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# SAMPLING FOR GOLD IN RIVER BARS, KUSKOKWIM RIVER BASIN, ALASKA

by Raymond P. Maloney

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UNITED STATES DEPARTMENT OF THE INTERIOR

Walter J. Hickel, Secretary

BUREAU OF MINES

John F. O'Leary, Director

# INTRODUCTION

As part of the Bureau's heavy metal investigation, work was in progress on mercury deposits in the Kuskokwim River Basin near the Red Devil area. Years ago, prospectors were observed hand-sluicing very fine placer gold from river bars in the Kuskokwim River. Therefore, a cursory sampling was conducted of the river bars in the immediate area to determine if there might possibly be significant amounts of gold present in these sediments which are far removed from known sources of gold mineralization.

Thirty one-quarter cubic yard samples were concentrated by washing in a small portable sluice box; the concentrate was panned down to about 500 grams and was then submitted for fire assay.

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## ABSTRACT

River bars were sampled over a 50-mile interval of the Kuskokwim River to determine the possibility of their containing significant amounts of gold. One-quarter cubic yard samples were concentrated by washing in a small, simple sluice box, and the concentrate further reduced by hand panning and then assayed.

Colors of very fine gold were seen in the pan concentrates from all samples in the 50-mile interval, but assay results varied from nothing to about 2 cents per cubic yard of river bar material. It is questionable how much of the total amount of gold present in the samples was recovered in the concentrate; probably much less than 50 percent.

The work indicated that the river bars contain free gold, and gold is presently being transported and deposited by the silt-laden waters. Additional investigation would be necessary to determine the extent and importance of this potential gold source; recovery in large-scale channel dredging operations, or as a byproduct in harbor excavations might be of economic significance.

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## LOCATION AND DESCRIPTION

Sand bar samples were taken within a 50-mile-long section of the Kuskokwim River between Sleetmute and Crooked Creek, in the George River, about 3 and 4 miles upstream from its mouth, and in the Holitna River, from its mouth to about 12 miles upstream (figs. 1 and 2). The George and Holitna rivers are tributaries of the Kuskokwim River. This area is at about latitude 61°45' N and between longitudes of about 157° to 158° 10' W.

The adjacent drainage area is part of the Kuskokwim Mountains. The rocks are mostly sedimentary; namely, the Kuskokwim series of interbedded Cretaceous shales, sandstones, and graywacke, with some Tertiary rhyolite and basalt intrusives. The topography is featured by low-rolling hills with a maximum elevation of about 2,000 feet.

There is considerable mercury and antimony mineralization adjacent to the drainage area, but little gold mineralization. This is one of the most barren intervals on the Kuskokwim River in regard to gold mineralization. A small placer gold operation, inactive for many years, located adjacent to the George River and about 30 miles upstream from its mouth, is the nearest known gold occurrence of significance that might contribute gold to the river bars in the sample area. Major lode and placer gold mineralization in the present drainage pattern occurs at Nixon Fork about 300 miles upstream from Sleetmute on the Kuskokwim River. There are several small, known occurrences of placer gold in the area drained by the Holitna River, about 100 miles upstream from its confluence with the Kuskokwim River. Sediments from all of these could be assumed to eventually reach the area sampled.

