Louisiana Geological Survey

Louisiana GeoFacts

February 2001
Public Information Series No.6

Land

Highest Point in Louisiana—Mount Driskill, Bienville Parish

Driskill Mountain was named for James Christopher Driskill. He was born in Hancock County, Georgia, on June 27, 1817, and in 1840 he married Eugenia Irwin Walker. In October 1859, Driskill sold his land in Troup County, Georgia, and moved his wife and family of eight boys and one girl to Louisiana, where he bought 324 acres that contained a mountain.

During the Civil War, Driskill served in the Home Guard. His eldest son William was killed in action at the "Battle of the Wilderness" on May 5, 1864. Another son, James B., disappeared after he had left Louisiana to fight in the Civil War. The Driskills' descendants still live in the area to this day.

Mount Driskill is the highest natural point in Louisiana, at 535 feet (163 meters) high. It is located 5.3 miles southeast of Bryceland, Louisiana, in the northeast corner of Sec. 32, T. 17 N., R. 5 W. Mount Driskill consists of nonmarine quartz sands of the Cockfield Formation overlying marine clays and silts and coastal sands of the Cook Mountain Formation.

John Croche

Mount Driskill, the highest point in Louisiana.

Lowest Point in Louisiana—New Orleans

Of any major city within the United States, New Orleans has the lowest, flattest, and geologically youngest setting. The metropolitan area has an average elevation of about 1.3 feet (0.4 meters). Adjacent to the Mississippi River, its natural levee rises as much as 23 feet (7.0 meters) above sea level. Away from the river, parts of New Orleans lie about 5 feet (1.6 meters) below sea level (fig. 1).

Further Reading:

Kolb, C. R., and R. T. Saucier 1982. Engineering Geology of New Orleans. Geological Society of America Reviews in Engineering Geology (5): 75–93.

Saucier, R. T., and J. O. Snowden 1995. Engineering geology of the New Orleans area. Pp. 131-154 in C. J. John and W. J. Autin, eds., Guidebook of Excursions, in conjunction with the annual meeting of the Geological Society of America, New Orleans, La., November 6-9, 1995. Boulder, Colo.: Geological Society of America.

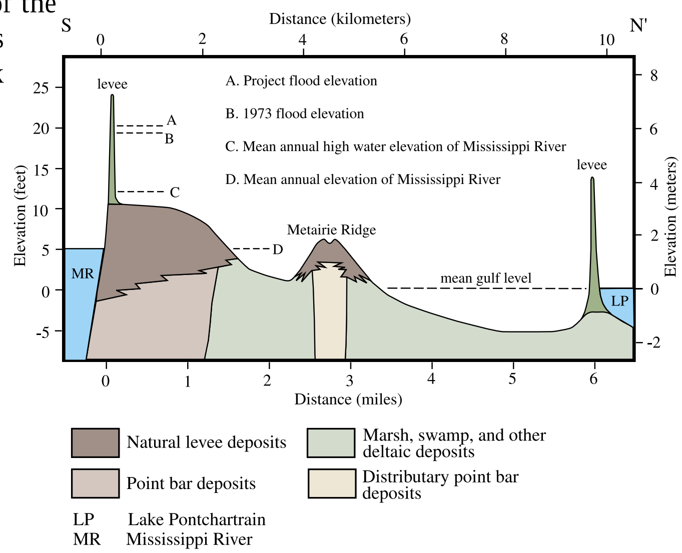


Figure 1. North-south cross section across New Orleans, Louisiana, showing topography relief and underlying sediments. (Redrawn and adapted from figure 6 of Saucier and Snowden, 1995:138.)

Fastest Growing—Atchafalaya and Wax Lake Deltas

The fastest growing natural features in Louisiana are the Wax Lake and Atchafalaya deltas. Prior to 1952, these deltas had not even formed. Only after the Atchafalaya River filled in Grand, Six Mile, and other lakes within its basin did deltaic sediments begin to accumulate in Atchafalaya Bay. By 1962, deltaic deposits greater than 1 foot (0.3 meters) thick covered about 46 mi^2 (120 km^2) of the bottom of Atchafalaya Bay. By 1972, the first small shoals, representing an accumulation of sediments that covered about half of Atchafalaya Bay, appeared along the east side of the navigation channel.

Between 1973 and 1975, abnormally large floods dumped about 255,000 tons of clay, silt, and very fine sand into Atchafalaya Bay. As a result, an extensive network of distributary mouth bars emerged. By 1977, both deltas had a total of 7.6 mi^2 (19.6 km^2) of deltaic plain. In 1991, these deltas had a total area of 22 mi^2 (57 km^2). By 1994, their areas had expanded to 59.3 mi^2 (153.6 km^2) (fig. 2; Roberts, 1992).

