DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

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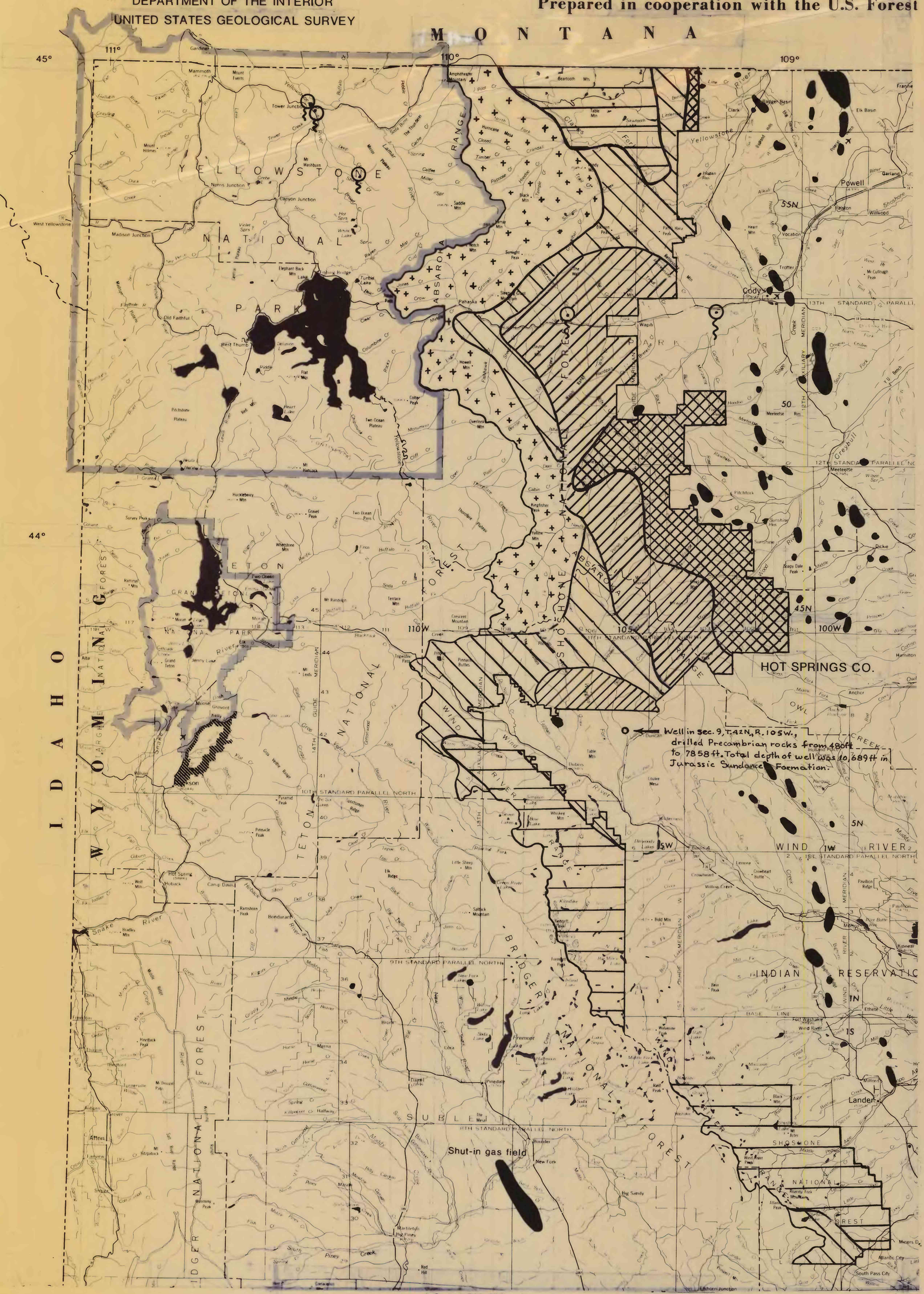
OPEN-FILE REPORT
81–667



Scale 1:500,000
1 inch equals approximately 8 miles
0 10 20 30 40 Miles
0 10 20 30 40 50 Kilometers
Lambert conformal conic projection
Standard parallels 33° and 45°

Base from U.S. Geological Survey, 1964

This map is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards.

EXPLANATION

HIGH POTENTIAL--Geologic environment highly favorable for occurrence of oil and gas accumulations. Area is on trend with and (or) adjacent to established production and has potential for economic accumulations of oil and gas in stratigraphic and (or) structural traps. Area mostly covered by Tertiary volcanic flows, flow breccias, intrusives, conglomerates, and volcaniclastic sediments; however, many presently producing structures east and southeast of the Forest were probably previously covered by volcanic and volcaniclastic rocks and have been exhumed by post-Tertiary erosion. Area includes some intrusive plugs that have no potential

MODERATE POTENTIAL--Geologic environment favorable for discovery of oil and gas fields. In an area covered by Tertiary volcanics and volcaniclastic rocks which are interpreted to be underlain by Paleozoic and (or) Mesozoic sedimentary rocks that were folded and faulted during the Laramide orogeny (Nelson and others, 1980, p. 8). Well control is sparse to nonexistent. Includes some intrusive plugs that have no potential

LOW POTENTIAL--Geologic environment interpreted to have low to very low potential for oil and gas accumulations. Includes areas, known or interpreted to have thin prospective sedimentary rocks. Sedimentary rocks mostly buried by volcanic cover or overthrust Precambrian rocks. Includes some areas with concentrations of volcanic intrusions (dikes and plugs). May contain some gas accumulations not destroyed by heating and faulting. Areas of lower heating levels have oil potential, especially where Mesozoic and upper Paleozoic rocks may be present

NO POTENTIAL--Geologic environment unfavorable for oil and gas accumulations. Includes mostly areas with exposed Precambrian rocks or thin lower Paleozoic strata

