Management; (2) the petroleum province boundaries of the U.S. Geological Survey Resource Appraisal Group as used in the 1981 national assessments; and (3) the geologic boundaries which distinguish the sedimentary-rock provinces having petroleum potential from the crystalline-rock provinces having no petroleum potential. All of the wilderness lands are digitized for mapping purposes and for calculation of the areas for each respective wilderness tract within the boundaries of the sedimentary-rock province. A computer search and compilation of exploratory-well data from the Petroleum Information Corp.'s Well History Control System (WHCS) was conducted for all the wilderness areas and their immediate surrounding. This tabulation of known well data is a part of the geologic input to the resource-assessment procedures.

Assumptions incorporated into the resource-appraisal methods are: (1) resource potential is not uniformly distributed throughout a petroleum province; (2) the total distribution of all recoverable petroleum resources is considered, both discovered and undiscovered; (3) consideration of the geologic characteristics favorable for the accumulation of petroleum resources in all the wilderness areas; (4) probability distributions are used to calculate a range of resource values to deal with the risks of uncertainty; and (5) the use of several alternative resource-appraisal methods are critically assessed.

The petroleum-resource assessments are compiled and reported by petroleum province and for each state. A total aggregation of the estimated petroleum resources for the existing and proposed wilderness areas in the 11 western states are presented as probability distributions.

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Eocene to Oligocene Paleo-Oceanography of the Northern North Atlantic: Seismic, Isotopic, and Faunal Evidence

Seismic stratigraphic evidence from the western and northern North Atlantic indicates that a major change in abyssal circulation occurred in the latest Eocene to earliest Oligocene. In the northern North Atlantic, the widely distributed reflector R4 correlates with an unconformity that can be traced to its correlative conformity near the top of the Eocene. This horizon reflects a change from weakly (Eocene) to vigorously (early Oligocene) circulating bottom water. Sediment distribution patterns provide evidence for strong contour-following bottom water flow beginning at reflector R4 time; this suggests a northern source for this bottom water, probably from the Arctic via the Norwegian-Greenland Sea and Faeroe-Shetland Channel. Erosion and current-controlled sedimentation continued through the Oligocene; however, above reflector R3 (middle to upper Oligocene), the intensity of abyssal currents decreased. Above reflector R2 (upper lower Miocene), current-controlled sedimentation became more coherent and a major phase of sedimentary drift development began. This resulted from further reduction in speeds and stabilization of abyssal currents.

Late Paleogene paleontological and stable isotopic data support these interpretations. In the Bay of Biscay/Goban Spur regions, a major $\delta^{18}O$ increase began at ~ 38 Ma (late Eocene), culminating in a rapid (< 0.5 m.y.) increase in $\delta^{18}O$ just above the Eocene/Oligocene boundary (~ 36.5 Ma). A rapid $\delta^{13}C$ increase also occurred at ~ 36.5 Ma in these sites. Major changes in benthic foraminiferal assemblages also occurred between the middle Eocene and the earliest Oligocene: (1) In the Labrador Sea, a predominantly agglutinated assemblage was replaced by a calcareous assemblage between the middle Eocene and early Oligocene, (2) In the abyssal (> 3 km, 10,000 ft paleodepth) Bay of Biscay, an indigenous Eocene calcareous fauna including *Nuttallides truempyi*, *Clinapertina* spp., *Abyssammina* spp., *Aragonia* spp., and *Alabamina dissonata* became extinct between the middle Eocene and earliest Oligocene, (3) In shallower sites (< 3 km, 10,000 ft paleodepth) throughout the Atlantic, a *Nuttallides truempyi*-dominated assemblage was replaced by a *Globocassidulina subglobosa-Gyroidinoides-Cibicidoides ungerianus-Oridorsalis* assemblage in the early late Eocene (~ 40 to 38.5 Ma). These faunal and isotopic changes represent the transition from warm, old, corrosive Eocene bottom waters to colder, younger (lower CO_2 and higher pH, hence less corrosive) early Oligocene bottom waters.

A ^{18}O enrichment noted previously in the Southern and Indian Oceans is synchronous with the enrichment in the North Atlantic. The enrichment probably cannot be attributed only to initial entry of Arctic/Norwegian-Greenland Sea sources of cold bottom water. There is evidence that initial formation of cold, vigorously circulating bottom water from both northern sources (as denoted by reflector R4 and Horizon A^u) and southern sources (as denoted by erosion of widespread unconformities and other changes previously described from the Southern and Pacific Oceans) began near the end of the Eocene. These events also were reflected by a major ^{18}O enrichment. High-salinity water provided by North Atlantic deep water is important in the formation of Antarctic bottom water today. Such linkages or "teleconnections" might be invoked to explain the formation of southern bottom-water sources following the tectonically-controlled entry of northern sources of bottom water into the North Atlantic.

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Paleogene Bathymetry and Oceanography of Deep-Sea Benthic Foraminifera from the Atlantic Ocean

Paleodepth estimates obtained from empirical age-versus-subsidence curves of oceanic crust allow an independent determination of the paleobathymetric distributions of deep-sea benthic foraminifera. Such "backtracking" of DSDP sites together with studies of planktonic biostratigraphy, seismic stratigraphy, lithostratigraphy, and isotopic studies allows the placement of benthic foraminifera into a chronologic, paleobathymetric, and paleoceanographic framework. This approach has proven to be successful in recognizing several bathymetrically distinct deep-sea foraminiferal biofacies from the Paleogene of the Atlantic Ocean. Paleocene species have broad bathymetric ranges, but Eocene and Oligocene species tend to be bathymetrically more restricted.

Paleocene deep-water benthic foraminifera are predominantly relict Cretaceous taxa. Comparison of Paleocene deep-water benthic foraminiferal faunas with Cretaceous benthic faunas shows that, unlike planktonic organisms, there was no crisis in benthic foraminifera at the end of the Cretaceous. Most of the faunal variation in the Paleocene is attributable to the gradual bathymetric restriction of the shallower *Gavelinella beccariiformis* assemblage and the bathymetric expansion of the deeper *Nuttallides truempyi* assemblage. Such depth migrations, both expansions and restrictions, are prominent among the faunal changes noted in deep-sea benthic foraminifera studied to date. A major benthic faunal crisis occurred in the latest Paleocene (Zone P6a) with rapid massive extinctions at the generic and specific levels. Most of the extinctions occurred in the shallower *G. beccariiformis* assemblage containing predominantly Cretaceous relict species; the *N. truempyi* assemblage was characterized