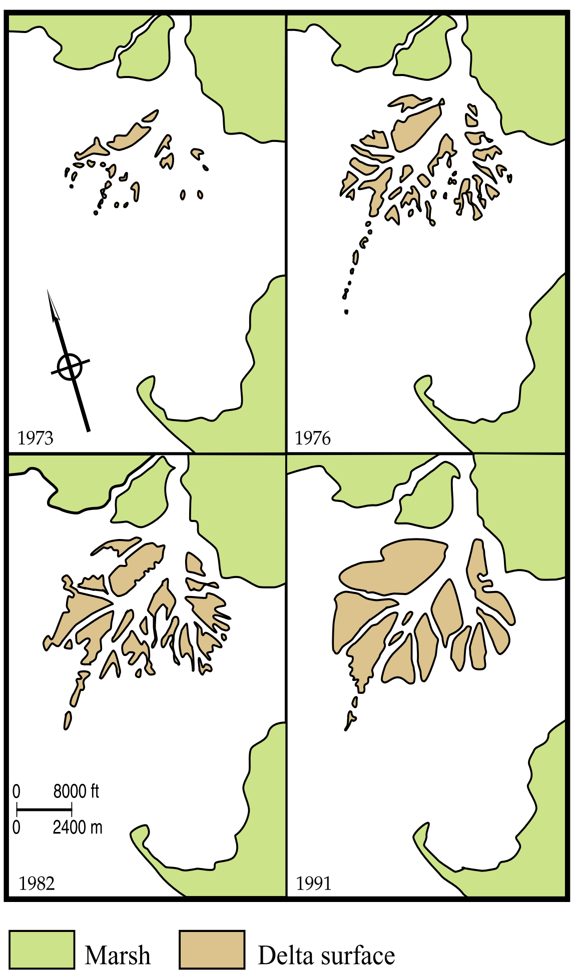


Figure 2. Growth history of the Atchafalaya Delta from 1973 to 1991. (Redrawn from figure 2 of Roberts 1992:33, by permission.)

Further Reading:

Roberts, H. H. 1992. The Atchafalaya Delta: an analog for thin deltas and subdeltas in the subsurface. Basin Research Institute Bulletin 2(1):31–45.

van Heerden, I. L., and H. H. Roberts 1980. The Atchafalaya Delta-Louisiana's New Prograding Coast. Gulf Coast Association of Geological Societies Transactions (30):497–506.

Fastest Vanishing—Lafourche and Terrebonne Parishes

Unfortunately, the addition of new land associated with the Wax Lake and Atchafalaya deltas and a short segment of the chenier plain is atypical of coastal Louisiana. Overall, coastal Louisiana is losing land to erosion and subsidence at rapid rates. Louisiana contains 40 percent of the nation's wetlands, but is experiencing about 80 percent of the country's wetland loss. From 1956 to1978, coastal Louisiana lost land at an average rate of 39.4 mi^2/yr (102 km^2/yr). In the 12 years, the rate of land loss averaged 34.9 mi^2/yr (90.4 km^2/yr). Since the 1930's, more than 1,000,000 acres of wetlands, an area 25 percent larger than Rhode Island, has disappeared into the Gulf of Mexico (Barras and others, 1994).

The parts of coastal Louisiana experiencing the highest rates of land loss are the Barataria and Terrebone basins. They comprise most of Lafourche and Terrebonne parishes. Between 1956 and 1978, the Barataria and Terrebone basins, respectively, lost land at an average rate of 7.6 and 9.3 mi^2/yr (19.7 and 24.1 km^2/yr). The average rate of land loss was, respectively, 11.1 and 10.2 mi^2/yr (28.7 and 26.1 km^2/yr) for the period 1978-1990 (Barras and others, 1994).

Further Reading:

Barras, J. A., Pierre E. Bourgeois, and Lawrence R. Handley 1994. Land loss in coastal Louisiana 1956-90. National Biological Survey, National Wetlands Research Center, Open File Report 94–01.Lafayette, La: National Biological Survey, National Wetlands Research Center.

Oldest Shoreline—Houston Ridge

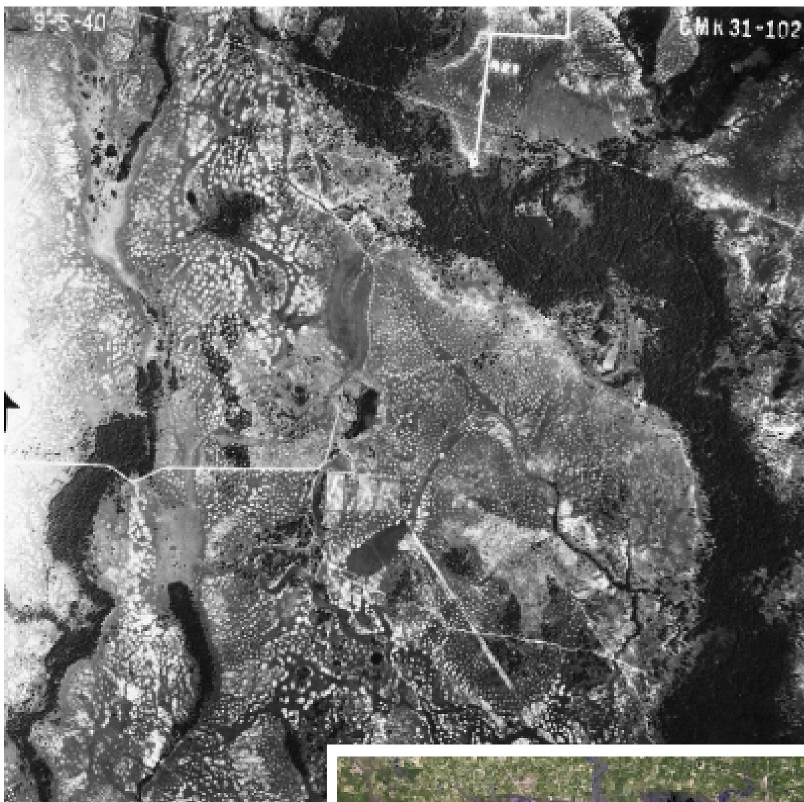
The oldest recognizable shoreline feature in Louisiana is the Houston Ridge in northern Calcasieu Parish. This ridge extends from the eastern edge of the Sabine River flood plain to the junction of the Houston River and West Fork of the Calcasieu River. This feature is the easternmost extension of a Pleistocene barrier island and beach ridge complex that stretches along the Gulf Coastal Plain from Mexico across Texas and into Louisiana. Although its age is still not precisely known, this ancient beach ridge is estimated to be from 132,000 to 110,000 years old—a period when sea levels were slightly higher than they are now.

