MR-078-02
Pilgrim
1930 misc.
Alk. Terr. Rept.
78-2

UPPER NABESNA, CHISANA AND SNAG RIVER AREA

Introduction

The area considered in this report lies along the headwaters of the Nabesna, and Chisana Rivers and includes a portion of the Nutzotin Mountains draining into the two main forks of Snag River. It covers in general an area extending 32 miles northeasternly from the Wrangell Mountains and 48 miles southeasternly from the Nabesna River Valley.

The Wrangell Mountains receive their name from Mount Wrangell which is centrally located in that imposing group of mountains lying between the St. Elias Range on the southeast, the Chugach Mountains on the south, and the Nutzotin Mountains on the north. These Wrangell Mountains are extremely rugged and the higher portions are ice covered. Mount Wrangell and Mount Sanford are active volcanies, giving off smoke and occasionally ejecting some ash.

This area was first mapped by Schrader and Witherspoon in 1902. (Mendenhall, Walter, C., and Schrader, Frank C., the Mineral Resources of the Mount Wrangell district, Alaska; Prof. Paper U. S. Geol. Survey No. 15, 1903). Moffit, Knopf and Capps covered the Nabesna, Chisana, and White Rivers in 1908 (Moffit, F. H., and Knopf, Adolph, with a section on the quaternary by Capps, S. R., Mineral resources of the Nabesna-White River District, Alaska: Bull. U. S. Geol. Survey No. 417). In 1914 the Chisana and White Rivers and the Chisana Placer District were surveyed in more detail (Capps, Stephen, R., the Chisana-White River District, Alaska: Bull. U. S. Geol. Survey No. 630).

The material for this report was gathered in June and July 1930 from a detailed examination of the several localities herein described, and from information furnished by various miners and other residents of the locality. The writer here desires to express appreciation for aid, information, and hospitality furnished by the following; Carl F. Whitham, James Brown, D. C. Sargent, William James, Mr. William James, A. S. Johnson, Mrs. A. S. Johnson, B. J. Davis, Anthony McGettigan. and W. Johnson Mccaulay.

Geography

The Nutzotin Mountains extend in a northwest-southeast direction and are separated from the Wrangell Mountains by several low passes extending from the head of Copper River to the White River. The highest point reached on the trail following along these passes is 4,990

feet on Cooper Pass between the Nabesna River and the Chisana River. The Nutzotin Mountains range in height from 6,000 to 8,500 feet with Mt. Allen, 10,420 (see topo map Bull. 417). The largest stream heading in the Nutzotin Mountains is Snag River, which heading south of the center of the range near the head of Chathenda Creek, flows northward through a deep valley to the lower country forming the head of the Tanana Valley. Snag River, however, turns to the northeast and joins Beaver River in Yukon Territory to form a tributary of the Yukon.

Nabesna River heads in Nabesna Glacier at an elevation of 2,600 feet, runs northerly for 22 miles in a broad, flat gravel filled valley and then enters a high walled canyon cut through the Nutzotin Mountains, for about 8 miles, to the lower country at the head of the Tanana Valley. The Nabesna River is the largest of the streams which unite to form the upper Tanana River. In the warmest day s of summer the river is impassable for foot travelers and often difficult for horses. Most of the streams contributing to the Nabesna south of the Nutzotin Mountains, are glacial fed from small isolated glaciers and are heavily laden with debris which helps to build up the gravel floor of the main valley.

Like the Nabesna, the Chisana River heads in a glacier of the Wrangell Mountains. Chisana Glacier is not as large an ice field as Nabesna Glacier and likewise Chisana River is not as large a stream as Nabesna River. It however shows sufficient volume in hot weather to make foot fording a risk. Like the Nabesna the Chisana follows a deep narrow valley through the Nutzotin Mountains and joins the Nabesna at the head of the Tanana Valley. Along the Chisana Valley south of the Nutzotin Mountains there is a wide basin gravel filled and well timbered. Bow Creek, Gehoenda Creek, Bryan Creek, Chathenda, and Chavolda Creeks all enter the Chisana River in this basin from the south and east. Cross and Notch creeks enter it from the west. On Chathenda Creek about 1 1/2 miles from its mouth is the placer mining camp of Chisana.

The Wrangell Mountains on the south rise to heights of from 10,000 to 16,000 feet and are heavily glaciered. The Nutzotin Mountains although not as high are sufficiently rugged. They do not at present contain many glaciers. The heads of the larger streams are however in small isolated hanging glaciers. The larger valleys all still retain their rounded U-shaped effect. The rivers draining from the Wrangell Mountains still retain the glacial topography

to a marked degree. Both Nabesna and Chisana river valleys show the U-shaped effect as far as the lowlands north of the Nutzotin Range. The higher peaks of the Nutzotins are sharp and jagged. Most of those in the Wrangell Mountains are flat-topped and terraced from the lava flows which cap them. The limestones beneath the lavas exhibit a castellated appearance along the bold outcropping cliffs.

Climate

The climate of this area is generally milder and with less snow fall than in the lower valleys of the Tanana, Yukon, and Copper Rivers. The area between the two mountain ranges is protected from severe winds and the higher elevations tend towards milder temperatures. Horses are wintered in the basins of the Nabesna, Chisana and White Rivers and come through in the spring without great difficulty, providing they are not too lean when turned out in the fall. During the summer of 1930 there were over 20 horses in the district which had spent the winter on their own resources.

The summers have considerable rains caused by the moisture laden air, travelling northwardly over the high snow covered mountains, precipitating out the moisture. Apparently there is a still greater rainfall in the Nutzotin Mountains. This was borne out during the writer's trip into the Nutzotins when it rained every day but one and upon returning to Bonanza Creek, just over the divide on the Chisana side, the miners stated that it had rained very little during that time.

Vegetation

There is a good growth of spruce occupying the valleys and hills below 4,000 feet elevation. In the gravel basin along Chathenda Creek trees over 24 inches in diameter were seen. There is a sawmill at Chisana and plenty of good saw timber closeby. On Nabesna River Valley and especially in the basin at the mouth of Jack Creek, there is fine saw timber. Timber-line in this area is at 4,000 feet. On the north slope of the Alaska Range timber ceases to grow at about 2,500 feet and on the coast of Prince William Sound at 1,200 feet.

Willows are found growing on many of the smaller tributaries at higher elevations and is available for fuel and for forage for horses. Grass and pea vine are found in the river valleys in sheltered localities. Grass is often found growing at considerable heights when

protected from winds and suitable soil is available. Generally where willows are found, grass is also present.

Game

Game is fairly plentiful in this area, although as in many other parts of Alaska, considerable time and labor is involved in procuring wild meat for the miner and prospector, mountain sheep are numerous in the mountains along the Nabesna and Chisana rivers. In the Nutzotin Mountains they are also quite plentiful and apparently have been disturbed very little by man. Wolves are also in abundance. One pair of wolves will destroy more game in a year than all of the miners and prospectors and natives in the whole district would ordinarily consume. Caribou are frequent visitors to this vicinity but due to their migratory habit, cannot be relief upon to present themselves during any season. Moose are found in the lower heavier timbered valleys, especially in the flats north of the Nutzotin Mountains. Bears of the black and grizzly varieties are fairly numerous. The black is considered edible by many but few are bold enough to try the grizzly.

