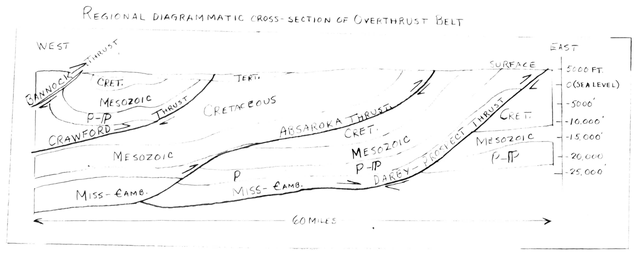
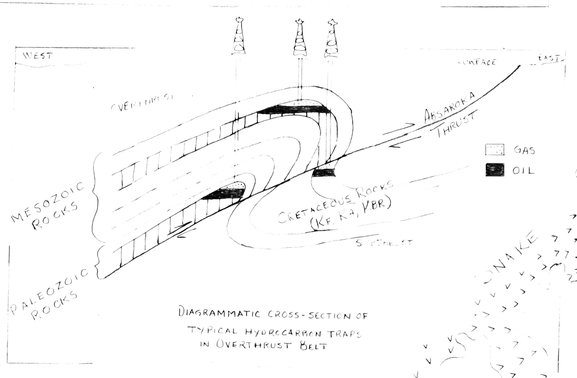
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT 78-956
RARE II AREAS, IDAHO-UTAH-WYOMING

REGIONAL DIAGRAMMATIC CROSS-SECTION OF OVERTHRUST BELT




DIAGRAMMATIC CROSS-SECTION OF TYPICAL HYDROCARBON TRAPS IN OVERTHRUST BELT




EXPLANATION

OIL AND GAS RESOURCE POTENTIAL

HHH

HIGH--Geologic environment highly favorable for undiscovered oil and gas. Area is near or on trend with established production and has potential for economic accumulations of oil and gas in structural and(or) stratigraphic traps.

MMM

MODERATE--Geologic environment very favorable for undiscovered oil and gas. Located in an area of known reservoir rocks, hydrocarbon source beds, and potential and(or) stratigraphic traps. Generally, tracts are in areas of sparse well control which have yielded oil and gas "shows" but not adjacent to existing production. Includes some areas with high potential for presently subeconomic accumulations of oil and gas.

LLL

LOW--Geologic environment interpreted to have low or no potential for accumulations of oil and gas. Includes areas of thin sedimentary rocks, poor hydrocarbon source beds and(or) reservoir rocks. Areas of exposed Precambrian rocks generally have no potential.

DISCUSSION

This map was compiled in December 1977 in response to a request from the U.S. Forest Service for an immediate regional evaluation of the oil and gas potential of proposed Roadless Areas (RARE II) in four National forests lying within the Idaho-Utah-Wyoming Overthrust Belt province. The Roadless Areas covered by this evaluation are shown on published maps by the U.S. Forest Service (1977); the configuration of some of these areas has subsequently been changed somewhat. The area changes are not shown on this map and the added RARE II tracts have not been evaluated by the U.S. Geological Survey.

The map analyzes the RARE II tracts for oil and gas potential and does not include areas with potential for hydrocarbons in tar sands or oil shales.

The basis for the classification is fundamentally geologic. It takes into consideration the distribution of recently discovered oil and gas fields and interpreted extensions of productive trends in the province. The analysis is also heavily weighted toward the known distribution of reservoir rocks, hydrocarbon source beds, tectonic history and stratigraphic and structural style favorable for oil and gas accumulations in this part of the Rocky Mountain Region.

There is generally sparse well control in those areas rated as having moderate potential. Future drilling will have a reasonable expectation of discovering hydrocarbons in these areas. As additional well control becomes available, some areas rated as having moderate potential may be reduced to low potential, and others will be upgraded to high potential. In addition, increased demand in the future for oil and gas and (or) price increases for these commodities will probably move some areas, rated as moderate, into the high category.

New oil and gas discoveries in the Overthrust Belt province indicate that it is becoming a major new onshore exploration frontier in the United States (Powers, 1977). Since the discovery of the Pineview Field in Summit County, Utah, early in 1975, eight more new oil or gas fields have been discovered in the southern part of the Overthrust Belt. In addition, four recent wildcat tests have recovered commercial amounts of oil, gas, or condensate from drill stem testing and are currently undergoing further evaluation. Some measure of the impact, on a national scale, of these discoveries in this province can be gained when compared to overall United States exploration drilling statistics published by the A.A.P.G.: 1) The new-field wildcat success rate, and 2) new-field discoveries of major size ("A" class: greater than 50 million barrels of ultimately recoverable oil, or greater than 300 billion cubic feet of gas). The national success rate for new-field wildcats is less than 17 percent (Johnson, 1978), while the success rate for the Overthrust Belt is 50 percent, highest of any area in the northern Rocky Mountain region (Walker and others, 1977). The total number of major-size, new oil or gas fields found in the United States in 1977 is zero, and a review of the past six years (1971-1977) shows that only nine major-size fields have been discovered in the entire United States (Johnson, 1978). In contrast, three fields--Pineview, Ryckman Creek and Painter Reservoir--in the southern Overthrust Belt, are estimated to contain ultimate recoverable oil or gas reserves equal to or exceeding major field-size.

