Abstract

THE PETROLEUM POSSIBILITIES OF CENTRAL AND SOUTHERN ALASKA

By J. Ben Carsey

Oil production was developed in the Katalla area of southeastern Alaska in the early 1900's and was sufficient to support a small refinery in the area. Production here continued until 1931 when the refinery burned. During and immediately following World War II, extensive exploration was conducted on the Naval Petroleum Reserve in northern Alaska. In the middle 1950's Phillips Petroleum Company drilled three exploratory wells in southeastern Alaska and joint operations of Colorado Oil & Gas, Continental Oil Company, and Frankfort Oil Company are continuing in the general area. In the summer of 1957 Richfield Oil Company made its important discovery on the Kenai Peninsula south of Anchorage, and the subsequent great interest in Alaskan oil possibilities was stimulated. Other current drilling activity includes the deep test of Humble Oil & Refining Company and Shell Oil Company near Wide Bay on the Alaska Peninsula, and the continuing operations on the Kenai Peninsula by Richfield, Standard of California, and others.

The accompanying diagrammatic map reveals that, so far as oil possibilities are concerned, Alaska may be divided into five broad geographic provinces underlain by sedimentary rock. These are Northern Alaska, Northwestern Alaska, the Fort Yukon - Kandik area, Southeastern Alaska, and Southwestern Alaska. As Northern Alaska has been discussed by Mr. John Woolson*, the other provinces will be reviewed briefly.

Northwestern Alaska is a large area containing several structural features lying generally west and southwest of Fairbanks and roughly bounded by the Kuskokwim River on the southeast and the Brooks Range on the north. A Cretaceous Basin occupies much of this area. The Lower Cretaceous consists of a great thickness, possibly 10,000 or even 20,000 feet of marine and non-marine graywackes, silty shales, and conglomerates. The Upper Cretaceous consists of 3,000 feet of sands, shales, and coal.

In the Fort Yukon-Kandik area, which is northeast of the Fairbanks mining district, there is a well-developed section of Paleozoic and Mesozoic sediments; igneous rocks, principally basaltic lavas of the greenstone type and associated pyroclastics, are present in the Mississippian and Devonian. Lower Paleozoic and Carboniferous limestones and dolomites and other Paleozoic sediments are found in the area, as well as Cretaceous and Tertiary graywacke, sandstone, shale, and conglomerates. Several prominent anticlines have been observed from the air, and H. L. Hunt and other operators have holdings in this part of Alaska.

In Southeastern Alaska marine and non-marine Tertiary sediments ranging in age from Eocene to Pliocene occur in a narrow strip, two to forty miles in width, along the coast from Katalla southeastward for nearly 300 miles. These rocks were deposited in an elongate basin and are probably related to marine Tertiary rocks reported on the southeast edge of Kodiak Island and in the Trinity Islands. If these scattered outcrops are part of the same sequence, the Tertiary basin would have a length of almost 700 miles. Rapid deposition is indicated by relatively poor sorting of the thick accumulation. Thicknesses range from 12,000 to 25,000 feet, and the seaward tilt of most of the strata suggests that even greater thicknesses may lie offshore. The rocks consist for the most part of marine shales, siltstones, and sandstones, some of which are indurated.

This Tertiary belt is bounded on the north by the Chugach-St. Elias Mountain range which is composed of Cretaceous and early Mesozoic metamorphosed sediments and volcanic intrusive and extrusive rocks estimated to be 30,000 to 50,000 feet in thickness. This metamorphic complex was upliftedalong a system of high-angle thrust faults in early Pleistocene or at the close of Tertiary time.