UNKNOWN POTENTIAL--Areas of volcanic and volcaniclastic cover wherein it is nearly impossible to predict or determine oil and gas potential. These areas are generally a considerable distance from existing production, well control, and surface exposures of potential source beds and reservoir rocks. This lack of control does not necessarily mean that no potential is present but that the potential can not reasonably be determined with present data

OIL OR GAS FIELD--Includes producing and some shut-in, or abandoned oil and gas fields within and adjacent to the Shoshone National Forest. Location of fields from VerPloeg and others (1980)

OIL SEEP--Hydrocarbon-bearing spring or bitumin occurrence described by Love and Good (1970). Dot shows specific location

BOUNDARY OF SHOSHONE NATIONAL FOREST

DISCUSSION

The Shoshone National Forest extends from the Beartooth Mountains Uplift on the north through the Absaroka Range volcanic field to the Wind River Range on the south. The Beartooth and Wind River Uplifts consist mainly of exposed Precambrian rocks. The Absaroka Range is composed of Tertiary Eocene volcanic intrusives, flows, breccias, conglomerates, and volcaniclastic rocks which conceal rocks ranging in age from the lower Eocene Willwood Formation to Precambrian. Minor erosional remnants of Pleistocene ash-flow tuff are present (Nelson and others, 1980). The Forest is on the west edge of the Bighorn Basin and generally east of the Yellowstone plateau.

The potential reservoir rocks range in age from Eocene through Cambrian. Cretaceous, Jurassic, Triassic, Permian, and Pennsylvanian age rocks have the greatest potential for production of oil and gas. Structure on Cretaceous and older sedimentary rocks, throughout much of the Forest, is obscured by the Eocene Absaroka Volcanic Supergroup. This volcanic cover, as well as faulting and heating associated with the volcanism, make prediction of sites of potential hydrocarbon accumulation very difficult. Heating may have converted some previously existing oil accumulations to natural gas. However, Love and Good (1970) have described several oil and "tar" seeps and springs in and adjacent to the Forest, suggesting that at least in some areas the source rocks are not over-matured with respect to oil generation.

This evaluation was prepared in response to a request from the Forest Servoce for an oil and gas evaluation of the entire Shoshone National Forest. Portions of the Forest designated for study as roadless areas were previously evaluated for oil and gas potential by Dolton and Spencer (1978). Selected wilderness and proposed wilderness areas in the Forest have been studied for their mineral resource potential (Ketner and others, 1966; Nelson and others, 1980; Prostka and Antweiler, 1979). The basis for the present classification is primarily geologic. It takes into consideration the known nearby accumulations of oil and gas, in both producing and shut-in fields. The analysis is heavily weighted toward the known or interpreted distribution of reservoir rocks, hydrocarbon source beds, geologic history, and stratigraphic and structural style favorable for oil and gas accumulations in this part of the Rocky Mountain Region. Consideration is also given to oil and gas occurrences associated with volcanic intrusions and volcaniclastic debris elsewhere in the United States and worldwide. Also, the documentation by Love and Good (1970) of hydrocarbons in thermal spring areas within the Forest, to the west in Yellowstone Park, and to the east near Cody is believed to have important implications for hydrocarbon potential. Love and Good (1970, p. 322) interpreted that hot water may have liberated oil from buried source beds and carried the oil upward to surface springs. We agree with this interpretation.

Most of the northernmost part of the Forest has no potential owing to the presence of exposed Precambrian rocks in the Beartooth Uplift. The extreme northeastern part also has exposed Precambrian but has oil and gas potential because the Precambrian here may be thrust over Mesozoic and older sedimentary rocks (Gries, 1981, fig. 1). An area in the eastcentral part of the Forest has been rated as having high potential for oil and gas accumulations. The main basis for this interpretation is the expected presence of structures similar to those producing oil and gas on the west flank of the Bighorn Basin to the east.

The southern part of the Shoshone Forest has mostly Precambrian rocks on the surface (Love and others, 1955). The southwestern flank of the Wind River Range is classified as having low potential on the basis of an interpretation that a low-angle thrust from northeast to southwest has placed Precambrian rocks over Phanerozoic sedimentary rocks (Smithson and others, 1978). Tertiary and Cretaceous low-permeability gas reservoirs are probably the most prospective subthrust objectives.

Modern seismic methods can map structure in areas of relatively thin volcanic cover. Seismic mapping will be difficult, if not impossible, in areas of thick volcanic flows and porous volcaniclastic sediments. Magnetotelluric geophysical methods should be useful in mapping major structural features and depths to basement in areas where seismic techniques are unsuccessful. Magnetotelluric surveys should also help map major structures and sediment thickness beneath the Wind River thrust.

Exploration, development, and production activities for the immediate future within the Forest, where such activities are permitted, will vary somewhat with relative oil and gas potential. Some of the surface activities in the high-potential areas would include seismic surveys and (or) sites being programmed to be drilled. In areas of moderate potential, activities may include seismic work, magnetotelluric surveys, and acquiring leases in prospect areas. Filing applications for leases, photographic reconnaissance work, and (or) aeromagnetic surveys are expected activities in the low-potential and unknown-potential level areas. However, surface geophysical surveys in low-potential areas may provide a basis for lease acquisition and drilling. We did not have access to seismic data in the Forest and therefore this evaluation was based on surface mapping by the U.S. Geological Survey, examination of data from the few wells drilled in the Forest, and projection of structural and stratigraphic trends.

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MAP SHOWING EVALUATION OF OIL AND GAS POTENTIAL OF THE SHOSHONE NATIONAL FOREST, WYOMING

by

Charles W. Spencer, U.S. Geological Survey, and John S. Dersch, U.S. Forest Service