mont or coastal zone.

The nature and quantity of sediment produced from the source area determine the morphologic character of the river, and a river can be classified into five patterns dependent on type of sediment load. The (1) straight and the (2) sinuous-thalweg patterns reflect relatively low values of sediment transport, of bed-load to total-load ratio, and of stream power. The (3) meandering pattern reflects relatively low to moderate values of sediment transport, of bed-load to total-load ratio, and of stream power. The (4) meandering-braided transitional pattern and the (5) braided pattern reflect relatively high values of sediment transport, of bed-load to total-load ratio, and of stream power.

Throughout geologic time fluvial systems have had complex erosional and sediment-production histories as a result of external and internal influences. The external variables that most significantly affect the fluvial system are tectonic, eustatic, and climatic. The response of the fluvial system to changes in these controls is not necessarily simple; rather a complex response involving both erosion and deposition will ensue and the morphologic character of a river will change as the character of the sediment delivered from the source area changes. The exceeding of intrinsic geomorphic thresholds also produces episodes of high sediment movement.

The character of sedimentary deposits (piedmont, deltaic, or nearshore) will reflect the geology, morphology, and erosional history of the source area as well as the type of river transporting the sediment. Abrupt changes in amount and type of sediment reflect not only the complexity of the erosional evolution of the area, but also the dynamics of the sediment-producing and transport zones of the fluvial system.

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Oil and Gas in China

No abstract available.

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Hydrogeologic Significance of Ogallala Fluvial Environments

A "spring line" separates areas of flowing and nonflowing artesian wells completed in alluvial-fan deposits of the Ogallala Formation southwest of Cheyenne, Wyoming. Electric and lithologic logs from water well test holes in the area permit the distinction of depositional subenvironments within and near the ancient fan. West of the "spring line," the Ogallala coarsens upward through an aquifer unit of interbedded sand and gravel approximately 35 m thick, representing low-sinuosity fluvial-channel deposits. East of the "spring line," the same unit becomes markedly finer and is characterized by fining-upward subunits 10 to 15 m thick, representing deposits of fluvial channels with higher sinuosities. Water wells completed in the proximal-fan deposits on the west commonly produce a few hundred gallons per minute; in contrast, wells in the distal fan and in interbedded fan and lacustrine deposits on the east produce only several tens of gallons per minute or less. Identifying the location of the distal margin of the low-sinuosity deposits, and thus the "spring line," through interpretations of depositional environments from outcrops and logs, helped locate rapidly one industrial water supply in the area.

Contrasting fan geometries illustrate varying rates of progradation with respect to the adjacent aggrading flood basins, whereas cyclicity within fan bodies reflects lobe shifting and/or basin-floor subsidence. General contrasts in fan thickness, size, and facies on opposite basin margins allow reconstruction of the basin geometry and provide clues to the likely types of bounding faults.

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Paleosols as Environmental Indicators in Nonmarine Sedimentary Rocks—Example from Brule Formation

Although there has been considerable study of Pleistocene and post-Pleistocene soils as stratigraphic markers and environmental indicators, much less attention has been given to older paleosols. In nonmarine sedimentary beds, periods of nondeposition or erosion can be characterized as intermittent, areally extensive, and of variable duration. Under favorable conditions of weathering, soils may develop on exposed rocks and subsequently be preserved by deposition and burial.

The Brule Formation (Oligocene) in northwest Nebraska consists predominantly of fluvial and eolian rocks. Based on paleontologic evaluations, several stratigraphic levels have been suggested as being soils or soil complexes. Of these, two stratigraphic zones were studied as possible paleosols. One of these, the lower ash bed of the Whitney Member, Brule Formation, has physical characteristics similar to those of a soil formed in a semiarid climate.

The lower ash bed is indicated to be a paleosol on the basis of trends in organic matter, particle-size distribution, and calcium carbonate content. The vertical profile shows a zone of higher organic matter in the upper part, a zone of high clay content below, and high calcium carbonate content in the subsoil. The White marker bed of the Whitney Member of the Brule Formation was also studied. The amounts of organic matter, clay, and calcium carbonate do not indicate a simple paleosol origin for the White marker bed.

Comparison of the lower ash paleosol to modern soils provides a basis for additional interpretations. Depth and thickness of zones of accumulation suggest that the paleosol was developed under a grassland cover and are characteristic of Chestnut-type soil. The climatic conditions that typically produce these characteristics include an average annual precipitation of 30 to 45 cm.

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Geology and Hydrocarbon Accumulation in Mississippian Midale Beds, Benson Oil Field, Southeastern Saskatchewan

In southeastern Saskatchewan the Mississippian strata dip south-southwest and are progressively truncated northward against the post-Mississippian erosion surface. Impermeable "red beds" of the Watrous Formation unconformably overlie the Mississippian carbonate sequence.

