twin Butte Mountain. This mountain, whose elevation is about 1,700 feet, is situated about 32 miles south of the Yukon and is separated from what may be considered as northerly outliers of the Kuskokwim Mountains by a

¹ Maddren, A. G., Gold placers of the Ruby Creek district: Bull. U. S. Geol. Survey No. 379, 1909, pp. 229-233; and The Innoko gold-placer district, Alaska, Ruby Creek area: Bull. U. S. Geol. Survey No. 410, 1910, pp. 75-80.



MAP OF RUBY PLACER DISTRICT.

saddle some 4 or 5 miles wide, whose elevation is about 600 feet above sea level. This low pass lies about 8 miles east of Twin Butte Mountain and separates a western headwater of Solatna River, named Long Creek, from an eastern headwater of the North Fork of the Innoko, which drains the southeastern flanks of Twin Butte Mountain. As thus bounded the Ruby district embraces an area extending about 35 miles from north to south and about 30 miles from east to west, and includes about 1,000 square miles of territory.

RELIEF.

For a distance of 10 miles along the south bank of the Yukon the Ruby Creek area is made up of rolling hills, from 400 to 600 feet high, which border the river, forming rock bluffs 200 or 300 feet high. These hills may be considered as forming the northeast end of the Kaiyuh Mountains, which extend for about 175 miles toward the southwest to lower Innoko River. The Ruby Creek hill country is noteworthy as being the only tract on the south side of Yukon River between Tanana River and Bering Sea, a distance of over 800 miles, where highlands of the older rocks and bluffs of consolidated bedrock form the immediate bank of the Yukon. The south side of the Yukon throughout all the rest of this distance is bordered by low banks and here and there bluffs of unconsolidated alluvial silt, which covers the older hard-rock formations for distances of 5 to 20 miles or more back from the river. Southward from the vicinity of Ruby the rolling hills gradually rise to low, dome-shaped mountains, 1,500 to 2,000 feet in height. These mountains extend southwestward to the lower Innoko Valley as the Kaiyuh Range. Southeast of the Kaiyuh Range are northwestern outliers of the Kuskokwim Mountains, which are drained by the headwaters of Innoko River. There is a topographic connection between these two ranges about 35 miles south of Ruby, consisting of a low saddle ridge about 600 feet above sea level.

DRAINAGE.

The drainage of the Ruby district is of that type which may be expected to characterize a low, rolling, moderately mountainous region that has been gradually worn down to its present form during a long period by rather small streams having no great erosive power. None of the present streams carry much water; their grades are not steep, and the character of the relief that they have produced suggests that they have remained about as they now are since the Yukon cut through what appears to have been a bedrock barrier across its present channel in the vicinity of Ruby, or perhaps since an earlier time.

The streams that drain the Ruby district may be conveniently described in three groups—those which flow directly into the Yukon,

those which flow eastward into the Nowitna, and those which flow westward into the Yuko and the North Fork of the Innoko. The groups will be considered in the order named.

Big Creek has its source 3 or 4 miles south of Ruby and discharges into the Yukon about 4 miles above the town. Independence Creek, whose open valley stretches along the western border of the Nowitna Flats about 5 miles east of Big Creek, enters the Yukon some 9 or 10 miles above the town of Ruby. These two streams drain the eastern part of the hilly country that borders the Yukon east of Ruby. The western part of this group of hills is drained by Ora Creek, which empties into the Yukon about 5 miles below Ruby, on the eastern edge of the Yuko Flats. South of these creeks a considerable area of the hills is drained by the headwaters of Main Creek, which also enters the Yukon after flowing westward across the Yuko Flats. Ora and Main creeks are said to discharge into a slough that leaves the Yukon just below the Ruby Bluffs.

Big and Ora creeks, as has just been stated, drain opposite sides of the Ruby Hills. North of the divide that separates their upper basins from the channel of the Yukon lies a strip of hilly country, from 2 to 3 miles wide and about 10 miles long, that extends along the south bank of the Yukon, the bluffs already mentioned overlooking the river. These bluffs are separated by small valleys which run at right angles to the Yukon and which are occupied by creeks from 1 to 3 miles in length. These short streams that drain directly into Yukon River, named from east to west, are Flat, Center, Melozi, Ruby, Short, and Hannah creeks. They all have a very scanty water supply. South of the headwaters of Main Creek the Ruby Hills rise to low, dome-shaped mountains, which form a divide between waters that flow eastward into the Nowitna and those that flow westward into the Yuko and thence into the Yukon.

