

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

PRELIMINARY GEOLOGIC AND MINERAL
EVALUATION OF THE NOWITNA RIVER
DRAINAGE BASIN
FOR
(BUREAU OF OUTDOOR RECREATION WILD AND SCENIC RIVER STUDY)

By

Mitchell W. Henning
Resource Evaluation Section
March 1973

This report is preliminary and
has not been edited or reviewed
for conformity with Alaska
Geological and Geophysical Surveys
standards

TABLE OF CONTENTS

	Page
Table of Contents	1
Location Map.	2
Introduction and Summary.	3
Regional Geology.	4
Economic Geology.	5
Bibliography.	6

Plates

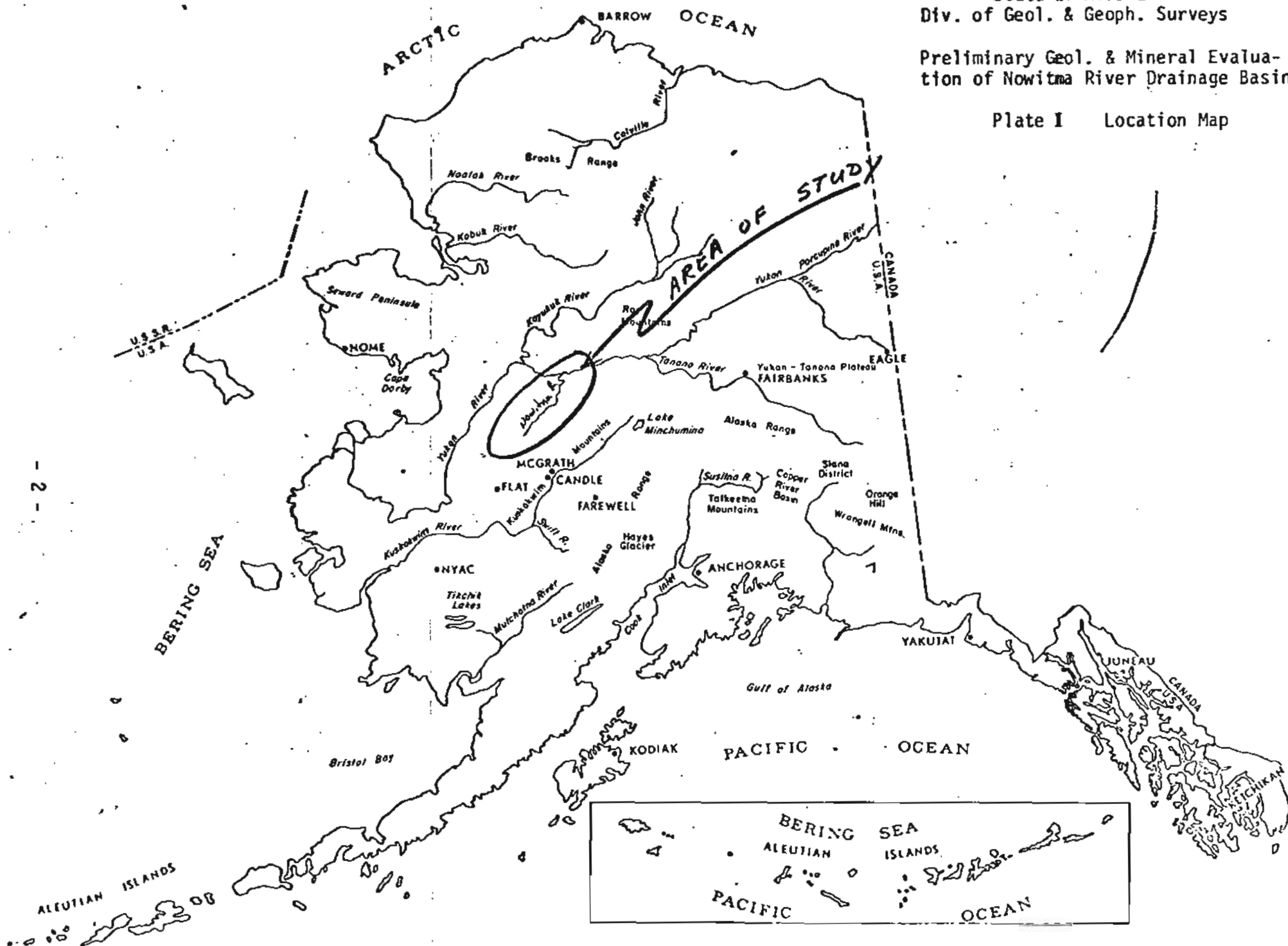
I. Location Map.	2
II. Geology of Lower Nowitna River.	7
III. Geology of Upper Nowitna River.	8