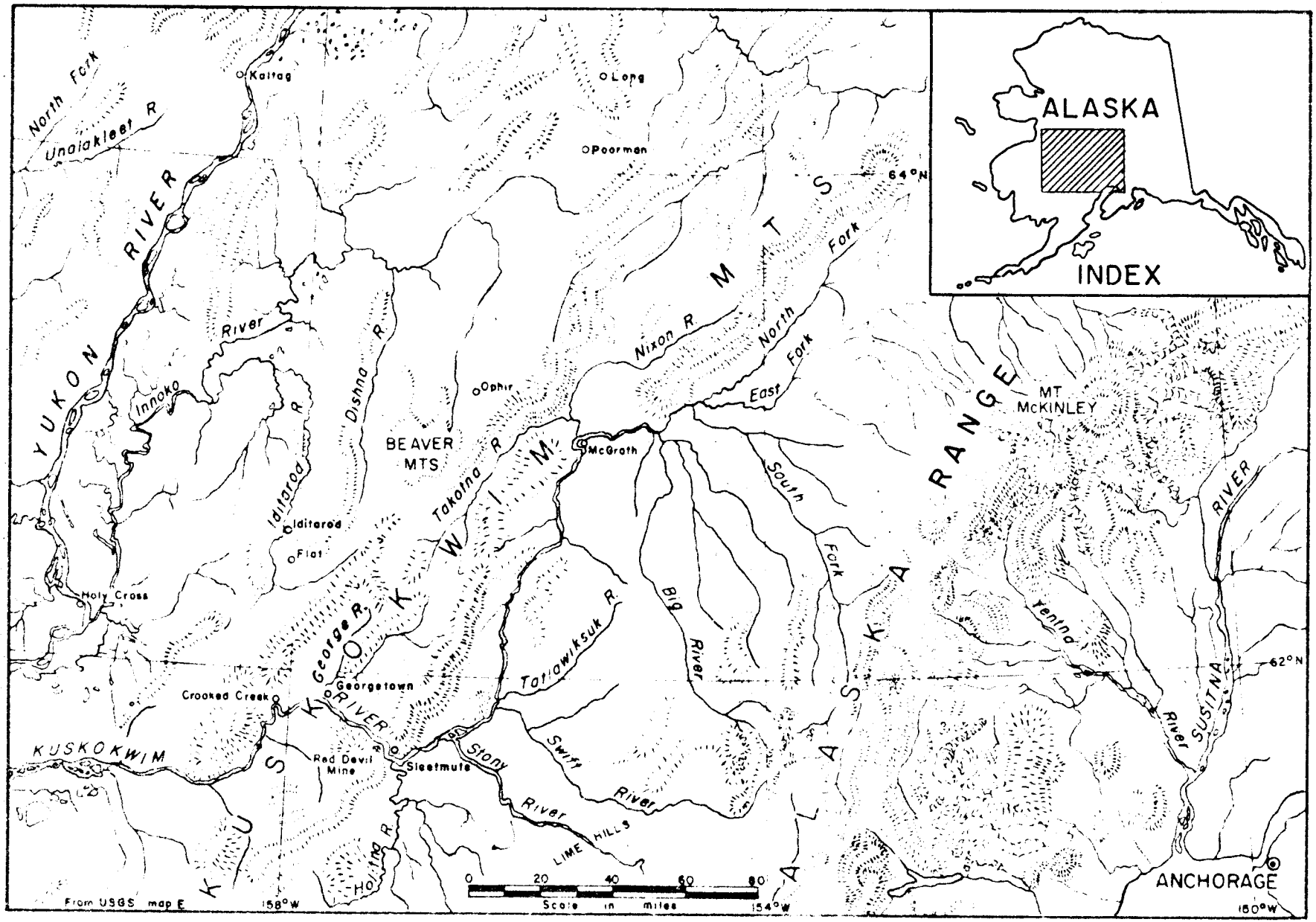


FIGURE I.- Index map, Kuskokwim Basin, Alaska

The Kuskokwim River is heavily laden with silt in this sample interval, and the current here is about 5 miles per hour and probably more in places. The Holitna River, where the samples were taken, has a somewhat slower current and is not as silt laden. The George River, except at its mouth, has a very fast current with numerous small rapids. The water is clear enough in most places to easily see the numerous trout, average length about 16 inches, swimming around.

The rivers were exceptionally low at the time of sampling.

# BUREAU WORK

## Equipment

Equipment consisted of a portable sluice box made out of sheet metal and weighing less than 100 pounds. It had a 29- by 10 3/4-inch box with 1-inch diamond-shaped expanded metal riffles over 2 thicknesses of ordinary burlap sacking. A 12- by 33-inch hopper, holding about 50 pounds of material with a 12- by 12-inch grizzley with 5/8-inch round holes, was connected to the box. Water was furnished at the approximate rate of 5 gallons per minute by a small pump used with a portable diamond drill. The box had an 8-degree slope.

## Method and Results

Thirty one-quarter cubic yard samples of river bars, all but a few taken from the interval between the surface and a 2-foot depth, were concentrated by washing in the sluice box with river water under almost no pressure. Some of the bars sampled were deposited as recently as two weeks before sampling, and others had timber growths at least 50 years old. The oversize (+ 5/8) was negligible and was discarded. Eighty to ninety percent of the material was -10 mesh in size. The sluice box concentrate was panned down by hand to about 500 grams, and this submitted for fire assay.

A few gold colors, sometimes 20 or more, usually small enough to need the aid of a 10-power hand lense to see, were present in practically all pan concentrates.

Because of the crude equipment and the very fine gold, it is almost certain that only a minor percentage of the total gold was recovered in the concentrate. The petrographic analyses of concentrates from three samples are given in Table 1. Gold contents of the concentrates for all samples as determined by fire assays are shown in Table 2. Considerable fine cinnabar was present in the concentrates from George River. Mercury mineralization is known to occur about 2 miles above the farthest upstream sample.

Two 700-pound bulk samples of river bar material were taken and sent to the University of Alaska for additional research work by their personnel. The samples were taken at the same location as R-1 and H-4 and at the same 0- to 2-foot interval. They were not altered in any way, and the University plans to determine the total gold content of each sample. Results are not available at this time.

