

National Petroleum Reserve in Alaska by the Naval Petroleum Reserves Act of 1976 and jurisdiction was transferred to the Secretary of the Interior. Beginning June 1, 1977, the U.S. Geological Survey was charged with the responsibility to (1) continue the petroleum exploration program, (2) expand production of natural gas at Barrow for local consumption, and (3) environmentally rehabilitate those parts of the reserve disturbed by previous exploration and construction activities.

All of these activities are accomplished through a contract with Husky Oil NPR Operations, Inc.; the activities were previously supervised by the U.S. Navy in 1975 and were assumed in 1977 by the Department of the Interior. The U.S. Geological Survey provides technical and contract supervision and makes the final determination of the exploration strategy. Sixteen plays have been defined on the basis of geological and geophysical parameters to assess the petroleum potential and aid in management and land-use decisions.

From 1974 to June 1, 1977, the Navy drilled seven test wells and completed 7,680 line mi (12,360 line km) of a planned 26-well and 10,000 line-mi (16,093 line km) seismic program. All test wells were drilled in northern NPRA along trend with Prudhoe Bay. At the W. T. Foran test well on the Arctic Coast, the Sadlerochit Formation (the principal reservoir at Prudhoe) had good porosity and permeability with residual oil. The other wells had minor shows of oil and/or gas.

Twelve test wells were included in the program for fiscal years 1978 and 1979. Eight have been completed with shows of oil and gas; the J. W. Dalton well on the Arctic Coast produced a few barrels of heavy oil, but there were no commercial discoveries. A five-well exploration program is projected for fiscal year, 1980.

One exploratory and two development gas wells were drilled at Barrow in 1978. The two producible wells in a new section of the Barrow gas district were tied into the pipeline system that delivers gas to the Barrow communities.

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#### Mississippian Shelf Margin and Carbonate Platform from Montana to Nevada

The Kinderhookian to middle Meramecian history of a carbonate platform and shelf margin, extending from Nevada to Montana, is documented through four time-rock correlation charts and five successive maps that are synchronized by foraminiferan, conodont, and coral zonations. The platform was bordered on the west by a starved basin, a flysch trough, and orogenic highlands. The history of platform development is an integral part of the sedimentary cycle of the deep-water Deseret starved basin. Antler orogenic activity produced epeirogenic movements on the craton, which affected sea level and caused episodic progradation and retreat of the carbonate shelf margin. The sequential history is: (1) in earliest Mississippian time a narrow, northeast-trending seaway bordered by low coastal plains received mostly fine clastic sediments; (2) during late Kinderhookian time, a carbonate platform and shelf margin formed as

a result of eastward expansion of the seaway; (3) during early Osagean time, the shelf margin retreated and a broad, gentle (less than 0°5') clinoform ramp developed; (4) during middle Osagean time, lowering of the basin and craton and rise of sea level changed the pattern and sedimentary regime of the carbonate platform. Progradation of the shelf margin over the former ramp resulted in maximum expansion of the platform concurrent with maximum deepening of the starved basin. The foreslope attained a maximum steepness of 5°; (5) in middle Meramecian time, uplift of the craton and lowering of sea level caused shoaling of the carbonate platform and development of a sabkha landward. With increased uplift a karst plain developed over most of the former carbonate platform, and some cratonic sands were transported westward by streams into the basin. Meanwhile, filling of the flysch trough allowed eastward spillover of distal-flysch sediments to almost completely fill the basin.

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#### Petroleum Possibilities in Altar Desert, Sonora, Mexico

A late Miocene-early Pliocene marine basin has been identified in the northwestern corner of the State of Sonora, Mexico. The existence of the Altar basin has been established by geophysical means. Its stratigraphy and hydrocarbon generation potential are known from the geologic history of the adjoining areas.

The geology of the Altar basin is compared to basins of the same age in California which have been proven to contain more than 27 billion bbl of oil. The San Andreas fault system is a very important factor in the oil possibilities of the region.

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#### Foreign Frontiers—An Overview

Undiscovered potential in foreign frontiers is believed to be substantial. This potential is located in moderate and harsh physical environments. Very little exploration has been conducted in these basins and the majority are classified as essentially unexplored. These areas are not geologic mysteries and it is highly possible that they can contribute large increments of discovery. The attractive possibilities which exist in these foreign frontiers must not be overlooked, therefore, all must be adequately explored. Major exploration activities should begin in these areas as soon as possible if they are to have any impact on new reserves and production before the end of this century. Governments controlling harsh frontier areas are beginning to recognize the high costs and risks incurred in exploring and operating therein and are beginning to offer greater incentives to those willing to undertake the environmental challenges.

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#### Application of Ecologic Studies of Living, Algal Symbiont-Bearing Foraminifera to Paleocologic Interpretation