The Houston Ridge is a discontinuous feature about 17 miles (27 km) long. It ranges in elevation from about 25 to 35 feet (7.6 to 11 meters) and rises about 10 to 15 feet (3 to 4.5 meters) above the surrounding coastal plain. Its width varies from one mile (1.6 km) wide at its eastern end to between 0.4 and 0.6 of a mile (0.6 and 1 km) wide farther west. Like any typical beach ridge, it is made up of yellowish brown to gray, clean fine to very fine sand. In Texas, segments of this ancient shoreline are wider and exhibit the ridged topography that characterizes an ancient shoreline.

Strangest Landform—Pimple Mounds

The Pleistocene coastal terraces that form the coastal plain of southwest Louisiana are covered by hundreds of thousands of enigmatic landforms called "pimple mounds." These low, rudely circular or elliptical dome-like mounds are composed of loamy sand. These mounds range from 10 feet (3 meters) to more than 100 feet (30 meters) in diameter. They can be up to 2 feet (60 cm) in height.

The origin of pimple mounds, also called "mima mounds" and "prairie mounds," is still a matter of considerable controversy. From the early 1800's to present, literally dozens of different theories explaining the origins of pimple mounds have been published. Some of the hypotheses proposed include (1) erosional remnants left by either sheetflood erosion or wind deflation; (2) accumulations of wind-blown sediment around clumps of vegetation; and (3) mounds formed by burrowing rodents.



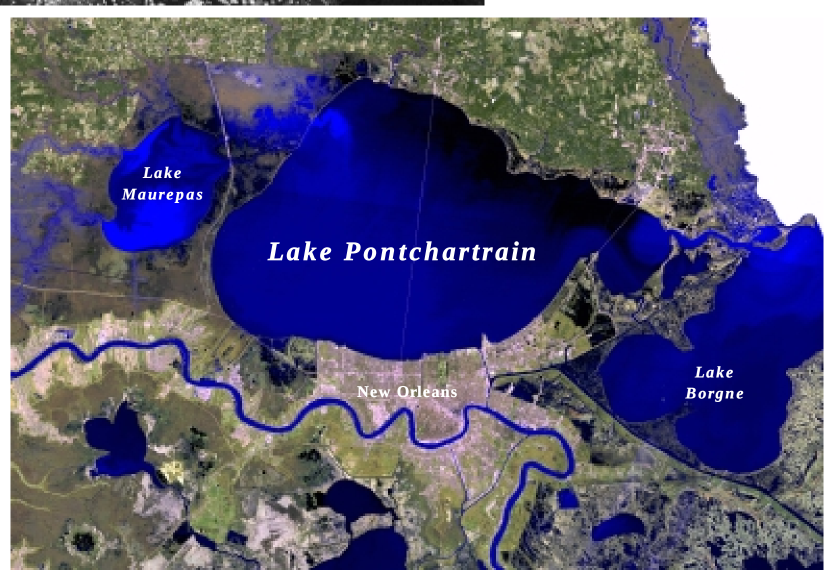
Aerial photograph of pimple mounds (white dots) within southern Beauregard and northern Calcasieu parishes about 3 km (5 miles) southeast of De Qunicy, Louisiana. (Agricultural Stabilization and Conservation Service photography taken September 5, 1940)

Water

Largest Natural Water Body—Lake Pontchartrain

Lake Pontchartrain is the largest natural water body in the state, being about 40 miles (65 km) long, 25 miles (40 km) wide, and 10 to 16 feet (3 to 5 meters) deep. Along with Lake Maurepas, the lake comprises one of the largest estuaries in the United States.

In geologic terms, Lake Pontchartrain is relatively young. During the last Ice Age, about 21,000 B.P., the Lake Pontchartrain region was dry. A negative change in sea level by about 360 feet(110 meters) resulted in what is now the Louisiana continental shelf to be exposed land. Beginning about 15,000 B.P., the continental ice sheets melted and, consequently, sea level rose episodically until by about 5,000 B.P. At that time, the Gulf of Mexico's shoreline had moved inland close to what is now Lake Pontchartrain's north shore. Between 5,100 and 4,000 years B.P., longshore currents created and maintained a chain of barrier islands and shoals. They extended southwest from



the mouth of the Pearl River. This barrier island chain, called the "Pine Island Barrier," created the gulfward boundary of an ancient Pontchartrain Bay. About 3,000 B.P., the St. Bernard Delta Complex built out across the New Orleans area and over the Pine Island Barrier burying it. This created Lake Pontchartrain.