The Benson field is a structural and stratigraphic trap in which oil has accumulated in dolomite layers of the Midale Beds beneath the erosion surface. The dolomite rocks which are microsucrosic and commonly burrowed have good to excellent intercrystalline and moldic porosity. Dolomite layers are present at several stratigraphic positions within the lagoonal carbonate rocks of the Midale Beds and range from 0.1 to 3.2 m in thickness. Either limestones (wackestones and micritic packstones), highly calcareous dolomites (microsucrosic), or anhydritic dolomites (cryptocrystalline) provide the caprocks and the bottom seals for the porous layers. Laterally, the dolomites grade into highly calcareous dolomites and/or wackestones. The porous layers result from selective dolomitization of carbonate sediments.

Close to the erosional edge, porosity in the dolomites has been reduced or obliterated by secondary anhydrite.

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New Look at Oil and Gas Resources of Denver-Julesburg Basin

The Denver-Julesburg basin, with approximately 1,000 Lower Cretaceous fields and over 30,000 wells, presents a unique opportunity for statistical analyses of its exploration history. Comparison of an analysis of the current activities in the basin with a similar analysis made 20 years ago by J. J. Arps provides an interesting perspective of the known distribution of field sizes, as well as speculations on the basin's exploration future.

Five years ago 12,200 exploratory wells had been drilled in this basin and resulted in the discovery of 820 fields. As a result of the known field-size distribution in the basin at that time, the average size of an undiscovered field was predicted to be on the order of 1 million bbl of recoverable resources. Since then, more than 5,000 additional exploratory wells have been drilled, and the average size of the 125 new fields discovered is in the predicted range. Exploration statistics indicate that the rate of oil discovery has declined in the past 5 years, even though the frequency of wildcat drilling has accelerated. Newly discovered fields are generally located in the heavily drilled areas as opposed to the sparsely drilled or "under developed" areas of exploration.

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Uranium Geology of Morton Ranch Property, Southern Powder River Basin, Wyoming

The Morton Ranch uranium deposits are located along the southern axis of the Powder River basin approximately 22 mi (35 km) northwest of Douglas, Wyoming. The property encompasses approximately 26,000 acres (10,400 ha.) of private and state lands and is divided into two separate tracts: North Morton and South Morton.

The uranium deposits are restricted to two bedrock units—Wasatch Formation (Eocene) and Fort Union Formation (Paleocene). Both rock units consist essentially of fluvial sediments of interbedded and highly lenticular silty claystone and sandy siltstones that contain lenses of coarse, cross-bedded, arkosic sandstone.

Most of the uranium mineralization is restricted to three sandstone units within the Fort Union Formation. The ore sands are continuous throughout the area and range in thickness from 2 to 80 ft (0.6 to 24 m). On South Morton, the ore sands crop out in the Box Creek area but for the most part lie at a depth of 40 to 300 ft (12 to 90 m) below the surface. On North Morton, the ore sands are 550 to 700 ft (165 to 210 m) below the surface.

The uranium orebodies are present typically as geochemical-cell or "roll-front" deposits. Of less importance are tabular and elliptical or dish-shaped orebodies, primarily present on South Morton.

Surface (open pit) and possibly adit-level underground mines are planned for South Morton and underground mines for North Morton. In-situ leaching may be used as a recovery method in some areas of the property.

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United States and World Energy Outlook for the 1980s

An assessment of energy supply and demand for the United States and the world to the year 1990 is presented as balanced volumetric energy flows disaggregated over the primary sources and major consuming sectors. On the national scene, some of the projections and conclusions are (1) between now and 1990 the world demand for oil will grow more rapidly than United States demand; (2) most of the energy to be consumed in the United States over the projection period will be supplied as domestically produced fossil fuels; (3) oil imports will increase to about 10 million BOPD throughout the decade of the 1980s, coming more and more from OPEC; (4) coal will supply an increasingly greater fraction of total U.S. energy consumption, primarily in the utility and industrial sectors; (5) new sources of energy will be developed, but before 1990 will have only a small impact on total supply; (6) nuclear power, while growing less vigorously than estimated in past projections, will be important to the nation's economy; and (7) the successful balancing of long-term U.S. energy futures is contingent on our ability to achieve significant reductions in energy consumption growth rates.

On the international scene, it appears that: (1) unemployment may be the largest single factor affecting the international economy, (2) the majority of the oil reserves are in communist countries and the Middle East, (3) over 60% of the gas reserves are in communist countries, (4) and the same is generally true for coal reserves, (5) the United States will have to compete with the rest of the world for the available interregionally traded oil,