Transportation

There are two methods used in reaching the Nabesna River and vicinity. By aeroplane it is about 75 minutes travel from Copper Center on the Richardson Highway to the landing field close to the mouth of Jack Creek in Nabesna River Valley. By foot or horseback trail, the traveler must go approximately 88 miles from Gulkana to reach the same point. An automobile highway is now under construction from Gulkana and is completed for over 30 miles. This highway will in all probability be continued to the Nabesna River then north through the Nutzotin Mountains to their north slope and east to the Chisana and Snag Rivers.

Chisana River and the vicinity is now reached by aeroplane 2 hours flying via Nabesna and Cooper Pass from Copper Center. Freight by pack horse is brought in to Chisana from McCarthy in summer by the Nizina-Russel Glacier-White River route. This route is used only in the summer and probably will be discontinued after two or three more seasons work on the Gulkana-Nabesna road. The winter route for dog freighting follows Copper Pass from Nabesna

River to Notch Creek and Chisana. This route is about 35 miles from Jack Creek. For horse sleds or tractors in winter the route from Jack Creek down the Nabesna, east along the north slope of the Nutzotin Mountains to Chisana River, can be used and is about 80 miles in length. Snag River would use the same route from Nabesna River, branching off when Chisana River was reached and would continue on southwesterly until Snag River was reached. This route would be approximately 63 miles from Jack Creek and cat erpiller tractors or horse sleds could be utilized for the whole distance without encountering any serious grades. A small caterpillar was used in 1929 to freight supplies from Chitina via Gulkana. This tractor reached Jack Creek and because of its small size was unable to travel farther. One of the larger caterpillar tractors would have little difficulty in making the journey the whole distance to Chisana. A tabulation of freight and passenger rates now existing is given below:

Route	Aeroplane	PackHorse Summer	Horse Drawn Sled
Passenger Rate			
Copper Center-Nabesna	$125.00		
Copper Center-Chisana	150.00		
Snag River	160.00		
Freight per pound			
Copper Center-Nabesna	0.35		
Chisana	0.40		
Gulkana-Nabesna		0.25	0.10
Chisana		0.35	
McCarthy-Chisana		0.22 1/2	
Bonanza		0.25	

Probably if sufficient tonnage were offered the above figures could be reduced.

Geology

The general geologic features of this area are shown on Plate 2 Bull. 417, U. S. Geol. Survey, Shrader, Moffit, Knopf and Capps. Plate 2, Bull. 630, U. S. Geol. Survey, Capps shows the revised and more detailed geology of the Chisana-White River District. Only portions of the Nutzotin Mountains have been examined geologically by members of the U. S. Geol. Survey. The important stratigraphic features shown in Bull. 417 is here given:

Quaternary	Gravels, till, and other unconsolidated deposits.
Tertiary	Volcanic Rocks. Litnite-bearing formation, including shales, sandstones, lignite beds, etc.
Jurassic	Shales of Jacksina Creek. Shales, slates, and graywackes of the Nutzotin Mountains.
Triassic	Thin bedded limestone of Cooper Creek.
Carboniferous or later	Lavas and pyroclastic beds--tuffs, volcanic breccias, etc. Shales of Skolai Pass.
Carboniferous	Massive limestone. Shales with some tuffs and lava flows. Basic lavas and pyroclastic beds, with some shale and limestone beds.

All of these rock formations, including the Tertiary deposits, are intruded by dikes and sills of a basaltic or diabasic nature and the carboniferous sediments have in addition been intruded by quartz diorites, diorite porphyries, and andesites.

The oldest recognized rocks (Devonian) found in this area are described by Capps as occurring at one locality, on Bonanza Creek near the mouth of Little Eldorado Creek and consisting of basic lavas, agglomerates, and tuffs, associated with considerable black shale and minor amounts of graywacke. They lie beneath the Carboniferous lavas and pyroclastic beds and are believed to be conformable with them.

The carboniferous rocks are found on both sides of the Nabesna River and are especially prominent along the sides of the lower 5 miles of the glacier, between Monte Cristo and Wait Creek, on Jack Creek, between the Nabesna River and Copper Pass, along the Chisana River, on Chathenda Creek, and are prominent south of the White River, and the headwaters of the Beaver. Capps reports these rocks as probably being continuous between the Nutzotin Mountains at the head of Beaver Creek and the St. Elias Mountains to the south and east.

The middle and most conspicuous member of this series is a massive crystalline limestone, locally altered to marble and varying in thickness from 200 to over 1,000 feet. It is conspicuous by its light color, varying from bluish gray to almost white. The predominating shade is a light cream. White Mountain, a local landmark between Wait Creek and Jack Creek derives its name from the distinguishing color of its massive carboniferous limestone. Lying above the massive limestone, is a series of lime shales and lavas. These shales have a thickness of from 100 to 400 feet.

This whole carboniferous series has been intensely intruded, tilted and faulted.

Mesozoic Rocks

Other than certain thin bedded limestones seen in the vicinity of Cooper Pass and between Notch and Wilson Creeks as described by Moffit and Knopf, the only Mesozoic rocks in this area occur in the Nutzotin Mountains and consist of a series of banded slates interbedded with graywackes, conglomerates, sandstones, limestones, and lavas slightly intruded and greatly folded and tilted. These sediments where observed are dark colored; black, gray, and bluish black.

Tertiary Lavas

Capping the higher mountains of the area south of Jack Creek, Cooper Pass and Cross Creek and along the Nutzotin Mountains between Snag and Beaver Rivers, also the hills north of White River, is a great thickness of sheeted lavas and pyroclastics. They have been poured out from the volcanoes of the Wrangell Mountains and lie dipping gently to the north. They have been described by Mendenhall, Prof. Paper No. 41, U. S. Geol. Survey, and consist largely of pyroxene andesites, commonly grading into olivine basalts which are often referred to as greenstones. They are locally known to contain copper minerals.

Tertiary Sediments

At a number of localities in this area sediments are found which are provisionally assigned to the Tertiary by Capps, and consist of conglomerates, sandstones, arkoses, and shales with some tuffs and interbedded lava flows. Locally they contain carbonaceous shales with some lignite, and in one place are composed of unconsolidated gravels. These sediments have been observed in a number of small isolated areas, the most important of which are on Rocker Creek, tributary of Ptarmigan Creek, on Rhyolite Creek, tributary of Chathenda Creek, on Gold Hill between Chathenda Creek, and Chavolda Creek and between upper Bonanza and Chathenda Creeks. They contain occasional thin lignite beds of no importance and are believed to be one of the contributing sources of the placer gold of the Chisana Placer District.

Quaternary

Rocks of the Quaternary found in this area are derived principally from glaciation. The region has undergone an intense regional glaciation which has been in operation for a considerable period, possibly even antedating the Tertiary and undoubtedly represented by a number of

advances and retreats. Capps shows the northern limits of glaciation in this region as extending several miles north of the Nutzotin Mountains. The valleys of the Nabesna and Chisana glaciers were the two main transportation routes of the gravel and till resulting from this intense glaciation. The principal deposits now remaining are found along the basins of the Nabesna and Chisana Rivers and consist of gravels, sands, and silts, locally stratified slightly, but generally unstratified, and unconsolidated.