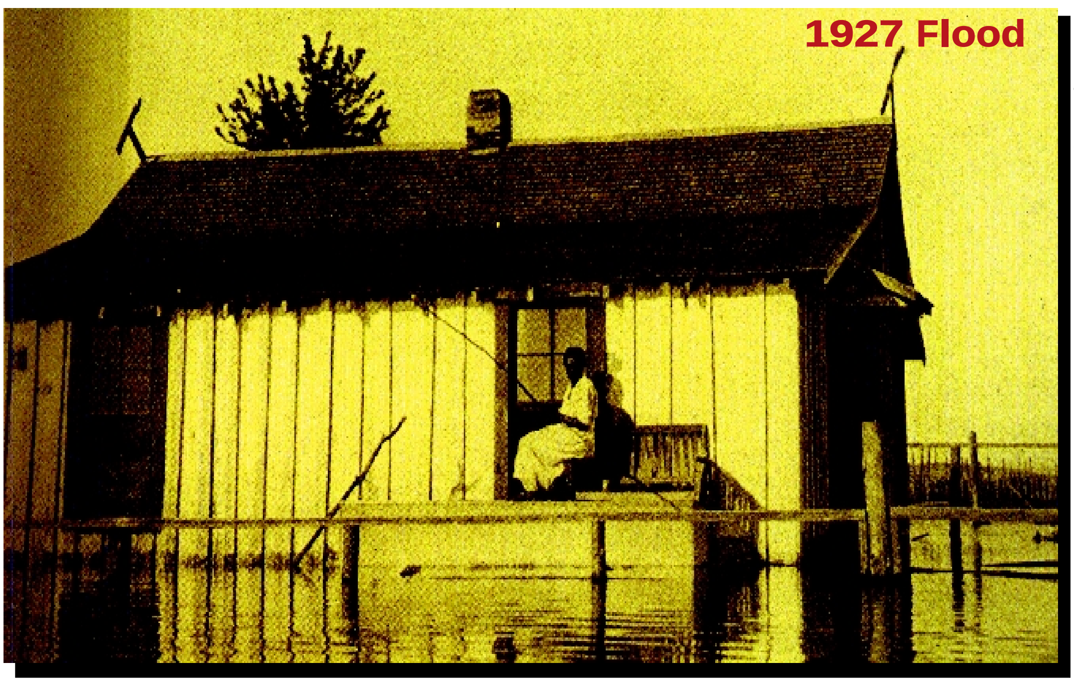
Further Reading:

Otvos, E. G. 1978. New Orleans-South Hancock Holocene Barrier Island Trend and Origins of Lake Pontchartrain. Gulf Coast Association of Geological Societies Transactions (28):337–355.

Largest Artificial Lake—Toledo Bend Reservoir

According to the Sabine River Authority, Toledo Bend Reservoir is the largest engineered lake in the southeastern United States. The reservoir sits astride the Louisiana-Texas border on the Sabine River. From the dam site, the reservoir extends upstream for about 65 miles (20 km) to Logansport, Louisiana. This reservoir inundates parts of Sabine, Shelby, Panola, and Newton counties in Texas, and Sabine and De Soto parishes in Louisiana. It has over 1,200 miles (1,900 km) of shoreline. In surface area, it is the fifth largest reservoir in the southeast, covering over 185,000 acres. The controlled storage capacity of Toledo Bend Reservoir is 4,477,000 acre-feet (5.52 km^3).

Toledo Bend Dam is a rolled earth-fill structure. Including saddle dikes, the dam is 11,250 feet (3,430 m) long, 25 feet (7.6 meters) wide at its crest, and 112 feet (34 meters) high. The dam's spillway has a design discharge of 290,000 ft^3/sec (8,200 m^3/sec). Construction began in May 1963 and it was completed three years later. The power plant started operating in the early part of 1969.



Collection of Don Davis

Most Devastating Flood— The 1927 Flood

The Great Mississippi Flood of 1927 affected the entire Mississippi alluvial valley. It was one of the most destructive floods in American history. The flood started with unprecedented rain falling over the entire Mississippi alluvial valley in the summer 1926, lasting about a year. On the lower river, the flooding began at Memphis, Tennessee, in the fall of 1926. It lasted until August 1927. At Red River Landing, the flood lasted 135 days and reached a crest of 60.9 feet (21.2 meters). The river's flow was measured at 1,520 ft^3/sec (43 m^3/sec). The flood destroyed artificial levees along the Mississippi River in 160 breaches. It inundated more than 165 million acres (66.8 ha). Two hundred and forty five people died, 600,000 were homeless, and damage was at least $230 million (in 1927 dollars). Since the 1927 flood, there have been 16 major floods along the Mississippi. Of these, the 1973, 1983, and 1993 floods were the most damaging.

Further Reading:

Barry, John M. 1997. Rising Tide :The Great Mississippi Flood of 1927 and How It Changed America. Simon & Schuster, New York, New York. 524 pp.

Daniel, Pete 1977. Deep'n As It Come: The 1927 Mississippi River Flood. University of Arkansas Press. Fayetteville, Arkansas, 221 pp.

