GEOLOGY OF TEXAS

1992

BUREAU OF ECONOMIC GEOLOGY
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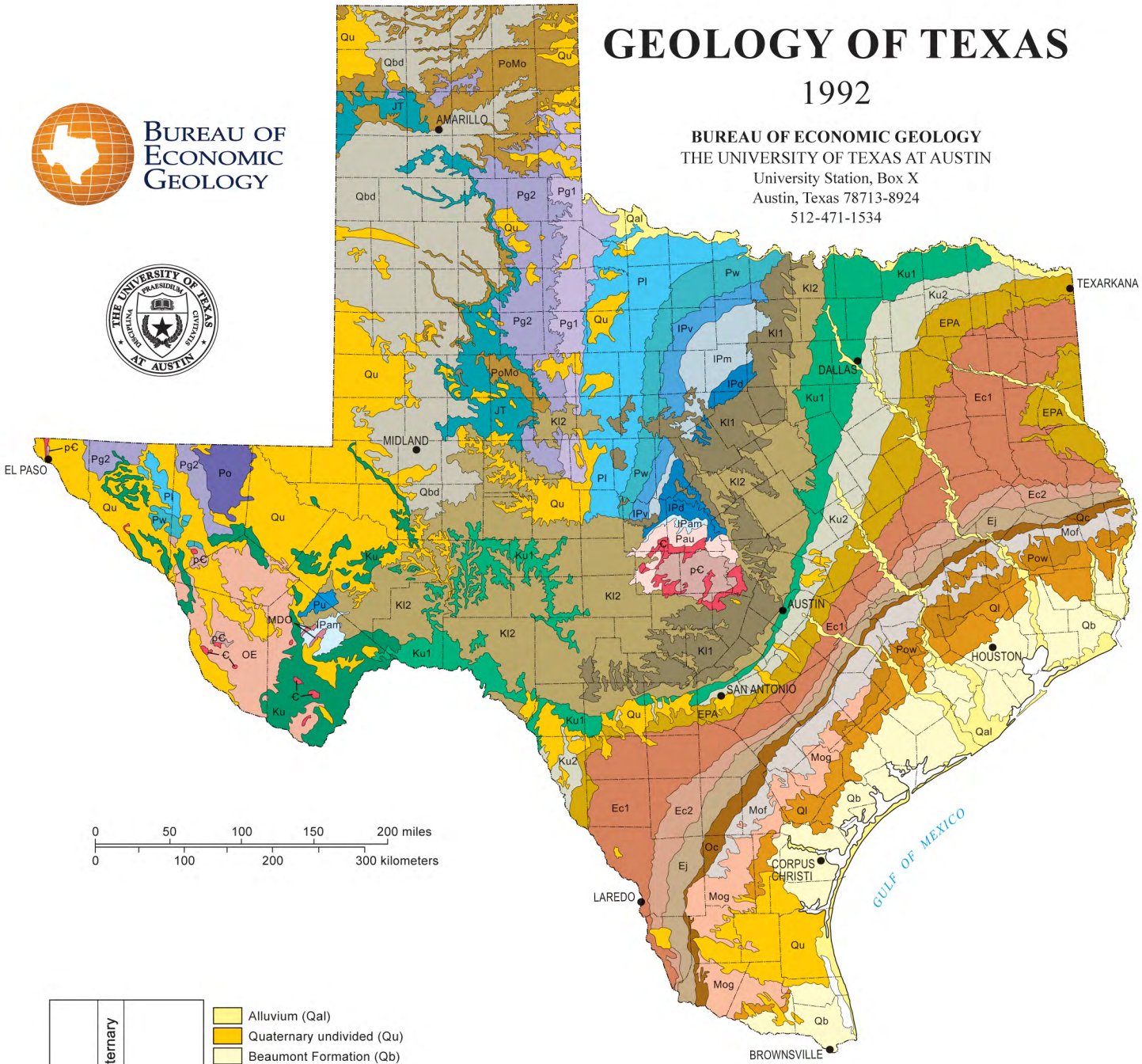