Volcanic Ash

Overlying a considerable portion of this area, but nowhere observed in the Nutzotin Mountains nor west of Chisana River, is a blanket deposit of volcanic ash, white in color, and varying considerably in texture with the distance from its source. Behind the town of Chisana this deposit shows from 4 to 6 inches in thickness and lies immediately beneath the top moss and on top of an older moss covering. Farther west the thickness increases and near the head of White River it is said to be several feet in depth and to often show fragments of pumice several inches in diameter.

Intrusive Rocks

Intrusive rocks are exposed in a number of places in this area. Capps has divided them into two groups, an older group consisting of coarsely crystalline diorites and granodiorites, including gabbro and gabbro porphyry, and a younger group of oligoclase andesites and dacites with associated dikes and sills of gabbro and basalt porphyry.

The older group of coarse crystalline texture is reported as occurring in the Nutzotin and Wrangell mountains in small areas, also south of the White River and a large mass north of Beaver River and one between Chathenda and Chavolda Creeks. They also occur on both sides of the Nabesna River near its head, on Wait Creek, and White Mountain, Camp Creek, Cooper Creek, and undoubtedly in many other places. The intrusions are believed to have occurred prior to late Jurassic time. They are important to the prospector in that they are closely related to the most important lode deposits of this region.

The younger group of oligoclase andesites and dacites with associated dikes and sills of gabbro and basalt porphyry are reported by Capps as occurring in the basin of Rocker Creek near the international boundary, as dikes cutting the Jurassic and Cretaceous sediments of

upper Bonanza and Chathenda Creeks, as small stocks in the Chathenda Basin and in numerous other localities. Moffit and Knopf reported large exposures of andesite porphyry intruded into quartz diorite on Monte Cristo Creek. They also reported this intrusive near the mouth of Bond Creek on Nabesna River and at the head of Cross Creek invading the Carboniferous, and on Orange Hill at the head of Nabesna River.

Mineral Resources

The first prospectors in this region are reported as arriving on the White River in 1898, interested by Indian stories of native copper to be found in the creeks. From then on there was a gradual sifting in and out of prospectors in search of copper and placer gold. In 1905 the copper sulphide deposits of Orange Hill in upper Nabesna Valley were located. In the same year lode gold was found on White Mountain near Jacksina Creek in the Nabesna Valley and a small three stamp mill was erected by the Royal Development Company. Copper and lode gold deposits were located at a number of other places and placer gold was found in upper White River but not in workable quantities.

In the summer of 1913 William James while examining a gold quartz vein at the mouth of a stream later named Bonanza Creek, found rich placer gravels, which discovery resulted in a rush from other camps of Alaska and Yukon Territory. The result of this stampede was, that the limits of the paying gravels were soon outlined and much of the surrounding country was covered by prospectors. It was found that the richest of the Chisana placers was limited to a few creeks of narrow width. However, the stampede brought a number of permanent residents into the country and stimulated a search for other mineral deposits.

The war and its accompanying high wages, prices and dearth of labor, caused an exodus from this section as well as from most of the Territory. The region at present is devoid of prospectors except for the few placer miners in the Chisana District and those engaged in opening up the new prospect on White Mountain. This present development should encourage additional prospecting in that vicinity and also in the same Carboniferous formation elsewhere in the region.

The construction of the Gulkana Highway and the resulting simplification of the transportation problem should also tend to increase the search for mineral deposits.

Nabesna Mining Corporation
Whitham Group

On White Mountain over 30 claims are held by the Nabesna Mining Corporation that cover a number of contact metamorphic deposits exposed on the steep mountain sides. The country rock consists of massive crystalline limestones and calcareous shales intimately intruded by diorite and gabbro dikes and sills. These intrusives vary in composition and are greatly altered along the contacts. The limestones are locally marmarized close to the contacts. The principal contact minerals are garnet, magnetite, pyrite, chalcopyrite, arsenopyrite, sphalerite, galena, and possibly phyrrotite. They occur in relative amounts as listed.

The number of intrusive contacts appear to be plentiful and owing to the exposed character of the bedrock are easily found. They are indicated by the reddish brown gossan which, upon panning, shows gold.

The first attempt to work these deposits was in 1907 when the Royal Development Company erected a 3-stamp mill (250 pound stamps) and milled less than 100 tons of ore which is said to have returned $12.00 per ton. This ore was obtained from a contact deposit about 60 feet in length striking N 83° E and dipping vertical. The deposit was mined for a width of from 12 inches to 4 feet. Near the middle of this deposit a mineralized cross fracture was followed into the hillside for a few feet. The deposit pinched out in the floor of the open cut and shows only a few inches wide at either end. The contact farther east shows only slight evidence of gold mineralization. The contact shows a development of lime garnetization with magnetite, pyrite, and chalcopyrite. Quartz is the chief mineral accompanying the gold mineralization. The deposit shows some cerrusite with small amounts of anglesite. Beyond this deposit the contact shows only a development of garnet and magnetite. A sample taken across the east end of the cut over a width of 16 inches assayed;

gold 0.06 oz. silver 0.20 oz.

Below this cut is a tunnel that is 195 feet lower in elevation, now caved, which was driven for a distance of over one hundred feet but which failed to reveal commercial ore. A second tunnel 300 feet lower in elevation than the first and about 330 feet east of it, was driven a distance of 30 feet but failed to strike ore.

Above the opencut described above and about 275 feet higher in elevation is another contact (marked No. 2 on the sketch map)[1], which strikes east and dips flatly into the hill. The contact material includes pyrite, arsenopyrite, quartz, and a small amount of sphalerite. The quartz appears to be distinct from the other mineralization except for a certain pyritic content and probably was deposited considerably later than the contact metamorphic minerals. It is not possible to determine positively as to this, due to the oxidized nature of all surface outcrops examined. Contact No. 2 measures about 48 inches in width.

Outcrop No. 3 is a mineralized fissure striking S 70° W and dipping 45° NW. It varies in width from 6 inches to 3 feet and is exposed on the surface for a distance of about 25 feet. The vein filling is soft crumbly quartz, possibly other silicates and iron oxide. The walls are calcareous shale. A narrow dike of diorite outcrops a few feet north of this vein. The walls do not appear greatly altered.

Outcrop No. 4 is a vein striking S 60° W and dipping 60° NW. The vein shows 36 inches of soft oxidized material. Both walls are shaley limestone but a few feet north of the vein is a diorite dike. The outcrop is strongly oxidized showing no sulphides. A sample taken across 36 inches of its width is reported to have assayed $24.00 in gold and silver.

At outcrop No. 5 is a vein striking N 70° E and dipping steeply to the west. The vein shows a width of 30 inches filled with crumbly quartz, pyrite, arsenopyrite, and small amounts of galena. The south wall of the vein is diorite and the north wall limestone.