TABLE 1. - Petrographic analyses

| Minerals | Sample No's Percent | | |
|---|---|---|---|
| | R-4 | K-5 | H-3 |
| Albite-oligoclase | | 2.0 | 1.5 |
| Andesine | | 5.1 | |
| Andesine-quartz | 0.9 | | 1.2 |
| Apatite | | Tr.[1] | Tr.[1] |
| Augite | 0.2 | 0.9 | |
| Augite-diopside | - | 0.2 | 0.6 |
| Augite-diopside-hypersthene | | | 0.2 |
| Augite-hypersthene | 0.2 | | |
| Cinnabar | Tr.[1] | | |
| Epidote | 0.5 | 0.6 | Tr.[1] |
| Garnet | 2.0 | 6.8 | 0.3 |
| Hypersthene | 0.3 | 4.2 | 1.0 |
| Hornblende | 1.7 | 2.5 | 2.6 |
| Ilmenite | 49.8 | 36.3 | 53.0 |
| Magnetite | 35.1 | 22.7 | 27.8 |
| Monazite | 0.1 | Tr.[1] | 0.2 |
| Potash feldspar | | 0.5 | 0.2 |
| Quartz | Tr.[1] | | |
| Rutile | Tr.[1] | | |
| Sphene | Tr.[1] | | |
| Zenotime | | Tr.[1] | |
| Zircon | 8.7 | 9.4 | 7.8 |
| **Rock Fragments** | | | |
| Chlorite | 0.3 | 8.8 | 3.6 |
| Feldspathic | 0.2 | | |

1/ Trace- less than 0.1 percent

TABLE 2. - Chemical analysis of pan concentrates

| Sample | Description | Gold, per cubic yard | | |
|---|---|---|---|---|
| | | Mg | Oz. | Cents |
| H-1 | Center bar, Holitna River | 0.10 | 0.0000032 | .011 |
| H-2 | Center bar, " " | Tr. | Tr. | |
| H-3 | Center bar, " " | 6.72 | 0.0002160 | .756 |
| H-4 | Downstream end bar, Holitna River | 2.74 | 0.0000880 | .308 |
| H-5 | Downstream end bar, Holitna River | 1.12 | 0.0000360 | .126 |
| K-1 | Downstream end bar, Kuskokwim River | 0.12 | 0.0000038 | .013 |
| K-2 | Upstream end bar (K-1), " " | 0.56 | 0.0000180 | .063 |
| K-3 | Downstream end bar, " " | 2.32 | 0.0000745 | .261 |
| K-4 | Downstream end bar, " " | 0.26 | 0.0000083 | .029 |
| K-5 | Center bar (K-4), " " | 1.36 | 0.0000437 | .153 |
| K-6 | Center bar (K-4), " " | 1.28 | 0.0000411 | .144 |
| K-7 | Upstream end bar, " " | 0.52 | 0.0000167 | .059 |
| K-8 | Center bar, " " | 1.36 | 0.0000437 | .153 |
| K-9 | Downstream end bar, " " | 0.20 | 0.0000064 | .023 |
| R-1 | Downstream end bar, " " | 2.00 | 0.0000643 | .225 |
| R-2 | Downstream end bar, 0-1 depth Kuskokwim River | 1.98 | 0.0000636 | .223 |
| R-3 | Same location as R-2, 1-2' depth | 0.12 | 0.0000038 | .014 |
| R-4 | Upstream end bar, Kuskokwim River | 7.70 | 0.0002475 | .866 |
| R-5 | Pan concentrate from R-4 sluice box concentrate | 17.20 | 0.0005529 | 1.936 |
| R-6 | Downstream end - 0-1 depth, Kuskokwim River | 0.74 | 0.0000237 | .083 |
| R-7 | Pan concentrate from R-6 sluice box concentrate | 7.52 | 0.0002417 | .846 |
| R-8 | Same bar as R-6, 8' higher, Kuskokwim River | 0.88 | 0.0000282 | .099 |
| R-9 | Upstream end bar, George River | 0.04 | 0.0000012 | .005 |
| R-10 | Pan concentrate from R-9 sluice box concentrate | 0.08 | 0.0000025 | .009 |
| R-11 | Upstream end bar, George River | 2.56 | 0.0000823 | .288 |
| R-12 | Center bar, Kuskokwim River | 0.18 | 0.0000057 | .020 |
| R-13 | 1/3 way from upstream end, Kuskokwim River | 5.20 | 0.0001671 | .585 |
| R-14 | Center bar, Kuskokwim River | 3.68 | 0.0001183 | .414 |
| R-15 | Center bar, Kuskokwim River | 2.08 | 0.0000668 | .234 |
| R-16 | Center bar, Kuskokwim River | 2.28 | 0.0000733 | .257 |
| R-17 | Downstream end bar, Kuskokwim River | 2.48 | 0.0000797 | .279 |
| R-18 | Mouth of Cobb Creek, Kuskokwim River | 0.28 | 0.0000090 | .032 |
| R-19 | Center bar, mouth Egnaty Creek, Kuskokwim River | 2.96 | 0.0000951 | .333 |