Sea Level—Its Highs and Lows

Because of its low, flat, broad coastal plain, small changes in sea level are significant to the Louisiana coastline. Further, this coast is directly impacted by the growth and decline of the Antarctic ice sheet. In fact, the history of Antarctica and Louisiana are intimately connected since this continental ice sheet contains about 90 percent of the world's ice. For example, East Antarctica contains about 6,220,800 mi^3 (25,920,100 km^3) of grounded ice and West Antarctica contains about 773,100 mi^3 (3,221,400 km^3) of grounded ice (Pabain, 1994). This amount of water, stored as ice in the Antarctica ice sheets, is enough to raise sea level by about 184 feet (56 meters). Even if this ice only partially melts, a large part of Louisiana—the southern third and the Mississippi Valley—will become submerged.

Prior to development of Antarctica and Greenland ice sheets, most of southern Louisiana was submerged beneath the Gulf of Mexico. It was not only the accumulation of delta sediments that shifted the Louisiana coastline southward, but also development of the Antarctic and Greenland ice sheets that dropped sea level by 200 ft (62 meters). During the Ice Age, the Antarctic ice sheet was larger. Large ice sheets also covered North America, Siberia, and Europe. Enough water was stored in these features to have dropped sea level by 330 to 390 feet (100 to 120 meters). The change in sea level resulted in Louisiana's coastline extending southward as much as 92 miles (150 km). Conversely, during the warmer global climates 3 to 6 million years ago, the ice sheets of Antarctica and Greenland were likely much smaller. As a result, sea level was 115 feet (35 meters) higher. At that time, much of the modern Louisiana coastal plain—to Longville and Oakdale in southwest Louisiana, and Amite and Montpelier in the Feliciana Parishes— was submerged beneath the Gulf of Mexico.

Rocks

State Gemstone—Agate

Agate is the Louisiana state gemstone. It is a variety of translucent microcrystalline quartz called "chalcedony," which is characterized by well-defined banding. Agates are found within the Citronelle Formation and younger sediments in the Feliciana Parishes. Both the agate and chert originally formed within limestones that covered the central United States. Erosion released the state's gemstone from these limestones, and ancient rivers carried them into Louisiana and Mississippi.

Further Reading:

Pabian, R. K. 1994. Banded Agates—Origins and Inclusions. Nebraska Geological Survey, Educational Circular 12, 32 pp.

Oldest Rocks

The oldest exposed rocks in Louisiana are small patches of Late Cretaceous marine rocks that outcrop along the edges of the Prothro and Rayburns salt domes in Bienville Parish. At both salt domes, pits excavated for the extraction of agricultural lime exposed these rocks. Cretaceous fossils have reportedly been collected from the vicinity of the King salt dome in Bienville Parish. However, the outcrops that produced these fossils have been lost.

Only the Late Cretaceous strata at the Rayburns salt dome has been studied in detail. Where exposed in a borraw pit, these often highly fossiliferous strata consist of blue-gray marls and chalks, hard white chalk, greensand, gray chalky marl, and olive-gray marl. The lithology of these strata and the fossils found in them indicate that they consist of formations that also outcrop in Arkansas. About 70 to 82 million years ago these strata accumulated at the bottom of a shallow sea that covered Louisiana.

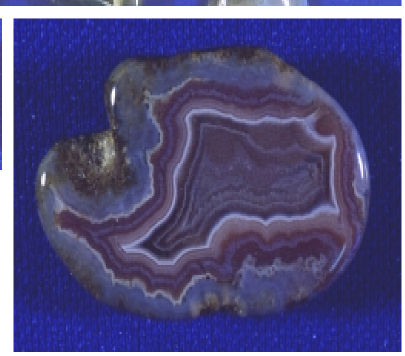
The next oldest strata consist of a small outcrop in Caddo Parish, and consist of marine mudstones exposed along the southeast edge of Caddo Lake. They accumulated about 55 to 66 million years ago.

Further Reading:

Frey, R. C., and R. D. Kaiser 1984. Surface exposures of Late Cretaceous strata at the Rayburns Dome, Bienville Parish, Louisiana. Gulf Coast Association of Geological Societies Transactions (34):357–361.

Stringer, G. L. and Henry, M. (1996) First report of the Cretaceous Shark Squalicorax from Louisiana. Mississippi Geology. vol. 17, noi. 2, pp. 40-42. 1996.

Tooth of the shark, Squalicorax pristodontus, found in exposures of Cretaceous sediments exposed at the surface above the Prothro salt dome in Bienville Parish, Louisiana. Reprinted from Stringer and Henry (1996).



Varieties of agate from the Citronelle Formation.

Rocks of Louisiana Now Part of South America

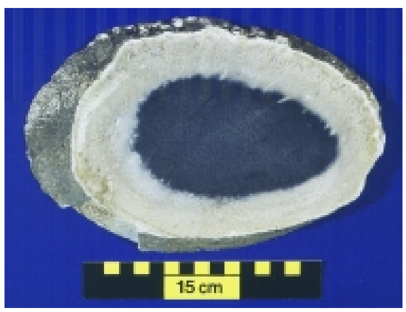
Exposed in the Andes of Argentina are ancient rocks that, hundreds of millions of years ago, once underlayed a part of Louisiana. These rocks consist of a block of granitic continental crust over 120 miles (200 km) wide, capped by 3,000 to 4,900 feet (900-1500 meters) of 470 to 570 million year-old sedimentary strata. These strata are composed of fossiliferous limestone and dolomite overlying shale and sandstone.