No. 6 outcrop shows a width of 15 feet and a length of about 25 feet. The walls are massive limestone showing much garnetization. The outcrop is heavily mineralized with garnet, magnetite, and pyrite. About 40 feet west of this mineralization is a narrow igneous apophysis intruding the limestone and trending in a northwest direction. This rock is probably diabase.

At No. 7 the massive limestone shows intense igneous metamorphism. The lime has been altered to garnet, of the green variety, showing well developed crystals measuring as much as 2 inches across. Considerable chalcopyrite is associated with the garnet. A number of stringers cut the mineralized zone and are said to carry good values in gold. The limestone here strikes N 54° E and dips 34° SE.

[1]Outcrops numbered to correspond with references in the text are shown on map opposite page-

At outcrop No. 8 which is almost directly under the tram line, occurs a vein known as the "Tower Knob" vein which strikes N 40° E and dips 76° NW. This vein is somewhat irregular as to strike, dip, and width, and has a number of branches that extend into the limestone wall to the west. The limestone is greatly altered and shows considerable garnetization and in one place exhibits a slight schistosity. The vein varies from a few inches to over 30 inches in width. It consists of soft decomposed iron stained material containing some quartz. The vein is cut off abruptly on the northeast at a point about 80 feet below Tower Knob. This break possibly may be a fault that follows the gulch but there is no visible surface evidence of faulting.

Assays furnished the writer by Mr. Carl F. Whitham, general manager for the Nabesna Mining Corporation, of samples taken from this vein are here listed;

Sample 256 - Tower Knob Vein width 39 inches	gold 3.6 oz.	silver 7.40 oz.
Sample 257 - Tower Knob vein width 7 feet, gray and brown ore, 30 feet south of 256	2.05	1.65
Sample 258 - Tower Knob Vein width 30 inches, between Tower Knob and upper tram term	4.55	3.85

At outcrop No. 9 on top of the ridge between the upper tram terminal and Swede Gulch and at an elevation of 4,278 feet, the Bear vein is exposed dipping into the mountain at an angle of 28° to 30° NW. This vein strikes N 45° E and is on the contact of massive limestone and a small sill of diorite which forms the backbone of the ridge. At the outcrop the vein filling is soft and crumbly and contains some pieces of flinty quartz that carry pyrite. Other vein minerals are fine crystals of pyrite, cerrusite, marcasite, and anglesite. The vein is light gray in color with a dark gray streak near the middle that contains considerable cerrusite and anglesite. The vein shows on the surface a width of from 3 feet to 4 feet. Pannings taken from this soft vein filling show considerable free gold. The gold is irregular in shape but not angular. It is stained a dark color probably resulting from the cerrusite present. This stain may easily be rubbed off the pan with the finger.

The hanging wall of this deposit is dark gray diorite that contains considerable magnetite and chalcopyrite along the contact wall. The footwall is massive crystalline limestone dipping 36° SE and striking N 25° E. This limestone shows little garnetization close to the contact but has been greatly marmarized for some distance from the contact.

The contact is irregular as to direction and dip where exposed along the surface. It has been traced a short distance down into Swede Gulch. It does not show the mineralization evident above. From a point close to the discovery outcrop a shaft has been sunk 30 feet almost vertically. This shaft was badly iced up from surface seepage freezing on the walls which were therefore difficult to examine. According to Mr. Whitham however, the vein was encountered at a depth of 7 feet in this shaft and at a depth of 20 feet the material penetrated commenced to change from the gray cerrusite color to the brownish color producted by iron exide. He found that the values also changed at this point. It is possible that the shaft has passed through the vein and into the footwall, which fact would explain the decrease in values that oocurred.

On the side of the ridge followed by the tram an opencut driven in a few feet at a point slightly lower than the Bear Vein outcrop, encountered the vein which at this point is said to carry good values and to held its width. Returns from the assay of a sample taken by Mr. Whitham at this cut are as follows:

4 feet wide, gold 18.60 oz.; silver 12.70 oz.; lead 1.6%

At a point 80 feet below the Bear Discovery and close to the upper terminal of the aerial tram, a tunnel has been started to intersect the vein. This tunnel will give much information regarding the nature of the vein, character of ore, and condition of the gold formining and milling purposes. It is reasonable to expect that at a depth the gold will be associated with lead and copper sulphides instead of occuring free, as it does in the oridized zone.

Assays of samples obtained from the Bear Vein by Mr. Whitham are here listed:

N. 241 Bear Vein Shaft 9 feet depth gold 17.25 oz. silver 0.14 oz.

Sample No. 242. Bear Vein Shaft 8 feet depth, brown ore on hanging wall, low grade following main ore body.	gold 0.11 oz.	silver 0.14 oz.	
Sample No. 243. Bear Vein Shaft 12 feet depth, 18 inches width	gold 1.25 oz.	silver 0.85 oz.	
Sample No. 244. Bear Vein Shaft, 16 feet depth, brown and gray ore	gold 7.90 oz.	silver 9.10 oz.	
Sample No. 245. Bear Vein Shaft, 21 feet depth, 3½ feet wide.	gold 0.24 oz.	silver 0.56 oz.	
Sample No. 247. Bear Vein Shaft, 29 feet depth, 2½ feet wide hanging wall,	gold 0.04 oz.	silver 0.56 oz.	
Sample No. 248. Bear Vein Shaft, 18 feet depth, 3½ feet wide dip 70° W.	gold 10.15 oz.	silver 11.85 oz.	
Sample No. 248. Bear Vein Shaft, 29 feet depth, south side, 3 feet wide, brown ore	gold 0.23 oz.	silver 0.87 oz.	
Sample No. 264. Bear Vein bottom shaft	gold 0.11 oz.	silver 0.49 oz.	lead trace
Sample No. 261. Bear Vein dark streak near center of vein,	gold 6.33 oz.	silver 192.70 oz.	
Sample No. 262. Bear Vein west end of surface cut, lead carbonate streak 18 inches wide.	gold 20.45 oz.	silver 30.70 oz.	lead 19.2%
Sample No. 253. Bear Vein, open cut, 5 feet wide	gold 14.00 oz.	silver 18.60 oz.	lead 2.9%

Samples taken by the writer from the Bear Vein near the south end of open cut mentioned above and over a width of 5 feet, were assayed with the following results:

Gold 10.39 oz.; silver 12.70 oz.; lead 1.67%; copper 0.15%

Sample from Dark streak near hanging wall- 5 inches wide, assayed as follows:

gold 49.74 oz. silver 73.00 oz. lead 6.11%

At No. 10, about 150 feet southwest of the Bear Vein outcrop, and at an elevation of 4,158 feet, along the lower contact of the same sill of diorite, that is exposed at outcrop No. 9, copper mineralization shows for a distance of over 50 feet. The lower side of the contact is shaley limestone and the upper side is dark gray quartz diorite. The

limestone beds dip 42° NW. and strike N. 15° E. and the diorite sill apparently follows along the bedding planes. The contact is mineralized for a few inches in width and shows magnetite and chalcopyrite with oxidized copper minerals. A grab sample taken for a length of 5 feet along this contact gave assay results as follows:

gold 0.10 oz. silver 1.80 oz. copper 4.2%

A sample taken by Mr. Whitham gave the following results:

Sample No. 254. Copper Veins, 8 inches to 10 inches wide 150 feet southwest from Bear Vein Shaft.

gold 0.24 oz. silver 7.96 oz. copper 20.8%

At outcrop N. 11 in Swede Gulch is a fissure striking N. 19° E. and dipping 79° SE. Both walls are massive crystalline limestone. The fissure varies from 12 inches to 36 inches in width and is filled principally with crushed limestone. Close to the bottom of the vertical limestone face the fissure is mineralized with fine crystals of pyrite, cerrusite and white anglesite. A sample of the pyrite taken by Mr. Whitham assayed;

Sample No. 263. Iron Sulphides, Swede Gulch
2-3 feet wide.
gold 3.8 oz. silver 5.60 oz.