CENOZOIC	Quaternary	2 m.y.	Alluvium (Qal)
			Quaternary undivided (Qu)
			Beaumont Formation (Qb)
			Lissie Formation (Ql)
			Blackwater Draw Formation (Qbd)
	Tertiary	Pliocene 5 m.y.	Willis Formation (Pow)
			Ogallala Formation (PoMo)
		Miocene 24 m.y.	Goliad Formation (Mog)
			Fleming and Oakville Formations (Mof)
		Oligocene 38 m.y.	Catahoula Formation (Oc)
			Oligocene and Eocene undivided (OE) (volcanic rocks and conglomerates in Trans-Pecos Texas)
		Eocene 58 m.y.	Jackson Group (Whitsett, Manning, Wellborn, Caddell, Yazoo, and Moodys Branch Fms.) (Ej)
			Claiborne Group (Yegua Formation) (Ec2)
			Claiborne Group (Cook Mountain, Sparta, Weches, Queen City, and Reklaw Fms.) (Ec1)
	Paleocene		Wilcox and Midway Groups (EPA)
MESOZOIC	66 m.y.		Navarro and Taylor Groups (Ku2)
	Cretaceous		Austin, Eagle Ford, Woodbine, and U. Washita Groups (Ku1)
			Fredericksburg and L. Washita Groups (Kl2)
	144 m.y.		Trinity Group (Kl1)
	Jurassic Triassic 245 m.y.		Cretaceous undivided (Ku)
			Jurassic Triassic undivided (JT)

	245 m.y.	
PALEOZOIC		Ochoan Series (Po)
		Guadalupian Series (Whitehorse and Quartermaster Formations) (Pg2)
	286 m.y.	Guadalupian Series (Blaine and San Angelo Formations (Pg1)
		Leonardian Series (Pl)
		Wolfcampian Series (Pw)
		Permian undivided (Pu)
	320 m.y.	Virgilian Series (IPv)
		Missourian Series (IPm)
		Desmoinesian Series (IPd)
	505 m.y.	Atokan and Morrowan Series (IPam)
		Mississippian, Devonian, and Ordovician undivided (MDO)
	570 m.y.	Cambrian (Ꞓ)
		Paleozoic undivided (Pau)
Pre-cambrian	1200 m.y.	Precambrian undivided (p-Ꞓ)
	2000 m.y.	

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Geology of Texas

The geologic history of Texas is recorded in the rock strata that fill the many subsurface sedimentary basins and crop out across the state. The origin of these strata documents a changing geography that began several billion years ago in the Precambrian Era. Mountains, seas, rivers, volcanoes, and earthquakes are part of the geologic story of Texas, and the resources produced by geologic phenomena (petroleum, coal, lignite, metals, groundwater, salt, limestone, ceramic clays, and various soils) are the legacy of the state's changing face.

Texas is underlain by Precambrian rocks more than 600 million years old. The deformed ancient volcanic and intrusive igneous rocks and sedimentary rocks were formed early in the Earth's history. They are now exposed in the Llano Uplift and in a few small areas in Trans-Pecos Texas.

During the early Paleozoic, broad inland seas inundated the stable West Texas region (Texas Craton), depositing widespread limestones and shales. Lower Paleozoic rocks are now exposed around the Llano Uplift and in the mountains of Trans-Pecos Texas. The Texas Craton was bordered on the east and south by the Ouachita Trough, a deep-marine basin extending along the Paleozoic continental margin from Arkansas and Oklahoma to Mexico. Sediments accumulated in the Ouachita Trough until late in the Paleozoic Era when the European and African continental plates collided with the North American plate. Convergence of the North and South American plates in this area produced fault-bounded mountainous uplifts (Ouachita Mountains) and small basins filled by shallow inland seas that constituted the West Texas Basin.

Broad limestone shelves and barrier reefs surrounded the deeper parts of the marine subbasins. Rivers flowed to the landward edges of the basins, forming deltas, and coastlines shifted repeatedly as nearshore sediments were deposited and then eroded by marine processes. Pennsylvanian strata that are products of these processes are exposed today in North-Central Texas. Near the end of the Paleozoic Era, the inland seas retreated southwestward, and West Texas became the site of broad evaporite basins where salt, gypsum, and red muds were deposited in a hot, arid climate. The strata originally deposited in the Permian Basin are exposed in the Rolling Plains of West and Northwest Texas and in Trans-Pecos Texas.