Note: Results of field inspection and geochemical data analysis will be added as Appendix I & II August 1973.

State of Alaska
Div. of Geol. & Geoph. Surveys

Preliminary Geol. & Mineral Evaluation
of Nowitna River Drainage Basin.

Plate I Location Map



Introduction and Summary

The Wild and Scenic River task force of the BOR has begun a study of 31 priority Alaskan rivers to determine the suitability for enclosure in the national system.

The following report has been written to supply the task force with all available geologic and mineral data on the Nowitna River drainage basin, one of the priority rivers.

The economic potential of the Nowitna drainage basin is unknown. There is not enough available data to make an honest appraisal of the mineral potential, although the geology of the area can be considered favorable for mineralization. The field program this summer will seek, through the use of geochemical sampling, to accomplish the following:

1. To establish a metals background for this drainage.
2. To help in delineation of mineralized or target areas.
3. To increase the general geologic data of this area.

Before the final classification of the river drainage is made, the results of the geologic field check and geochemical analysis must be considered. These results with recommendations will be added as an addendum to this report by August 1973.

Regional Geology

The Nowitna River drainage is stratigraphically and structurally very complex. The basement rock is dominantly a Precambrian or Paleozoic metamorphic complex, which is separable into two groups - a lower group composed chiefly of limestones and greenstones, and an upper group of mainly schists and quartzites. These rocks are unconformably overlain by Ordovician limestones. The pre-Ordovician limestones and greenstones occupy a considerable area within the drainage and outcrop on the upper end of the Nowitna River Canyon. The limestones of the lower group are mostly non-magnesian, but in places are dolomitic and siliceous. The greenstones are thickly-bedded, highly-altered basic igneous rocks, which probably represent lava flows that are interbedded with the calcareous sediments. The schists of the upper group are generally quartzose and micaceous. A gradation from quartz-mica schist to a calcareous mica schist and sheared or banded limestone also exists. The Ordovician limestones occupy a large area of the Sulukna River, a tributary to the Nowitna. This group is made up entirely of carbonate rocks, without admixture of other sediments. The rocks include limestones and dolomites and intermediate types, with the purer limestones dominating.

A series of late Mesozoic or early Tertiary volcanics interbedded with sandstone and shale overlies the rocks of the metamorphic complex along the southwestern part of the Nowitna River drainage. These rocks include lavas, tuffs, breccias and some sedimentary beds. The lavas are predominantly rhyolitic and andesitic porphyries. The tuffs are locally interbedded with the lavas. They are commonly fine-grained compact rocks composed of angular fragments of varicolored lavas. In places they are coarse and grade into breccias. The structure of the group appears to be very simple. Predominance of the same rock type over large areas suggests low dips. Outcropping within

this group are small areas of Cretaceous sediments composed of chert and argillite. The relationship between the Cretaceous rocks and those of the Tertiary is not clearly understood.

Tertiary granitic intrusions occur at several locations within the drainage, and vary somewhat in texture and composition, but probably correspond closely in age and mode of occurrence. Rock types are granite, diorite and quartz monzonite. These granitic rocks occur as intrusive stocks and dikes.

The dominant trend of the structural features throughout the region is northeasterly. Local variations from the dominant trend are few, and such variations probably represent local deflections of the stresses that formed the major features. At least two stages of faulting are present. Reverse faults and dominantly right-lateral strike slip faults of an earlier period appear to be genetically related to the folding. Recent movement along younger normal faults can be seen east of the drainage in scarps on alluvial fans of Quaternary age.