Assays of other samples taken from this vein by Mr. Whitham are here listed:

Sample No. 250. Swede Gulch Vein, 16 inches hanging wall

gold 0.16 oz. silver 5.44 oz. lead 3.9 percent

Sample No. 251. Swede Gulch Vein, 28 inches center of vein.

gold 1.-2 oz. silver 3.18 oz. lead 1.1 percent

Sample No. 252. Swede Gulch Vein, 30 inches foot wall,

gold 1.10 oz. silver 2.25 oz. lead 4.7 percent

Sample No. 1. Average ore in walls of Swede Gulch Vein.

gold 0.19 oz. silver 14.05 oz. lead 11.6 % copper 2.7%

Several hundred feet north along Swede Gulch and on the north wall of the contact is a large area intensly mineralized with magnetite. This mineralization is in the massive limestone and extends to within 30 feet of the top of the formation. The shales above it strike east and dip 35° to the south. These mineralized beds are many in number and vary in thickness from 2 inches to several feet. The beds of the formation include thin shales, blocky limestones and thin sandstones. Folding and faulting has lowered these beds on the southwest and somewhat complicated the geologic structure. The richest ores appear to lie in the contact zones bordering the massive limestones although this relation is not definitely proven. The Bear Vein apparently is the most valuable of the deposits so far discovered.

Igneous metamorphic deposits of this character are apt to be irregular as to width, length, and values. Careful geological study will be necessary to locate such deposits as are not exposed at the surface. Assays show the ones to have a considerable lead and copper content which may necessitate other treatment than amalgamation, Undoubtedly the ores will show a slightly lower gold content with depth. Oxidized outcrops usually show higher values in gold than the unaltered ores below. The zone of oxidation will probably extends to over 100 feet in depth on White Mountain.

This area of White Mountain and vicinity has been only slightly prospected for gold lodes. The Carboniferous sediments of the region are a fertile and nearly virgin field for the prospector. Search for one deposit in rocks of this series should be confined to those areas that show evidence of the occurrence of intrusive diorites.

On Chathenda Creek Gold Veins

Moffit and Knopf report an outcrop of sulphide ore in a surface exposure on Veaver Creek about a mile above the mouth of Ptarmigan Creek, which consists of

solid phyrrotite admixed with a little chalcopyrite and quartz that is said to carry from $18 to $40 a ton in gold. This deposit is described as being apparntly in shattered diorite rock traversed by narrow quartz seams.

They also report a number of strong quartz ledges at the head of Eureka Creek near the international boundary that occur in Carboniferous sediments and are said to carry chalcopyrite, galena, sphalerite, and gold values. On Anaconda Creek across the divide on the head of Eureka Creek a vein solid quartz from 6 feet to 12 feet wide is reported that crossucts the stratification of the country rock and is exposed for a considerable distance. The vein is said to contain chalcopyrite and azurite, and is also reported to assay $1.50 per ton in gold.

A number of other veins carrying chalcopyrite and small amounts of gold are reported to occur in the vicinity of Eureka Creek. These veins are from 8 feet to 30 feet in width where exposed and are all associated with intrusive rocks.

In the canyon of Chathenda Creek about 1½ miles below the mouth of Bonanza Creek, occurs fine-textured, dark intrusive rock which is mineralized with chalcopyrite and marcasite. Capps describes this mineralized belt as striking N. 65° W. and dipping 78° SW. A short tunnel that penitrates this belt at an elevation of 3740 feet, was full of ice at the time of the writers visit and could not be examined. An upper tunnel, 60 feet higher is elevation driven on the same belt and having a course of N. 62° W., was caved. These tunnels are driven in a sheared zone which shows 1½ inches of gouge and crushed quartz on the foot wall above which is about 26 inches of brecciated rock heavily mineralized with pyrite. The wall rocks on both sides of the zone also show considerable pyrite. A grab sample of this pyritized alll rock taken by the writer assayed;

gold 0.01 oz. silver 0.10 oz.

At the mouth of the canyon of Bananza Creek a vein was seen exposed in the creek bedrock of a placer cut where William James was mining. This vein strikes N. 47° W. and dips 75° NE. and shows 8 inches of filling that grades from solid calcite

on the hanging wall to quartz on the footwall. The footwall shows heavy pyrite mineralization. A sample taken across this vein assayed;

gold trace, silver trace.

On the bluff east of Bonanza Creek and about 100 feet downstream from the above described vein is another vein 12 inches wide striking N. 70°E. and standing vertical. The filling on the south side of this vein is white calcite and quartz showing some copper stains and a few specks of galena intermixed with considerable chalcopyrite and pyrite. On the north side the vein is soft yellow crumbly quartz and calcite. A sample taken across this vein assayed;

gold -.02 oz. silver 0.40 oz.

About 600 feet upstream from the vein first described, several stringers show on the west side of Bonanza Creek on the steep bluff just above the creek level and at an elevation of 3,950 feet. They vary in width from 1 to 12 inches and show for some distance along the canyon. These stringers also carry considerable pyrite and quartz filling. Pans were taken from several of them that showed a few colors of gold. These stringers are nearly parrallel and strike N. 80° W. anddip steeply to the northeast. A sample taken across the last one upstream examined, and across 12 inches of width assayed;

gold 0.06 oz. silver 0.20 oz.

About 40 feet upstream from the automatic dam located at the mouth of Bonanza Creek and on the east side of the canyon at creek level, a vein was examined which strikes N. 75° E. and dips steeply to the NE. This vein shows from a few inches to over 16 inches in width and contains a large amount of pyrite, crumbly quartz and calcite. Pans of this fine material showed a few colors of fine gold. A sample taken across 6 inches of the pyrite assayed;

gold 0.22 oz. silver 0.60 oz.

This section at the mouth of Bonanza Creek is without doubt well mineralized

and contains a large number of small veins and stringers. Careful examination of these might expose considerable widths of low grade material.

On upper Bonanza Creek near the upper end of No. 8 above Placer Claim a vein shows in the creek bedrock cutting across the canyon in a direction of S. 50° E. and standing vertical. This vein shows the following cross section measured from north to south (downstream).

Solid calcite with a clean seperation on both sides	24 inches
Solid calcite	36 inches
Brown clayey gouge	5 inches
Solid calcite with clean seperation	60 inches
Solid calcite	36 inches
	Total 161 inches

This vein shows practically no quartz or other mineralization. A grab sample taken across this vein returned;

gold 0.02 oz. silver 0.10 oz.