The Mesozoic Era in Texas began about 245 million years ago when the European and African plates began to break away from the North American plate, producing a belt of elongate rift (fault-bounded) basins that extended from Mexico to Nova Scotia. Sediment from adjacent uplifts was deposited in these basins by streams. While Europe and Africa drifted farther away, the basins were buried beneath marine salt as the East Texas and Gulf Coast Basins were created. During the rest of the Mesozoic Era, broad limestone shelves were periodically buried by coastal plains and deltaic deposits as the Texas continental margin gradually shifted southeastward into the Gulf of Mexico. In the East Texas Basin, deeply buried salt deposits moved upward forming salt ridges and domes, providing a variety of folded structures and traps for oil and gas.

In West Texas, during the early Mesozoic Era, a large shallow lake occupied the abandoned site of the Permian Basin, but eventually waters from the Gulf of Mexico encroached and flooded West Texas beneath a shallow sea. Dinosaurs roamed the land and shallow waters, and marine reptiles dominated the Mesozoic seas until the waters withdrew from West Texas, near the end of the era. Mesozoic strata are exposed along the western and northern margin of the Gulf Coast and East Texas Basins and extensively across West Texas.

When the Cenozoic Era dawned in Texas, about 66 million years ago, the East Texas Basin was filling with lignite-bearing deposits of river and delta origin. The early Cenozoic Mississippi River flowed across East Texas, and a large delta occupied the region north of Houston. Smaller deltas and barrier islands extended southwestward into Mexico, very much like the present Texas coast. Delta and river sands were transported southeastward into progressively deeper waters of the Gulf of Mexico. In the Gulf Coast Basin, deeply buried lower Mesozoic salt moved upward to form domes and anticlinal structures. Now, Cenozoic strata are exposed throughout East Texas and in broad belts in the coastal plain that become younger toward the Gulf of Mexico.

In Trans-Pecos Texas, extensive Cenozoic volcanoes erupted, thick lava flows were deposited over older Mesozoic and Paleozoic strata, and rift basins were formed. Cenozoic volcanic rocks are now well exposed in the arid region of Trans-Pecos Texas.

In northwestern Texas, late Cenozoic streams deposited gravel and sand transported from the Rocky Mountains of southern Colorado and northern New Mexico. During the Ice Age (Pleistocene Epoch, beginning about 2 million years ago) the Pecos River eroded northward into eastern New Mexico and isolated the alluvial eolian deposits of the Texas High Plains from their Rocky Mountain source. The isolated High Plains were eroded by several Texas rivers during and since the Ice Age, causing the eastern margin (caprock) to retreat westward to its present position.

While the northern part of the continent was covered by thick Pleistocene ice caps, streams meandered southeastward across a cool, humid Texas carrying great volumes of water to the Gulf of Mexico. Those rivers, the Colorado, Brazos, Red, and Canadian, slowly entrenched their meanders as gradual uplift occurred across Texas during the last 1 million years. Sea-level changes during the Ice Age alternately exposed and inundated the continental shelf. River, delta, and coastal sediments deposited during interglacial (high-sea-level) stages are exposed along the outer 80 kilometers of the coastal plain. Since sea level reached its approximate present position about 3,000 years ago, thin coastal-barrier, lagoon, and delta sediments have been deposited along the Gulf Coast.

Texas is a composite of nature's processes. Texas today is but one frame in a dynamic geological kaleidoscope of changing rivers, subsiding basins, shifting beaches, uplifting mountains, and eroding plateaus. The face of modern Texas is the link that connects its geologic past to its inevitable future.

Bureau of Economic Geology

The **Bureau of Economic Geology,** established in 1909, is the oldest research unit at The University of Texas at Austin. The Bureau functions as the state geological survey of Texas, and Director Scott W. Tinker is the State Geologist. The Bureau conducts basic and applied research programs in energy resources and economics, coastal and environmental studies, land resources and use, geologic and mineral mapping, hydrogeology, geochemistry, and subsurface nanotechnology.

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