Economic Geology

The economic potential of the Nowitna drainage basin is unknown. Not enough data are available to make an honest appraisal of the mineral potential of this area. There are only a few gold placer claims within the drainage, with most of these being located in the Sunshine Mountains. One other gold placer occurs near the head of Our Creek, which is a tributary to the Nowitna.

Based on the U.S.G.S. Metal Province Map of Alaska, the Nowitna River drainage Basin could realize a potential for antimony, copper, gold, mercury, lead, silver, tin, tungsten, and zinc. The geology of the area can certainly

be considered favorable for mineralization. While the drainage is being field checked this summer, a geochemical sampling program should be undertaken for the following reasons:

1. To establish a metals background for this drainage.
2. To help in the delineation of mineralized or target areas.
3. To increase the general geologic data of this area.

Before any classification of this river drainage is made, these recommendations should be carried out. With these data, a more qualified classification may be made.

Brown, J. S., 1924, The Nixon Fork Country and Silver-Lead Prospects Near Ruby, Alaska: U.S.G.S. Bulletin 783-D.

Cass, J. T., 1959, Reconnaissance Geologic Map of the Ruby Quadrangle, Alaska: U.S.G.S. Misc. Geol. Investigations Map I - 289

Clark, A. L.; Berg, H. C.; Cobb, E. H.; Eberlein, G. D.; MacKevett, E. M., Jr.; Miller, T. P.; Metal Provinces of Alaska: U.S.G.S. Open-file Report No. 534.

Eakin, H. M., 1918, The Cosna-Nowitna Region, Alaska: U.S.G.S. Bulletin 667.

Appendix I

Results of field Examination of Nowitna River

During a five-day period, between the 29th of May and the 5th of June 1973, a general geologic reconnaissance of the Nowitna River drainage was completed in conjunction with the Bureau of Outdoor Recreation's Wild and Scenic River Program.

The geology of the area is very complex both stratigraphically and structurally. The main rock type is a Paleozoic metamorphic complex that is divided into four basic units, which are composed of varying proportions of crystalline limestone, quartzite, schist, slate and phyllite, with some greenstones and gneisses.

The volcanic features observed along the river consists of highly altered andesitic and rhyolitic porphyries and greenstones. The volcanics are all steeply dipping and highly fractured, and abundant agates, geodes, chalcedony and chert pebbles are found associated with the andesitic and rhyolitic porphyries. Other features usually associated with volcanic rocks were not observed in the field.

The outcrops observed along the river do not show any outstanding structural features that are discernible in the field by the average person. These features must be viewed on a regional scale as opposed to outcrop observation. An example of the preceding is the fault that controls the Big Mud and part of the Nowitna drainage. This fault is of such a large magnitude that it is hard to recognize on the ground, but it is easily discernible from the air or E.R.T.S. photography.

The apparent absence of metallic mineralization in the stream float or in the outcrops observed in the field indicates that the metallic mineral potential of the river drainage itself is low. The geochemical sampling program was cancelled due to the lack of time and high water stage of the river (which causes dilution of the sample). Agates occur abundantly along the river drainage and their source appears to be the Tertiary volcanics which occur on the upper part of the river.

There are no known glacial features occurring in the Nowitna drainage basin. This area is non-glaciated although Pleistocene deposits of clay, silt, sand and gravel occur along the river. The only known occurrences of fossils along the river are those of Pleistocene beaver. The major country rock in the drainage is Paleozoic in age, and is highly contorted and altered. Fossils were not seen within these rocks.

The recreational geology found along the Nowitna drainage is rather unimpressive to the normal individual seeking a wilderness experience. The common occurrence of agates in great numbers offers enjoyment for those who collect semi-precious stones. The only outstanding erosional feature observed along the drainage were the cut banks. The river at high water has cut the unconsolidated silt, sand, and gravel from the upper eight to ten foot permafrost layer, leaving large overhanging cut banks exposed.

The State of Alaska has selected lands that occupy the upper part of the drainage. These lands show potential for placer metallic minerals and should be accessible by one or more transportation corridors. The Nowitna River fits the concept of transportation corridor quite easily.

Mitch Henning
July 15, 1973