A vein was reported to the writer by B. J. Davis as outcroping under the gravels on the ridge between Little Eldorado and Bonanza Creeks. This vein was described to the writer as being 24 inches wide and containing considerable galena. A specimen from this vein given to the writer assayed;

gold 0.01 oz. silver 62.40 oz. lead 72.95%

Near the head of Nabesna River just north of Nikonda Creek a group of patented claims is held by the Alaska Nabesna Corporation. Considerable work has been done upon these claims by open cuts, shafts, tunnels, and by diamond drilling. The writer visited this property in J-ne 1930, and although the owners were not at the property, most of the workings not caved in were examined. The Alaska Nabesna Corporation owns 18 claims and a mill site. Two substantial log buildings have been erected on the property including an assay office. A complete gasoline-driven diamond drill with necessary equipment is at the property.

Rising from the flat terrace by the side of Nabesna Glacier Moraine is a long low hill which reaches a height of over 500 feet. This hill is rusty red in color from the weathering of the diorite rock which composes its mass and from which color it has been named Orange Hill. The hill is over 4,000 feet in length and extends east for over 1,500 feet to the higher mountains which are composed principally of Carboniferous sediments. Orange Hill is cut diagonally by a deep gulch running northwest, which gives an excellent exposure for examination on that side. The hill along Nabesna River and Nikonda Creek is well exposed for its full length.

The rock of Orange Hill is quartz dioritevery extensively mineralized with chalcopyrite, and pyrite, and containing small amounts of molybdenite, gold, and silver. The hill has been prospected by a number of short undergound workings, and by diamond drill holes. These show that chalcopyrite is distributed in small amounts throughout the intrusive rocks.

To some extent the quartz diorite grades into a dark basic rock of the gabbro type. This rock contains many scattered irregular quartz and calcite stringers. Although the quarze of these stringers often contains chalcopyrite, a study of hand specimens indicates that the copper mineral is principally disseminated in the diorite itself. The diorites of Orange Hill are much weathered and decomposed at the surface but oxidation generally extends to only a few feet in depth, where the unaltered sulphides are found. There will be no zone of enrichment in this deposit on account of its having been so recently glaciated.

Near the west end of the Glacier Claim at an elevation of 2,806 feet and 20 feet above the foot of the hill, a tunnel has been driven a distance in a direction of N. 70° E. for 16 feet. This tunnel shows dissemination of chalcopyrite through the diorite.

About 500 feet north of the above tunnel and near the west end of the Nabesna Claim a tunnel has been driven in a direction of S. 25° E. for a distance of 45 feet. This tunnel is 24 feet above the base of the hill. It shows the same scattered chalcopyrite.

On the California Claim, near its west end, a tunnel 16 feet in length shows chalcopyrite scattered through the diorite and also shows a number of quartz and calcite

stringers. The quartz stringer contains some chalcopyrite.

Another tunnel driven south from the side of a small gulch, tributary of the deep California claim shows similar chalcopyrite mineralization in its face. This tunnel is 10 feet in length. Several pits and shafts on Orange hill were caved in and could not be examined.

Along California Creek gulch and the tributary gulches the same chalcopyrite mineralization shows in the diorite. The creek has carved a canyon from 100 feet to 400 feet deep which exposes the fresh diorite on its walls close to the creek bottom.

Over 2,100 feet of diamond drill holes have been driven into this hill which are said to show an average content of less than 1 percent copper.

Adjoining the Orange Hill Claims on the east are a number of claims owned by the Alaska Nabesna Corporation, which cover a zone of copper mineralization in the Carboniferous limestone along thd near its contacts with intrusive rocks. These contacts are exposed along the mountain and extend in a southeasterly direction.

The limestones are generally massive but in a few places show a more thinly bedded structure. These beds have a thickness over 1,200 feet vertically which may represent considerly more than the actual thickness due to tilting and faulting. They trend in a northwest southeast direction and dip from 17° to 30° to the northeast. Along and in the vicinity of the contacts the limestones show intensive alteration to garnet. The contact minerals magnetite, pyrrhotite, and chalcopyrite are present in relative ampimts as listed.

On the Lemon Extension No. 2 Claim about 450 feet from the west end line and near the center, a tunnel has been driven for a distance of 90 feet and at an elevation of 3,365 feet. This tunnel is in limestone which is heavily mineralized with garnet, magnetite, pyrrhotite, and chalcoprite. The following is exposed by this tunnel which has a direction of S. 77° E.

Mouth of tunnel to point 28 feet in.	Massive limestone showing some green garnetization but no sulphides.
28 feet to 50 feet, fault shows crossing tunnel 90°.	Limestone heavily mineralized with garnet, magnetite, pyrrhotite and chalcopyrite.
50 feet to 80 feet, fault crosses tunnel 12 inches wide, cuts off mineralized lime.	Heavily mineralized with magnetite and chalcopyrite.
80 feet to 90 feet	Light colored limestone showing slight mineralization.

A diamond drill hole driven under the supervision of Mr. Carlyle Weiss from a point in front of the entrance to this tunnel showed the following log;

No. 11 Drill Hole

Total depth of hole 188 feet
Angle (dip) 33° (-)

Core Data

0 - 22' Rock cut is lime and garnet with some quartz.

22 - 34½' Cut into solid white iron, most of it showing copper stain on the surfaces; malachite stain in contacts and joints. Rock apparantly is solid iron (sulphides) with the black magnetic variety filling in between the white iron. Shows little signs of oxidation.

34½ - 42½' Abruptly changes to lime with garnet, showing some streaks of white iron and apparently chalcopyrite. The iron is variable, some places heavy, others light deposits

42½ - 56½' Rock cut was chiefly quartz and garnet.

56½ - 68½' Blue gray lime with iron stain and some white iron. Latter part of core is less mineralized.

68½ - 75½' Continuation of lime with considerable oxidized iron and some white iron

75½ - 81' Lime with soem quartz and garnet showing spotted crystallization of white iron.

81 - 82' Cut through stringer of solid white iron showing some copper stain.

82 - 108' Lime garnet with crystallized mineralization of shite iron appearing throughout.

108 - 188' Core for this distance was mixed and out of order. Mineralization appears to be thinning out and most core shows practically none. Rock is lime with garnet and quartz and chiefly blue gray color.

Assays

B-57 Core from 0 - 28'
Copper 3.8%

B-58 Core from 28' - 34½'
copper 3.7%

B-23 Sludge from 22 - 27'
Copper 2.85%

B-59 Core from 34½ - 42½'
Copper 2.7 %.

B-60 Core from 56½ - 81'
Copper 0.5%

B-61 Core from 81 - 108'
Copper 0.3%

B-62 Average of all core from hole
Copper 0.95%

There is such a quantity of magnetic minerals (magnetite and pyrrhotite) present in the limestone in the vicinity of this tunnel that the compass needle is deflected as much as 180° on account of which it was difficult to take compass readings in the vicinity.