Southwestern Alaska includes the Susitna Valley, the Kenai Low - lands, the Shelikof Strait portion of the Alaska Peninsula, and the Nushagak Basin. Mesozoic metamorphic and associated intrusive rocks, largely of the granitic type, form the core of the Alaska Peninsula. Similar rocks

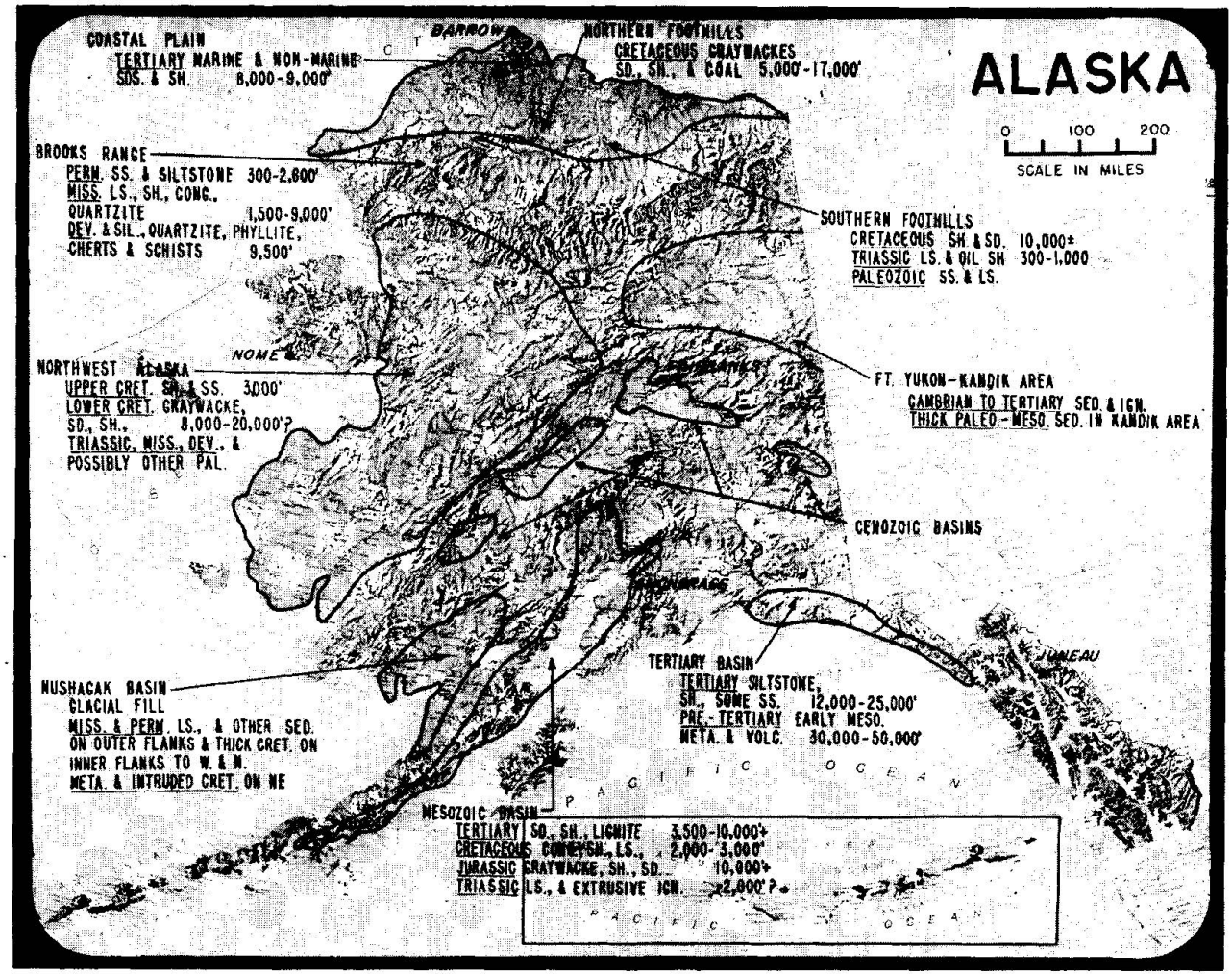
form the Kodiak Island area and the eastern, or mountainous, portion of the Kenai Peninsula. The metamorphic complex of the Alaska Peninsula is flanked on the southeast by a narrow band of sedimentary rocks 750 miles in length ranging in age from Triassic to Tertiary. The principal strata are Jurassic and Cretaceous and this area is sometimes referred to as the Cook Inlet Mesozoic Basin. The Triassic in the Alaska Peninsula area ranges in thickness from 1,000 to 2,200 feet and contains fossiliferous limestones, as well as extrusive igneous rock. The Jurassic is the most important in thickness and areal extent, possibly containing over 20,000 feet of sediments. These consist of marine graywackes, siltstones, shales, and conglomerates which are poorly sorted and have little porosity and permeability. Cretaceous is present at Herendeen Bay, Chignik Bay, and other places on the Alaska Peninsula and contains marine and non-marine beds including coal.

