

It is possible to calculate the cost of finding crude oil in the Rocky Mountain area by means of an exhaustive examination of published data. Expenditures can be computed by applying unit costs to physical factors, most of which are readily available. The total expenditures when compared with the barrels found furnish an estimate of the cost per barrel. The cost of finding per barrel for three areas covering much of the interior United States is as follows.

Cost of Finding Per Net Barrel

Area	1942-1957	1953-1957
Rocky Mountains	0.41	0.86
Kansas-Oklahoma	0.57	1.04
Illinois-Michigan Basins	0.70	1.26

Costs of finding oil are increasing in most areas of the United States at a faster rate than development and producing costs; they are expected to increase in the future. To find more oil at less cost is the challenge to the petroleum geologist.

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Uses of Petrographic Microscope in Petroleum Exploration

The petrographic microscope provides a direct visual means of observing and measuring the chemical and physical properties of sedimentary rocks. Through its use the geologist is able to study the details and relationships of a sediment that have a direct bearing on the majority of our exploration problems. In the past five years numerous exploration offices in the Rocky Mountains have acquired petrographic microscopes for use on routine problems. Petrographic information is being used effectively now to supplement other types of geological and engineering data in the following ways: (a) to assist in the interpretation of depositional environments, textural trends and facies patterns by revealing the primary character of the rock, i.e., composition, texture and fabric; (b) by showing the secondary changes that the rock has undergone since deposition such as mineral alteration, the development of solution cavities, fracturing and cementation; (c) by providing a visual method of analyzing porosity and its relationship to both the primary character and the secondary changes; (d) by revealing the age relationship between cementation, fracturing and porosity development with respect to the times of fluid movement and to the time of oil accumulation, and (e) by providing detailed mineralogic data that can be applied statistically toward the identification and correlation of specific sedimentary bodies.

Variations on standard techniques are being employed to adapt petrographic data to all types of geological and engineering problems. In the future, exploration offices will depend more heavily on petrographic information in helping to define comparable and noncomparable data associated with exploration leads. From this usage will evolve new geological concepts that will materially increase our knowledge of sedimentary rocks, porosity and permeability, fluid migration and oil accumulation.

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Revised Nomenclature for Williston Basin

A revision of the 1954 publication of the "Stratigraphy of the Williston Basin" is nearing completion

and will be published early in 1960. The revision is by six stratigraphic committees of the North Dakota Geological Society. The six committees also coordinate their nomenclature selections with the North Dakota Geological Survey. The Saskatchewan Canadian Government and the Saskatchewan Geological Society have given their approval to the nomenclature revision of the Mississippian group.

The committees have divided their work as follows: 1—Cambrian-Ordovician-Silurian; 2—Devonian; 3—Mississippian Madison group; 4—Mississippian Big Snowy group-Pennsylvanian; 5—Permian-Triassic-Jurassic; 6—Cretaceous-Tertiary. Close coordination among the committees is being carried on at all times. In addition to the preparation of regional cross sections, each committee is preparing branch cross sections to the regional cross sections, maps, nomenclature charts and electric survey type-section logs pertinent to its particular problem.

Although some nomenclature revisions may be made before publication, the following are group and formation divisions by four of the committees.

I. The Cambrian-Ordovician-Silurian have been divided as follows. The Cambrian has been classified as the Cambrian-Deadwood formation. The Ordovician has been divided into the Winnipeg, Red River, Stony Mountain, and Stonewall formations. The Winnipeg formation contains a lower, middle and upper member. The Stony Mountain formation has been subdivided into Stoughton and Gunton members. The Silurian has been classified as the Interlake formation. In the latter formation, two electric survey markers have been selected and named the Tioga and the Croff.

II. The Devonian sediments have been divided into the Elk Point, the Manitoba, and the Jefferson groups overlain by the Three Forks formation. The Elk Point group has been subdivided into the Ashern, Winnipegosis, and Prairie formations. The Winnipegosis formation contains a lower and upper member. The Manitoba group has been subdivided into the Dawson Bay and Souris River formations. The Jefferson group has been subdivided into the Duperow and Bird Bear formations.

III. Overlying the Devonian is the Mississippian Bakken formation. Above the latter sediments is the Mississippian Madison group. Previous designation of the Madison group consists of the Lodgepole, Mission Canyon, and Charles formations. These formations have now been classified into the Lodgepole, Mission Canyon and Charles facies in the light of more intimate knowledge of the stratigraphy. In addition, five marker-determined intervals and two sub-intervals are defined wherever they are recognizable for correlation purposes. The Madison group facies are commonly crossed by several of the intervals which are defined by log deflections. A marker-determined interval may, and frequently does, occur in more than one facies. The three facies are not generally traceable throughout the Williston Basin, but are identified and present in the correlation chart. For each of the six selected areas in the Williston Basin, a type log is presented. Each of the six type logs indicate porosity sections which are identified with the name or names they have come to be known by in the past. The Mississippian Madison group committee wishes to emphasize that the criteria for identification of the above mentioned intervals are based on log deflections or "markers," not on lithology.

IV. The Mississippian Big Snowy group-Pennsylvanian have been divided as follows. The Big Snowy group has been subdivided into the Kibbey, Otter, and Heath formations. The Kibbey formation contains a lower, middle and upper member. The Pennsylvanian