

tions provide input for the existing geohydrologic models for fracture flow which is significantly less variable than permitted by the models' sensitivity to this parameter.

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Perspectives of Energy Development in New Mexico

New Mexico ranks fourth in the nation in natural gas and natural gas liquids production. It is seventh in crude oil and lease condensate extraction, has 55% of the country's uranium, and ranks first in providing this crucial energy fuel. Over 120 billion tons of coal lie between the surface and 3,000 ft (915 m) in northern New Mexico with 3 to 6 billion tons of low-sulfur coal accessible for relatively inexpensive strip mining. The U.S. Geological Survey estimates that the Valles Caldera of the Jemez Mountains alone contains geothermal fluids capable of sustaining 2,700 Mw of electrical generating capacity for 30 years. Solar insolation in southern New Mexico is within 10% of the maximum received anywhere in the world.

Energy in all its forms will be the major force in New Mexico's economic future. More than half of the state's gross product is now derived from energy-oriented activities. It is not unreasonable to expect that, just as a century or so ago major communities and industrial enterprises developed around transportation corridors of rivers and railroads, the new commerce of the next decades will locate where assured energy supplies exist. Massive service, social, financial, and environmental burdens and impacts must be addressed by industry, government, and citizens if the state is to provide orderly, stable, and beneficial development, to avoid the potential misfortunes of "boom and bust" cycles, and to preserve its unique environment and life style.

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Origin of Intraformational Folds in Jurassic Todilto Limestone, Ambrosia Lake Uranium Mining District, McKinley County, New Mexico

The Todilto Limestone of Middle Jurassic age in the Ambrosia Lake uranium mining district of McKinley County, New Mexico, is the host formation for numerous small to medium-size uranium deposits in joints, shear zones, and fractures within small to large-scale intraformational folds. These folds probably were formed as a result of differential sediment loading when eolian sand dunes of the overlying Summerville Formation of Middle Jurassic age migrated over soft, chemically precipitated, lime muds of the Todilto shortly after their deposition in a regressive, mixed fresh and saline lacustrine or marginal-marine environment of deposition.

Encroachment of Summerville eolian dunes was apparently restricted to relatively narrow beltlike zones trending radially across the Todilto coastline toward the receding Todilto body of water. Intraformational folding is believed to be confined to the pathways of individual eolian dunes or clusters of dunes within the dune belts.

During the process of sediment loading by the migrating dunes, layers of Todilto lime mud were differentially compacted, contorted, and dewatered, producing both small, and large-scale plastic deformation structures including convolute laminations, mounds, rolls, folds, and small anticlines and synclines. During the processes of compaction and dewatering, the mud, in localized areas, reached a point of saturation at

which sediment plasticity was lost, causing shearing, fracturing, and jointing of the contorted limestone beds. These areas or zones within the limestone became the preferred sites of uranium mineralization because of the induced transmissivity created by sediment rupture during prolonged sediment loading.

Along the Todilto coastline adjacent to the eolian dune belts, both interdune and coastal sabkha environments dominated the Summerville on the margins of the Todilto body of water. Sediment in these areas consists mainly of claystone, siltstone, sandy siltstone, and very fine grained sandstone which was apparently derived from the winnowing of the finer grained fraction of sediment from adjacent eolian dune fields during eolian activity. Most of the sabkha sediments were probably carried in airborne suspension to the low-lying, ground-water saturated, coastal areas where they were deposited as relatively uniform blanketlike layers. Deposition of sabkha deposits was apparently slow and uniform over most of the Todilto coastal and interdune areas, and did not cause the formation of other than small-scale deformation features in underlying Todilto rocks. Large-scale deformational features as well as uranium deposits are notably absent in the Todilto where it is overlain by finer textured sabkha deposits in the Summerville.

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Mollusca from Upper Cretaceous Fruitland and Kirtland Formations, Western San Juan Basin, New Mexico: Review

Renewed interest in the development of substantial coal reserves in the San Juan basin has given new impetus to the determination of the potential impact of expanded mining on paleontologic resources and to a reconsideration of depositional environments of Fruitland coals.

Reanalysis of molluscan localities from the Fruitland and Kirtland Formations on lands of the Navajo Nation, in preparation for more extensive field studies, indicates that, of the 24 localities collected by C. M. Bauer in 1915, 12 are type localities for 17 species, representing a large percentage of the total fauna known from these formations. Differentiation of brackish and nonmarine environments on the basis of biostratigraphic distribution of species divides the Fruitland Formation into upper and lower units. Near the western margin of the San Juan basin, predominantly brackish environments are present near the base of the Fruitland, underlain by the littoral-marine Pictured Cliffs Sandstone, and extend up to 35.6 m in total thickness. Exclusively nonmarine sediments are present above this horizon to the top of the Fruitland and throughout the Kirtland Formation. Nonmarine molluscan diversity seems to increase markedly at approximately 35.6 m. Below this horizon, only 7 taxa indicate freshwater environments. At 35.6 m, 8 taxa are introduced, and of these 7 occur only at this level. Above 35.6 m, only 2 taxa are introduced: *Physa reesidei* at about 61 m and "*Unio*" *baueri* at 123.5 m (Kirtland Formation). The only terrestrial mollusk reported is *Planorbis chacoensis* from near the base of the Fruitland Formation.

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Overview of Geology as Related to Environmental Concerns in New Mexico