Hydrocarbons in commercial quantities have been recovered from eight separate clastic and carbonate formations ranging in geologic age from Middle Ordovician through Lower Cretaceous in the southern Overthrust Belt. Favorable reservoirs, especially in Paleozoic rocks, as well as hydrocarbon source rocks, and similar trap types that are identified to the south, are all believed to be present on regional thrust trends to the north.

The map is not intended as a comprehensive geologic map. Published maps used in the evaluation are listed in the references which show detailed geology as well as local and regional structure. Summary maps by Blackstone (1978) and Monley (1971) were especially helpful. The main purpose of the map is to show the location of RARE II tracts in relation to gross geologic features and to the location and trend of major, regional thrust systems. This relationship is important in resource evaluation since the location of recently discovered fields in the southern part of the Overthrust Belt appear to be controlled by the folded, leading edges of at least three of these major thrust faults (Powers, 1977). Each of the major thrust faults, exposed at the surface or projected, continues on a general northward trend into the central and northern parts of the Overthrust Belt where the majority of proposed RARE II tracts are located. Based on favorable stratigraphy and projection of regional productive trends parallel to the major thrusts, the same geologic factors critical to the entrapment of oil and gas to the south are also felt to be present to the north and northwest in the Bridger, Teton, Targhee, and Caribou National Forests. RARE II tracts located on regional thrust trends in the central and northern portions of the Overthrust Belt within these forests, therefore, are estimated to have a high potential for discovery of oil and gas. Most of the evidence used for the oil and gas evaluation of RARE II areas is available in the references. Additional evidence was provided by the writer's associates in the U.S. Geological Survey and from discussions with various companies doing exploration work in the Overthrust Belt.

This map is only slightly revised from the compilation delivered to the U.S. Forest Service in December 1977. It is being made available in open-file in response to public request.

Selected References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- GEOLOGIC EXPLANATION -

- QUATERNARY-TERTIARY VOLCANICS
- PRE-CAMBRIAN ROCKS
- MAJOR THRUST FAULTS (SAWTEETH ON UPPER PLATE, DASHED WHERE CONCEALED)
- GAS (JNG) 9700' RECENTLY DISCOVERED OIL OR GAS FIELD — AGE AND DEPTH OF PRODUCING FORMATION AND HYDROCARBON TYPE — ESTABLISHED PRODUCING FIELD
- ABANDONED FIELD
- GAS MM WILDCAT WITH OIL OR GAS SHOW ON DRILL STEM TEST (DST)
- NEW WILDCAT LOCATION
- 4-113 FOREST SERVICE RARE II TRACTS

Key to Stratigraphic Units (with hydrocarbon occurrence indicated)

| | | | |
|---|---|---|---|
| KF | Upper Cretaceous | Frontier Fm. | (oil, gas (condensate) |
| KA | Lower Cretaceous | Aspen Shale | (oil) |
| KBR | Lower Cretaceous | Bear River Fm. (Kelvin) | (oil (gas) |
| JTC | Jurassic | Twin Creek Ls. | (oil, gas) & (condensate) |
| JNG | Jurassic(?) and Triassic(?) | Nugget Ss. | (oil (gas) |
| TRT | Lower Triassic | Thaynes Fm. | (gas (condensate) |
| TRD | Lower Triassic | Dinwoody Fm. | (gas (condensate) |
| PP | Permian | Phosphoria Fm. and equivalents | (gas (condensate) |
| PW | Pennsylvanian | Wells Fm. | (Weber Fm. and equivalents) (gas (condensate) |
| MM | Mississippian | Madison Ls. | (Brazer Fm.) (gas (condensate) |
| DD | Middle & Upper Devonian | Darby Fm. | (Three Forks-Jefferson) |
| SL | Middle & Upper Silurian | Laketown Fm. | |
| OBH | Middle & Upper Ordovician | Big Horn Dol. | (and equivalents) (gas & condensate) |
| € | Cambrian | Gallatin Fm. / Gros Ventre Fm. / Flathead Ss. | and equivalents |

Scale 1:500,000
1 inch equals approximately 8 miles
10 0 10 20 30 40 Miles
10 0 10 20 30 40 50 Kilometers

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

Compiled by Richard B. Powers, U.S. Geological Survey, December, 1977; updated August, 1978

# MAP SHOWING APPRAISAL OF OIL AND GAS RESOURCE POTENTIAL OF RARE II PROPOSED ROADLESS AREAS IN NATIONAL FORESTS IN THE IDAHO-UTAH-WYOMING OVERTHRUST BELT

by


RICHARD B. POWERS


1978