The western part of the Kenai Peninsula, the Kenai Lowlands where the recent Richfield discovery was made, is underlain by thick continental beds of Eocene age. The Susitna Valley and part of the Matanuska Valley are also apparently underlain by similar Tertiary sediments. Cretaceous is also present in the Matanuska Valley east of Anchorage.

It is evident that Alaska contains several important sedimentary basins and has definite potential for oil and gas production. It is important to emphasize, however, the high costs and resulting large expenditures which will be required in order to develop this production.

The reader interested in further details on the geology of Alaska is referred to publications of the U. S. Geological Survey. Both published reports and open files are available at the headquarters office for the Alaska Branch in Menlo Park, California, and also in Washington, D. C. A report entitled "Geology of Possible Petroleum Provinces in Alaska" by Don J. Miller, Thomas G. Payne, and George Gryc was completed in 1957 and is on open file. This report is very comprehensive and will be of assistance to anyone interested in the geology of the area.

*See Abstract in Houston Geological Society Bulletin, Volume 1, No. 6.


ALASKA
0 100 200
SCALE IN MILES
COASTAL PLAIN
TERTIARY MARINE & NON-MARINE
SDS. & SH. 8,000-9,000'
BARROW
NORTHERN FOOTHILLS
CRETACEOUS GRAYWACKES
SD., SH., & COAL 5,000'-17,000'
BROOKS RANGE
PERM. SS. & SILTSTONE 300-2,600'
MISS. LS., SH., CONG.,
QUARTZITE 1,500-9,000'
DEV. & SIL., QUARTZITE, PHYLLITE,
CHERTS & SCHISTS 9,500'
SOUTHERN FOOTHILLS
CRETACEOUS SH. & SD. 10,000±
TRIASSIC LS. & OIL SH 300-1,000
PALEOZOIC SS. & LS.
NOME
NORTHWEST ALASKA
UPPER CRET. SH. & SS. 3,000'
LOWER CRET. GRAYWACKE,
SD., SH., 8,000-20,000'?
TRIASSIC, MISS., DEV., &
POSSIBLY OTHER PAL.
FT. YUKON-KANDIK AREA
CAMBRIAN TO TERTIARY SED. & IGN.
THICK PALEO.-MESO. SED. IN KANDIK AREA
CENOZOIC BASINS
FAIRBANKS
JUNEAU
NUSHAGAK BASIN
GLACIAL FILL
MISS. & PERM. LS., & OTHER SED.
ON OUTER FLANKS & THICK CRET. ON
INNER FLANKS TO W. & N.
META. & INTRUDED CRET. ON NE
TERTIARY BASIN
TERTIARY SILTSTONE,
SH., SOME SS. 12,000-25,000'
PRE-TERTIARY EARLY MESO.
META. & VOLC. 30,000-50,000'
PACIFIC OCEAN
MESOZOIC BASIN
TERTIARY SD., SH., LIGNITE 3,500-10,000'+
CRETACEOUS CONG., SH., LS., 2,000-3,000'
JURASSIC GRAYWACKE, SH., SD. 10,000'+
TRIASSIC LS., & EXTRUSIVE IGN. ±2,000'?
PACIFIC OCEAN