An opencut 56 feet higher than and directly in line with the tunnel shows the same altered lime with magnetite, pyrrhotite and chalcopyrite in considerable amounts. The bedrock surface for some distance above this cut is obscured by overburden and vegetation, making it impossible to trace the mineralization beyond the bluff where the tunnel and opencut are located. No intrusive rocks are exposed within several hundred feet of the tunnel. About 300 feet south of the tunnel there is a large quantity of diorite talus showing in a gulch.

This has probably moved down the mountainside from a location much higher. About 800 feet wouth from the tunnel, there is a dike of light colored siliceous porphyry rock (probably granodiorite) about 50 feet thick, cutting through the limestone in a

northeast direction. This dike shows higher up on the limestone bluffs on the Lemon Extension No. 3 Claim.

On the Lemon Extension No. 3 Claim about 150 feet east of the grandoiorite dike and 50 feet higher, is a mineralized outcrop in limestone which has been greatly silicified. On the outcrop are two cuts which show some chalcopyrite and considerable carbonate coating on the rocks. The body of mineralized materials at this place does not appear to be large.

On the Copper King North Extension No. 1 claim a similar mineralized zone occurs along a light colored limestone bluff for over a thousand feet in length. This mineralization is irregular and spotted. Close to the east end of the claim at over 4,600 feet elevation, some opencuts and diamond drill holes have prospected a large mineraliaed zone which occurs there. A cut 50 feet in length along the mountainside shows lime with chalcopyrite, bornite and copper carbonates. Just above this cut at an 4,670 feet is a tunnel about 6 feet in length. This tunnel shows mineralization similar to that in the cut below. A diamond drill hole driven from a point a few feet east of this tunnel shows the following log;

Drill Hole No. 14

Total depth of hole	93 feet.
Angle (dip)	5° up. (5 degrees up).

Core Data

0 - 10'	First 10 feet was loose side crush and removed by shovel in placing drill.
10 - 15'	Oxidized strata of lime and garnet rock showing traces of copper stain, bornite and chalcopyrite.
15 - 20'	Going into heavier lime showing good stringers of bornite with chalcopyrite.
20 - 25'	Core is stained lime. Cutting many cross stringers of chalcopyrite, some as thick as 3/16 inch.
25 - 30'	Practically a continuation of last 5 feet.
30 - 34½'	Lime becomes more dense giving longer pieces of core. Core shows crosscut mineralization principally chalcopyrite.

34½ - 39' Practically a continuation of above.

39 - 44' First 2 feet is a continuation of last core showing chalcopyrite in crosscut formation. Last 3 feet goes into red lime showing only little mineralization of chalcopyrite in feather-edge veins.

44 - 47' Lime becomes harder showing a little quartz. Mineralization is poor.

47 - 49' Continuation of last mineralization showing a little.

49 - 54' Core goes into white lime again showing small pockets of bornite.

54 - 61' Dense lime stained and showing small pciket mineralization.

61 - 68½' Into red rock again with almost no mineralization.

68½ - 71½' Continuation of dense stained lime with heavy cross vein mineralization of bornite and chalcopyrite.

71½ - 74' Going into white lime with cross contacts of solid pure white lime showing some bornite present.

74 - 84' Denser lime with small pockets and stringers of bornite, chalcopyrite. Shows cut of mineral pocket apparantly MoS2 at about 76' depth.

84 - 89½' Into dark rock carrying some bornite and chalcopyrite. At 86' depth molybdenite found in spattered pockets. Mineralization becomes poorer as core advances. Hard gray porphyry rock at 88 feet depth.

89½ - 93' Continuation of gray rock with green stain and some little mineralization on contact and seams.

Assays

B-17 Core from 10 to 15'
Copper 8.2%

B-18 Core from 15 to 16½'
Copper 9.5%

B-19 Core from 16½ to 18½'
Copper 0.7%

B-20 Core from 18½ to 20'
Copper none

B-21 Core from 20 to 25'
Copper 1.5%

B-42	Core from 25 to 41' Copper 0.75%.
B-43	Core from 41 to 49' Copper 1.5% .
B-44	Core from 49 to 61' Copper 1.65%.
B-22	Core from 74 to 79' Copper 0.6% .
B-45	Core from 61 to 74' Copper 0.4%.
B-46	Core from 79 to 84' Copper 0.7%.
B-47	Core from 84 to 88' Copper 0.9%.
B-48	Core from 88 to 93' Copper 0.9%

The higher portions of the mountains containing these copper-bearing zones are capped by younger lava flows. The extension of the limestone contact with copper mineralization has been found three claims beyond the Copper King North Extension No. 1 claim where it is said to show values similar to the above. The exposures were not examined by the writer.

White River Precinct
Snag River Area

On the sharp high ridge east and south of the two forks of Snag River in the Nutzotin Mountains, a number of patented claims are owned by the Chisana Mines, Incorporated. The property is commonly referred to as the Sulzer property. On the claims of this group is a belt of copper mineralization which has been traced for about 3 miles in a southeast direction.

The rocks of this section are slates, graywackes, conglomerates, and limestones which have been greatly folded and faulted. Overlying these sediments is a considerable mass of basic lavas (greenstones and andesites).

Erosion has cut deeply through these lavas and into the sediments beneath, ex-

pasing them fully. The lavas are now found covering only the higher ridges and some of the older valleys which have been filled to a considerable depth.

The principal copper mineral is bornite with lesser amounts of chalcopyrite. This copper mineralization is found in the basic lavas accompanied by the oxidation products, native copper, malachite and azurite. A few quartz and calcite stringers are generally found in the mineralized localities. The mineralization occurs sporadically and no large continous bodies of ore have been found.

On the Butte Creek Group of claims, which is located on the west side of Butte Creek and one half mile from its mouth, a number of opencuts have been dug on mineralized outcrops. They all show small irregular bunches of bornite and some calcite stringers. On the Dawson Claim an opencut shows slight mineralization covering a width of about 10 feet. Most of the other cuts show mineralized material from a few inches to 5 feet in width.

The Cosmopolitan Group of Claims lies along the ridge between Sheep Creek and the East Fork of Snag River and extends from Snag River east for about 9,000 feet. The lavas lie along this ridge dipping gently to the northwest. The Mesozoic sediments show along the canyon of Sheep Creek and along the front of the bold bluff bordering Snag River valley. The sediments strike about N. 65° W. and vary in dip from 5° SW. to 89°NE. The following section of the beds is exposed on Sheep Creek, the beds being listed from the bottem up;

Thin bedded limestone

Massive limestone

Sandstone (bedded)