This block of continental crust called the “Precordillera Terrane,” once was part of North America. However, opening of the Iapetus Ocean, a predecessor to the Atlantic Ocean, rifted the Precordillera Terrane away from North America, leaving oceanic crust where Louisiana now lies (fig. 3). Then, plate tectonics caused the block to drift across the ancient Iapetus Ocean. Eventually, this feature collided with and was welded onto a continental land mass that became South America.

Further Reading:

Astini, R. A., J. L. Benedetto, and N. C. Vaccari 1995. The early Paleozoic evolution of Argentina Precordillera as a Laurentian rifted, drifted, and collided terrane: a geodynamic model. Geological Society of America Bulletin 107(3):253–273.

Thomas, W. A. 1991. The Appalachian-Ouachita rifted margin of southeastern North America. Geological Society of America Bulletin 103(3):415–431.



Petrified palm wood

Fossils

State Fossil—Palm Wood

Petrified palm wood is the Louisiana state fossil and is characterized by prominent rod-like structures within the regular grain of the silicified wood. These rod-like structures are sclerenchyma bundles that give the palm tree its vertical strength. In Louisiana, petrified palm wood belongs to the genera *Palmoxylon*. It is found only within the outcrop belt of the Catahoula Formation, which consists almost entirely of sediments deposited within broad, low-lying coastal plains about 24 to 30 million years ago.

Petrified palm wood is a favorite of rock collectors because of its rod-like structures and variety of colors. Depending upon the angle at which the sclerenchyma bundles are cut, these rod-like structures show up as spots, tapering rods, or continuous lines. Depending on how the state’s fossil is cut, it exhibits a wide range of colors and designs. As a result, it can be incorporated into a variety of designs for jewelry. Because it is composed of silica, it can be polished and withstands the wear and tear of normal use.

Largest Fossil—Basilosaurus

The largest fossils found in Louisiana are the bones of Basilosaurus, a primitive whale, called by paleontologists “archaeocetes.” In fact, the size of its bones lead Dr. Richard Harlan to conclude that bones from the bluffs of the Ouachita River within Caldwell Parish were from a marine reptile. Thinking it was a giant Tertiary marine reptile, Dr. Harlan named the animal “*Basilosaurus*.”

Basilosaurus cetoides (Owen) is one of the most common of the primitive whales found in exposures of Middle to Upper Eocene, 35 to 40 million-year-old marine sediments within central Louisiana, Alabama, Mississippi, and Egypt. It had a streamlined body that averaged 45 to 70 feet (14 to 21 meters) in length. Its body looked more like a mythical sea serpent instead of a modern whale. It had a wedged-shaped, 5-foot-long head. Its jaws had frontal, cone-shaped teeth that caught and held prey, and rear, triangular-shape teeth for slicing up the prey. During the time that *Basilosaurus cetoides* lived, Louisiana was almost entirely covered by the Gulf of Mexico (fig. 4).

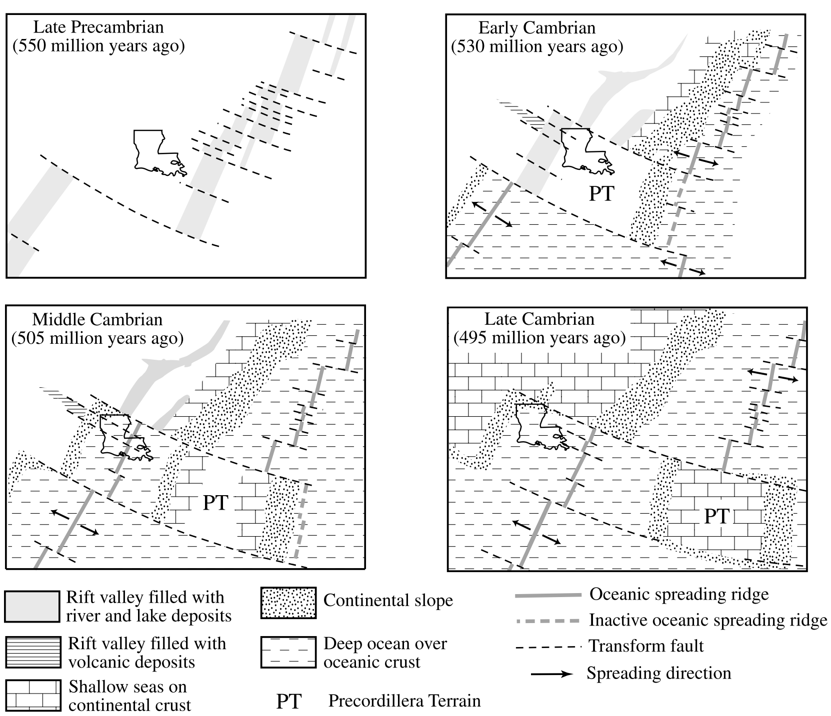


Figure 3. Rifting of the Precordillera terrain away from Laurentia, ancestrial North America, and its movement relative to modern Louisiana. (Redrawn from figure 6 of Thomas, 1991:138.)