Nowitna River discharges into the Yukon from the south about 36 miles above or east of the town of Ruby, after meandering across wide flats that extend southward from the Yukon for 30 miles or more. Westward from these wide flats broad strips of bottom land extend up the valleys of the larger tributaries of the Nowitna, reaching well back into the low mountains. These valleys are separated by the low, partly timbered ridges and foothills of the northeastern end of the Kaiyuh Range. A large western tributary of the Nowitna, named the Solatna, has its sources on the southeastern slopes of this part of the Kaiyuh Mountains, and its principal headwaters drain a considerable basin, which lies within them northeast of Twin Butte Mountain. The western headwaters of the Solatna, the chief of which is Long Creek, arise southwest of the divide on the northeast side of which the above-mentioned streams have their sources. The largest streams whose sources are in the Ruby district flow east-

ward into the Nowitna Flats between the Solatna and the Yukon. These streams, named in order from north to south, are Beaver, Flint, Trail, and Quartz 'creeks.

The latest discoveries of placer gold are on Long Creek, and some of its dozen or more tributaries, one near its head named Bear Pup and one near its mouth named Midnight being the most promising; also on Flint Creek and its headwaters, Glen and Birch; and on Trail Creek, which lies southeast of Flint.

Yuko River discharges into the Yukon about 23 miles below or west of Ruby. The Yuko, like the Nowitna, meanders in its lower course across broad flats containing sloughs and small lakes. These flats are bounded on the east and south by the northwestern flanks of the Kaiyuh Range and are traversed from east to west by several large streams that rise within the part of the range that is included in the Ruby district. The largest of these streams is the East Fork of Yuko River. A low divide south of the Yuko Valley separates it from the valley of the North Fork of the Innoko. The pass across this divide makes a wide break between that part of the Kaiyuh Mountains constituting the Ruby district and the southwestern extension of this range. The southwestern part of the Ruby district is drained by creeks that flow into the North Fork of Innoko River. Most of these streams have their sources on the western and southern flanks of Twin Butte Mountain.

VEGETATION.

Spruce, birch, cottonwood, aspen, alder, and willow are the principal woody plants. Spruce is the only tree available for use as lumber, and only on the flats and lower slopes near the larger streams does it grow large enough to be suitable for this use. On the hills and higher mountain ridges practically all of it is small and scrubby, although in favorable spots individual trees attain a good growth, especially high up in some of the gulches. Most of the mountains of elevations above 1,500 feet have open summits. Some tangled growths of stunted trees in the saddles along divides are so thick as to make it necessary to chop a trail through them for the passage of pack horses. Most of the spruce of cabin-log or lumber size stands in groves, interspersed with swampy meadows and brushy tracts of willows and alders on the Nowitna and Yuko flats, especially along the banks of streams.

Willow and alder grow thickly not only on the flats but also along the bottoms and slopes of nearly all the valleys and gulches within the mountains, reaching above the limit of spruce growth. They extend across many divides and up the slopes of mountains quite to their summits. At the higher elevations, however, their growth is not so vigorous as on the lower levels.

White birch is scattered among the spruce, both along the streams and on the slopes. Aspen grows on the drier hillsides in characteristic clumps, and cottonwood is found along the sluggish reaches of the streams, in places in considerable groves, especially on the flats of the Yukon.

GEOLOGY.

The bedrock of the hills and low mountains of the Ruby district comprises various old, altered sedimentary rocks, crystalline and cherty limestone, garnet-mica schists, quartzite schists, and mica-quartz schists being the most common. Much of the mica-quartz schist has a texture so fine that it may well be termed coarse-grained slate or phyllite.

These rocks are fairly well exposed in the bluffs along the Yukon and in a less satisfactory manner here and there on stream banks, valley slopes, crests of ridges, and mountain summits. Throughout most of the district, however, the bedrock is covered with vegetation and its small outcrops are so poor and so widely scattered that it is impossible to judge whether any particular kind of these rocks is more abundant than the others. All kinds have been considerably changed by metamorphism but not so much as to obliterate their sedimentary origin and their arrangement. They are presumably to be correlated with lithologically similar formations that occupy large areas of the mineral belt between Yukon and Tanana rivers, 200 miles farther east.

Diabasic and dioritic rocks are associated with the altered sedimentary formations. These igneous rocks are widely distributed throughout the district, but apparently do not make up a large part of the bedrock. Whether the diabases are old lava flows interbedded with the sedimentary rocks or whether they have been intruded into them as sheetlike masses or dike-like bodies has not yet been determined. The diorites, however, are distinctly intrusive, for they cut across the bedding and structure of the sedimentary rocks in various directions as dikes, ranging in thickness from a few to several hundred feet, the narrow ones being the more abundant. In texture the diorites range from compact crystalline to moderately porphyritic.