Conglomerate

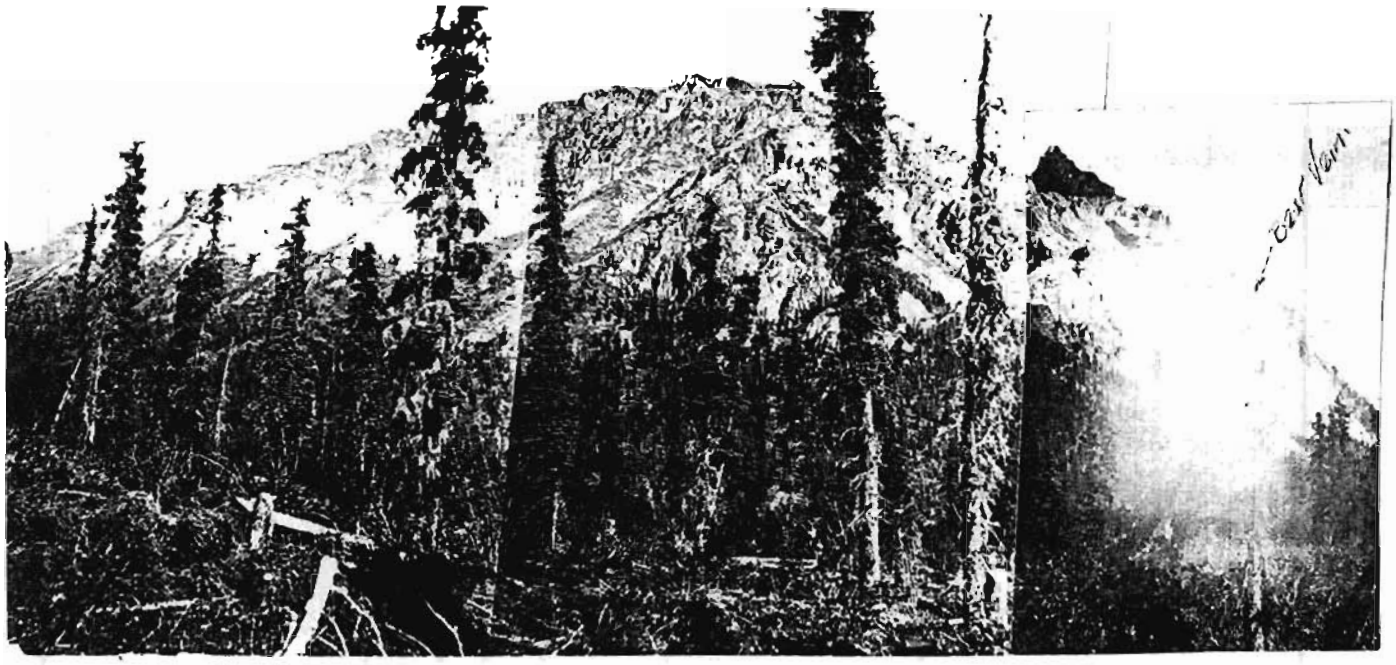
Lava (overlying but not conformably).

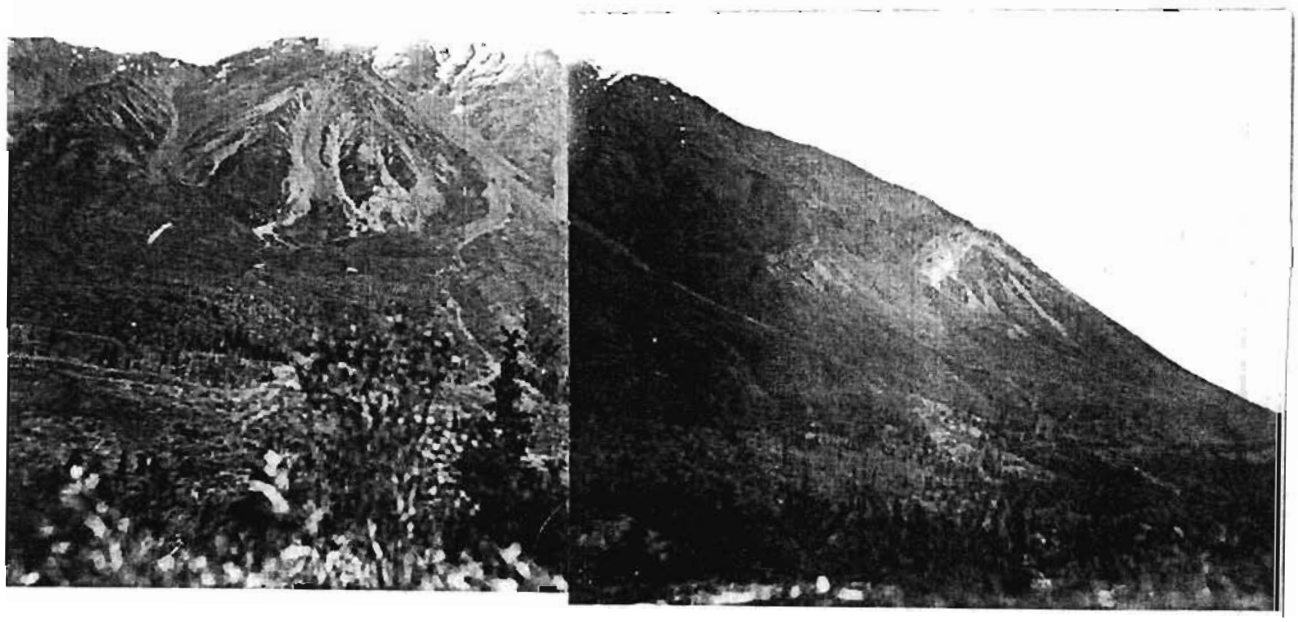
Near the west end of the Sybil Claim just over the saddle from the head of Sheep Creek and at the head of Abe Lincoln Pup, a tunnel has been driven a distance of 87 feet on a copper bearing zone in andesite at its contact with an underlying

conglomerate bed. The conglomerate is composed of boulders and pebbles of extrusive rock, probably andesite that vary from 2 inches to 12 inches in diameter. The conglomerate has a thickness of about 25 feet above the sandstone beds and dips flatly to the southwest. An area about 100 feet wide shows slight mineralization of bornite and chalcopyrite. Green copper stains have coated the conglomerate beneath. The tunnel shows scattered mineralization of chalcopyrite with occasional bunches of bornite. A number of opencuts have been made in the lava on mineralized patches along the ridge towards Snag River.

There is a group of patented claims on upper Gehoenda Creek (Trail Creek), about 12 miles from its mouth and the same distance from the town of Chisana. They cover a belt mineralized with native copper that occur in amygdaloidal lava associated with calcite, pectolige, quartz and possible prehnite. The claims are at elevations above 4,800 feet and extend along the rounded untimbered hills for over a mile in an easterly direction.

In a small gulch cutting across the Chisana claim near its eastern blobs, and fine stringers, an opencut in the east bank shows the same amygdaloidal andesite mineralized with native copper and the oxidation products, cuprite, and malachite. About 15- feet east of this cut is another trench 100 feet in length similarly mineralized. Several trenches dug on the claims farther east show a more pronounced amygdaloidal structure. No copper was visible to the eye, but, on crushing and panning, this rock showed copper in considerable amount.





White 17.
Wiley Nabesna
Mining Co's Claims
are located.

Mts. and Claims
east ~~of~~ from Orange Hill

Looking down into head of
Snag River from Johnson Pass
at head of Chathunda Creek.
Nutzotin Mts.

Nabesna Glacier from
claims east of Orange Hill

Head of Chathunda
Creek. Nutzotin Mts

Headframe Lower Tributaries
Nabesna Min. Co.
White Mountain.