Further Reading:

Johnston, J. E. 1991. Fossil Whale: State Fossil of Mississippi. Office of Geology, Pamphlet No. 3. Jackson, Miss.: Office of Geology, Mississippi Dept. of Environmental Quality.

Galloway, W. E., D. G. Bebout, W. L. Fisher, J. B., Dunlap, Jr., C. R. Cabrera, J. E. Lugo Rivera, and T. M. Scott 1991. Pp. 245–324 in A. Salvador, ed., Cenozoic, The Gulf of Mexico Basin. The Geology of North America, Vol. J., Boulder, Colo.: Geological Society America.

Oldest Fossils—Gravel Fossils

The oldest fossils found in Louisiana are Paleozoic marine invertebrates. They occur in gravel-bearing sands called the Citronelle Formation or the Upland Complex. These fossils are found in the gravel that are part of the gravelly sands. These sands are found across the northern half of the Florida Parishes and in an east-west belt across central Louisiana. The fossils consist of a variety of marine invertebrates such as brachiopods, bryozoans, cephalopods, corals, crinoids, pelecypods, and trilobites.

These invertebrate fossils once lived in shallow seas that covered most of the central part of North America between 320 to 480 million years ago. Their shells accumulated on the sea bottom and were buried and preserved in calcareous mud. Ground-water movement replaced some of these sediments and the fossils with chert. The fossiliferous cherts were exposed by erosion and carried by ancient rivers from Kentucky and Tennessee into Mississippi and southeastern Louisiana.

Further Reading:

Dockery, David T., III 1995. Rocks and fossils collected from Mississippi gravel. Mississippi Geology 16(2):1–42.

Youngest Fossils—Mammoths and Snails

The youngest fossils found consist of the bones of mastodons and the shells of various terrestrial and freshwater mollusks. The shells are those of land snails (pulmonate gastropods), freshwater snails (gastropods), and freshwater clams (pelecypods). The delicate shells of the land snails are the most abundant fossils found in the loess. Also, the skeletons of mastodons have been found in loess along both sides of the Mississippi alluvial valley. The fossil mollusca and mastodons range in age from 10,000 to 25,000 B.P.

Loess forms a blanket of relatively homogeneous, seemingly massive, well-sorted silt that covers the Tertiary uplands and Pleistocene terraces bordering both sides of the Mississippi alluvial valley. Where exposed in either roadcuts, stream banks, gullies, excavations, or other exposures, the loess consists of unconsolidated, massive, tan- to brown-color loess and forms steep slopes and vertical cliffs. Loess consists of well-sorted wind-blown silt eroded from the flood plain of the Pleistocene Mississippi River.

Paleozoic gastropods (Fossils courtesy of the Louisiana State University Museum of Natural History)

W. Ray Wilhite

Louisiana Mastodon teeth (Fossil courtesy of the Louisiana Museum of Natural Science)