The strikes of the sedimentary formations differ considerably, ranging from north-south to northeast-southwest, and the bedding dips away from the strike at angles varying from 30° to 45°. In some areas opposing dips have been observed, but in others the dips are all in one direction with reference to the general trends of the bedding, which for the most part range from 20° to 30° east of north and west of south. With the information now at hand it is not possible to state the nature of the folding that produced the structural attitudes noted above or the extent to which faulting or displace-

ment accompanying the intrusion of igneous rocks may have contributed to the result.

The exposures in the bluffs along the Yukon show local zones of shearing and fracturing, the spaces in which have been filled by stringers and bunches of quartz. Near Flat Creek the shearing in the schists produced large openings, which are occupied by quartz lenses and stringers. On the surface these quartz deposits are of the lens or bunch type, having no uniform trend or thickness for any considerable distance. Two principal exposures of quartz were seen—one about 100 yards below the mouth of Flat Creek, which shows a maximum thickness of 4 or 5 feet on its face, and another about 100 feet below, which is several feet thick, but not very long. Assays of samples of quartz from these exposures are said to have shown considerable gold. In 1906 a tunnel, now caved in, was run in 150 feet, it is said, on the largest of these quartz deposits. After the work had progressed for a few feet it was found that the tunnel passed mostly through country rock, it being impracticable to follow the irregularities of the quartz stringers with a straight tunnel. In brief, the work done at this place has shown that the bodies of quartz are too irregular and too uncertain in extent to be mined by tunnels, and what has been demonstrated at this place will probably be found to be more or less true throughout the district. Other occurrences of quartz are indicated by the float lying on the hills farther south, but the attitude and extent of the quartz in bedrock here can not be so well observed as in the bluffs along the Yukon, owing to the disintegrated condition of its outcrops. From what is now known it is presumed that all of the quartz mineralization in the bedrock of this district is similar to that observed along the Yukon in that it does not occur in defined veins. Whether there is an intimate relation between the quartz mineralization and the dioritic intrusives is not clear. One large dike of medium-grained diorite about 200 feet wide crosses the schists diagonally to their strike and stands about vertical. It has been greatly sheared and has been shattered into blocks, the fracture and joint spaces between which have been recemented by quartz stringers or veins, the largest 6 inches wide. This structure indicates that structural and other changes that favored mineral segregation and deposition took place after at least some of the diorites had been intruded into the country rocks.

Besides occurring as noted above, the quartz is distributed in considerable amount through portions of the schists as small veinlets, leaflets, and blebs.

A large part of the placer gold of this district is probably derived from quartz that was mineralized in the manner indicated above, but the distribution of the gold-bearing minerals throughout the bedrock and the geographic relation of the gold to its bedrock source can not

now be stated. However, the alluvial deposits that fill the bottoms of the valleys, with which the placer gold is locally associated, are for the most part moderate in quantity and thickness. They appear to be gradual accumulations produced by a meager drainage such as now prevails, and probably the placer gold has not been carried far from its bedrock source before being deposited in them. The rounded forms of the ridges and mountains suggest that the present aspect of the country is the result of a long and uniform erosion, perhaps moderately accelerated recently, with the result of giving some of the valleys in the more mountainous parts deepened V-shaped cross sections and steepened gradients to their headwater slopes.

PLACER-GOLD PROSPECTING.

When the news of the discovery of placer gold on Ruby Creek spread along the Yukon Valley in 1907, men hurried there, especially from Tanana, Rampart, and Fairbanks, and, following what is now the usual practice in new placer fields, located as placer ground practically all the alluvial bottom lands along the streams of this district. The locations included both association placer groups containing 160 acres and single 20-acre tracts. Large areas of the valley slopes also were located as so-called "bench claims." No discoveries of gold were made on 99 per cent of the claims thus located, and probably half of the location notices were never recorded. Some actual prospecting was done near Ruby during the winter of 1907-8, most of it on Ruby and Big creeks, although a few holes were sunk on Boston Creek and two of its headwater tributaries—Logger and Boston gulches. Prospecting was also done at the headwaters of the Solatna, which at that time were known as Beaver and Dome creeks. As this prospecting did not result in mining developments, except in a small way on Ruby Creek, not much information is at hand regarding the nature of the stream deposits, except those on Big and Ruby creeks. On Big Creek, where about 15 holes were dug to bedrock, the valley bottom is covered with alluvium to a depth of 15 to 60 feet, the deeper deposits apparently being near the upper part of the valley. These holes showed that washed gravel of the schistose country rocks lies on bedrock. It is from 1 to 7 feet thick and is overlain by sandy clay and muck. The gravel contains boulders of igneous rocks and quartz, the largest a foot in diameter. A good deal of iron pyrite occurs with the gravel, either as washed grains or inclosed in or attached to some of the larger fragments of slaty bedrock. It is reported that colors of gold were found in all of the holes on Big Creek.

