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**STEPHEN R. CAPPS**

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BONNIFIELD REGION. ALASKA**



DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, DIRECTOR

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**BULLETIN 501**

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**THE BONNIFIELD REGION**  
**ALASKA**

**BY**

**STEPHEN R. CAPPS**



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## PREFACE.

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By ALFRED H. BROOKS.

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The Bonnifield district, described in this report, has long been known as a field of some productive placers as well as extensive lignitic coal deposits. Its annual gold output up to the present time has been much smaller than that of most of the other Yukon camps and its coals are entirely undeveloped. For this reason the survey of this district was deferred until the more important regions had been mapped. Meanwhile, several Geological Survey parties have traversed parts of the region and some knowledge has been gained of its mineral resources. The present report can be considered by no means exhaustive in its treatment of the geology and mineral resources, for the field season was limited to 100 days, during which time the party mapped 3,100 square miles.

In spite of the hasty character of the field work Mr. Capps has been able to subdivide the metamorphic rocks into two formations. An older, the Birch Creek schist, is made up chiefly of altered arenaceous and argillaceous sediments. This formation is similar to the typical Birch Creek schist so extensively developed in the Yukon-Tanana region to the north, as well as elsewhere in the Yukon basin. Its assignment to the pre-Ordovician is based on work done outside of the Bonnifield region. The younger group of metamorphic rocks, called the Totatlanika schist, is made up chiefly of altered rhyolites but includes subordinate amounts of sediments. The assignment of the Totatlanika to the Silurian or Devonian is by no means definitely established. There are many gneisses and crystalline schists in the Yukon-Tanana region, to the north, which in the hand specimen bear a considerable resemblance to the Totatlanika schist. These rocks, for the most part, have been regarded as granite porphyries intruded into the Birch Creek schist and later intensely deformed. No evidence of their Paleozoic age has been found.

In the earlier reports these gneisses were represented as belonging to a basal complex and provisionally assigned to the Archean. The Totatlanika schist also closely resembles the rocks of McConnell's

Klondike series,<sup>1</sup> which are typically developed in the Klondike district. These have been described as altered quartz and granite porphyries. The distribution of the Klondike "series" corresponds closely to that of the "basal granite" as represented by Spurr<sup>2</sup> on the first geologic map published of the Yukon basin. It seems probable, therefore, that the Totatlanika schist may represent the formation formerly termed "basal granite" or "basal gneiss."

The Tertiary of this field, made up of loosely cemented gravels and sands and clays or shales, with intercalated lignitic coal beds, resembles certain phases of the coal-bearing series, widely distributed in Alaska, which has usually been referred to the Kenai formation and, on the basis of the plant remains, assigned to the Eocene. Arthur Hollick is now engaged in a study of the flora from the beds which have been referred to the Kenai in different parts of Alaska. His work is not completed, and the results are not published, but they point to the conclusion that part of the lignitic coal-bearing series of the Bonnifield region is to be correlated with some beds exposed near Rampart, on the Yukon, which are probably of post-Eocene age and therefore younger than the typical Kenai formation of the Cook Inlet region.

Mr. Capps regards the extensive elevated sands and gravels termed by him the Nenana gravels as of preglacial age. The writer,<sup>3</sup> who traversed the west end of the Bonnifield region in 1902, considered these deposits as having been laid down by the flood waters which accompanied the retreat of the main ice sheet. Mr. Capps had opportunity to study these deposits in far greater detail than did the writer, and the evidence he obtained must have great weight. On the evidence at hand it seems reasonable to correlate the Nenana gravel with the great sheet of unconsolidated deposits that mantles the piedmont region of the Alaska ranges which have been glaciated. Much of this material seems to have been pretty definitely proved to be of postglacial origin. Therefore, viewed in these broader relations, the Nenana gravel would seem to be of postglacial age. It is possible that the apparently contradictory character of the evidence may be explained by supposing that there was an older period of glaciation than that recorded in the moraines described by Mr. Capps (pp. 38-39) as of post-Nenana age.

Both the Totatlanika and Birch Creek schists are locally mineralized and were undoubtedly the ultimate source of the placer gold. The two localities in this region where auriferous lodes have been

<sup>1</sup> McConnell, R. G., Report on the Klondike gold fields: Ann. Rept. Geol. Survey Canada, vol. 14, pt. B, 1905, pp. 156-226.

<sup>2</sup> Spurr, J. E., Geology of the Yukon gold district: Eighteenth Ann. Rept. U. S. Geol. Survey, pt. 3, 1897, Pl. XXXVIII.

<sup>3</sup> Brooks, A. H., The Mount McKinley region, Alaska: Prof. Paper U. S. Geol. Survey No. 70, 1911, pp. 135-136.

found are not far from granitic intrusives, suggesting a genetic relation to igneous rocks, such as has been established in other parts of Alaska. The gold of the developed placers has been derived in part by reconcentration from the Nenana gravel, in part directly from the mineralized schists. The wide distribution of gold in the alluvium suggests that other commercial deposits may be found. An all-important question to the future of the district is whether the Nenana gravel, known to be auriferous, carries commercial quantities of gold. This matter is now being settled, for one locality at least, by a hydraulic plant which has been installed on Gold King Creek.

The lignitic coal reserves of this region have been estimated by Mr. Capps to be nearly 10,000,000,000 tons, which exceeds by nearly 3,000,000,000 tons the estimate<sup>1</sup> made a few years ago, on the information then available, of the total lignitic coal tonnage for the entire Territory. Though Mr. Capps's estimates are made on a very conservative basis, they indicate that the coal tonnage of the Bonni-field region is greater than that of all the other surveyed fields of the Territory.<sup>2</sup>

Although the quantity of the coal is enormous, it is all of lignitic character and therefore can not be considered available for shipment to distant markets. It will probably be chiefly valuable for use in the mining camps of the Yukón-Tanana region, especially Fairbanks, when the depletion of the timber supply and the installation of large plants create a market for fuel. These coals could be made available for Fairbanks by building about 60 miles of railway or by erecting a power plant and transmitting their energy in the form of electricity.

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<sup>1</sup> Brooks, A. H., Alaska coal and its utilization: Bull. U. S. Geol. Survey No. 442, 1910, pp. 36-39.

<sup>2</sup> It should be noted that only about one-fifth of Alaska has been surveyed, and only a small part of the surveyed coal fields has been examined in sufficient detail to permit tonnage estimates.