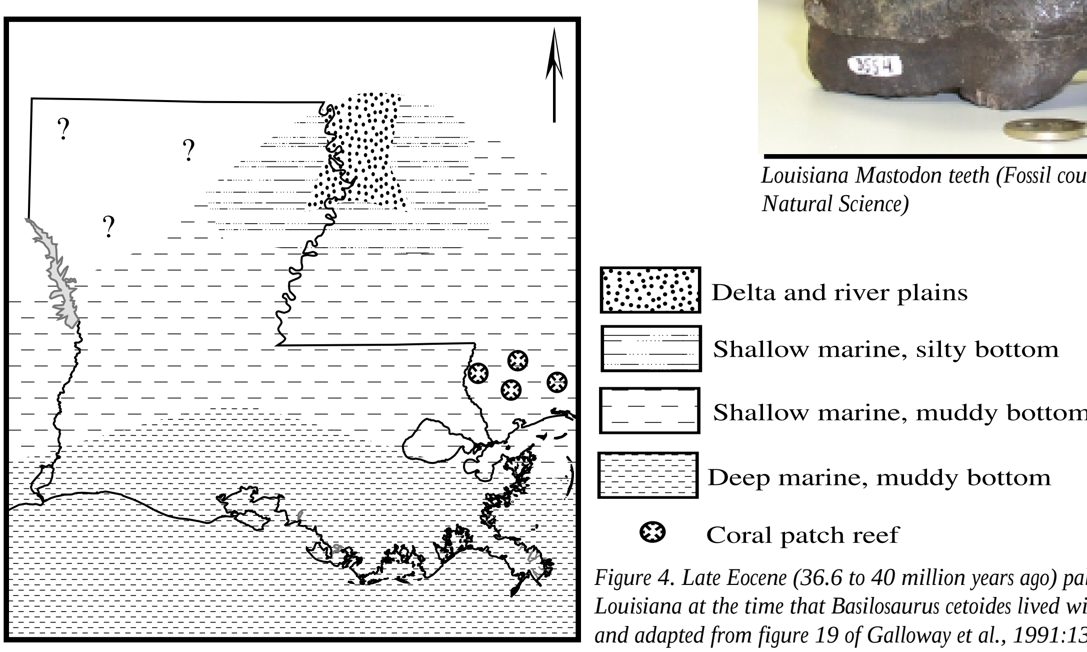
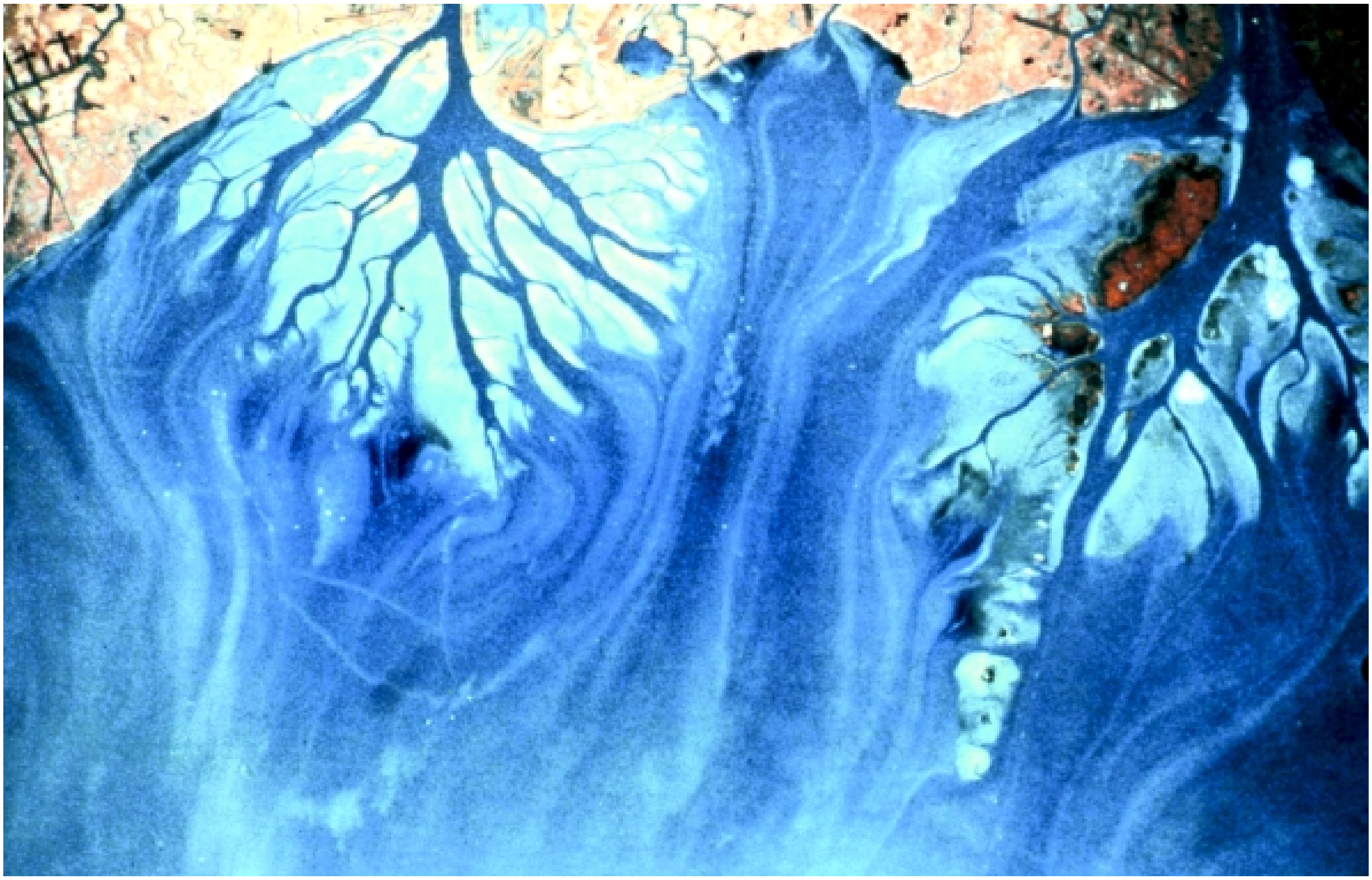


Figure 4. Late Eocene (36.6 to 40 million years ago) paleogeography of Louisiana at the time that Basilosaurus cetoides lived within it. (Redrawn and adapted from figure 19 of Galloway et al., 1991:138.)



Satelite image of the Wax Lake (left) and the Atchafalaya (right) deltas.

Louisiana Geological Survey

Chacko J. John, Director and State Geologist

208 Howe-Russell Geoscience Complex
Baton Rouge, Louisiana 70893
225•578•5320 Fax 225•578•3662
www.lgs.lsu.edu

This public information document is part of a series published periodically by the Louisiana Geological Survey, whose offices are located at Louisiana State University, Room 208 Howe-Russell Geoscience Complex, Baton Rouge, LA 70803-4101. This information is distributed free of charge. The publisher does not guarantee the accuracy or correctness of any information. Contact the LGS business office at (225) 578-5320 for extra copies or for more information, or visit the web site at http://www.lgs.lsu.edu.

Text and figure graphics by Paul V. Heinrich.
Graphic design by Lisa Pond.
Edited by Margo Olinde.

This public document was published at a total cost of $1511.00. One thousand copies of this document were published in this second printing at a cost of $1511.00. This document was published by the Louisiana Geological Survey, Room 208 Howe-Russell Geoscience Complex, Baton Rouge, Louisiana, 70803-4101, to aid in public understanding of the geology of Louisiana under the authority of R.S. 30:206. This material was printed in accordance with standards for printing by state agencies established pursuant to R.S. 43:31.