The unconsolidated valley deposits on Ruby Creek probably average about 15 feet in depth. They are composed of muck, loamy sands, patchy layers of flat schist and slate pebbles, and a good many

water-rounded boulders of igneous rocks. The bedrock is schist, slate, and limestone, in the form of rectangular blocks and slabs. The material handled in mining on Discovery claim consists of this loose, blocky limestone, flat pieces of coarse-grained mica slate similar to that seen above and below Ruby Creek on the Yukon, close-grained cobbles of diabase, and large heavy boulders of medium-grained diorite similar to that seen in a large dike on the Yukon. These boulders are from 12 to 18 inches in diameter and are well rounded. The whole is covered with a mantle of muck and silt. In most places this muck is underlain by finer wash made up largely of flattish slate pebbles mixed with loamy sand. This sand also fills the spaces between the blocky limestone fragments of the bedrock. Finer water-worn gravels, consisting of slate pebbles, mostly flat, are mixed with the sand and occur in patchy layers within it and on top of the blocky limestone. These layers of fine washed material do not appear to be very continuous or very thick. They carry most of the placer gold, which is in the form of flaky particles, none as large as bird shot. Owing to its fineness the gold is hard to save in the sluice boxes.

During the excitement of 1911 the staking of ground without first making discoveries was repeated over that part of the district where similar locations were first made in 1907 and was also greatly extended to the south. Most of the prospecting in the district is now being done on streams situated from 10 to 30 miles south of Ruby, and under the present favorable conditions, with plenty of men, equipment, and supplies at hand, there appears to be no doubt that the possibility that the district may afford good placer mining will be thoroughly tested.

The latest information in regard to the progress of mining developments in this district is to the effect that Flint Creek has not yielded very good results, except on the Nuahmah discovery bench claim, situated between Gold Run and Eldorado creeks. On this claim a crosscut 100 feet long, at a depth of 60 feet, has given returns for 40 feet that average \$1 to the square foot of bedrock surface. The ground adjoining this bench claim is said to be about as good. No satisfactory colors have been found above or below this locality, and prospecting along Flint Creek has been practically discontinued.

Glen Gulch, a headwater tributary of Flint Creek, just north of Eldorado, shows prospects of 6 cents to the pan in 3 feet of gravel at its mouth, but appears to contain no pay streak on bedrock. Half a mile up Glen Gulch from its mouth gravels 4 feet deep and 12 to 14 feet wide yield from \$3.50 to \$4 to the square foot of bedrock surface, but the extent of the pay streak here has not been determined.

On Trail Creek, which is the first large stream southeast of Flint, pay gravels that are said to run \$3 to the square foot of bedrock have been found 1 mile above and 2 miles below Discovery claim.

Discovery claim, on Long Creek, which was first located five years ago, now shows good prospects. Windy Bench, on the left or east side of Long Creek, a quarter of a mile below Discovery claim, contains gravels at a depth of 45 feet which runs \$1.50 to the square foot of bedrock surface. The benches on the left of claim No. 7 below Discovery on Long Creek show prospects at a depth of 60 feet. Likewise the bench gravels on the left limit of claim No. 8 below Discovery on this stream carry, at a depth of 71 feet, good low-grade prospects of fine gold, and the left limit bench claim No. 12 below Discovery shows prospects at a depth of 76 feet.

Claim No. 2 above Discovery on Long Creek includes bench gravels that have been drifted into for 35 feet and found to carry \$2 to the square foot, but the extent of this deposit is not known. Prospects of 15 cents to the pan have been found in one hole on claim No. 3 above Discovery on Long Creek, and on claim No. 4 above Discovery a crosscut of 20 feet prospected \$6 to 20 pans of gravel. A nugget of \$1.90 was found in this prospect.

Midnight Creek, a west-side tributary to Long Creek, about 5 miles in length, is reported to be promising. This branch comes in about 20 miles from the head of the main stream, where its flat valley bottom is several miles wide. On Discovery claim the pay gravels lie at a depth of 25 to 30 feet and are reported to carry as much as \$4 in gold to the square foot of bedrock surface. Here 40 feet of drifting has been done, and it is said that tests of 15 cents to the pan may be obtained from gravels as high as 7 feet above bedrock. At last reports a large boiler was being installed on this claim to replace a prospecting boiler that had been on the ground, and it was the intention to start hoisting at once and take out a dump for spring sluicing. Immediately above and below this claim there are said to be good prospects on which lays have been let.

Small prospects which do not yet seem to be important enough to encourage mining have also been found on many other creeks in the district.

No work is now being done on any of the creeks that empty into the Yukon except one, named Shovel Creek, which enters the river about 15 miles above Ruby, but it is said that no valuable deposits have yet been found on this stream. Prospecting is also being done in the upper basin of Innoko River and on the headwaters of the North Fork of the Innoko.