Louisiana Geological Survey

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Geologic Mapping in Louisiana

Introduction

A *geologic* map is one that depicts the distributions of rocks, strata, and geologic features, such as faults, according to their particular characteristics and geologic ages.

Geologic maps are a vital source of information for all types of planning involving mineral resource extraction, location of municipal and industrial facilities, environmental remediation, land use, soils classification, natural-habitat classification, and other uses.

Summary and Background of Geologic Mapping

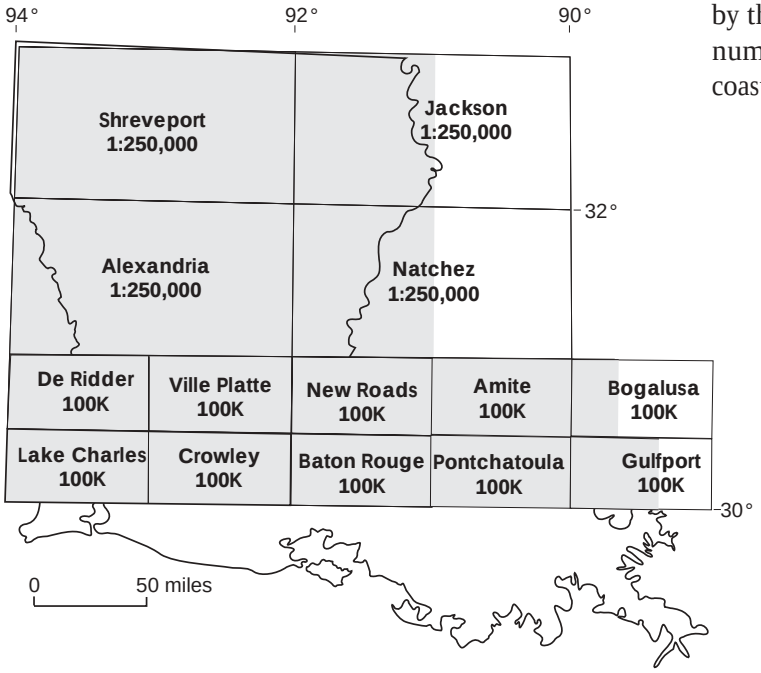
In recent years the U.S. Geological Survey (USGS) and National Research Council have documented a nationwide decline in geologic mapping, as well as a concurrent increase in the demand for geologic maps in conjunction with growing needs for environmental work. Louisiana has historically depended on university professors and students for all of its detailed mapping investigations of surface geology, and appears never to have directly supported geologic mapping except for reconnaissance efforts in the nineteenth century.

As a result, the decline in geologic mapping in Louisiana corresponds to a decline in in-state mapping done at state universities. Only 30 percent of Louisiana parishes were ever mapped in detail, and most of these mapping investigations were done in the 1930s and 1940s; since then, geologic mapping in the state has been an essentially nonviable research pursuit.

Because fewer investigators are doing detailed field mapping today, cooperative agreements with the USGS to produce intermediate-scale mapping have proven crucial to the maintenance of an ongoing mapping effort.

Louisiana's position, astride the great delta of the Mississippi River at the southern end of the Mississippi embayment, is such that virtually all of the state's surface deposits and landforms reflect deposition of this relatively young material by the river and by a number of important coastal plain streams.

Louisiana Geologic Quadrangle Index
Completed COGEOMAP/STATEMAP coverage
January 1998



The index map of study areas of these cooperative agreements shows that they have covered virtually all of the state above the coastal zone at intermediate scales.

The distribution of these deposits is important to assessing coastal erosion and land loss, flood hazards, development and contamination potential of ground water resources, protection strategies for aquifer recharge areas, aggregate and mineral resource potential, and unstable soil hazards. Thus accurate and current geologic maps are essential for planning by a host of agencies and industries concerned with such issues.

In Louisiana, the young ages of the deltaic and coastal plain deposits and the inferred processes by which they formed provide a baseline for comparison and continuity with historical and recent processes and deposits. Accurate geologic mapping of these sediments and their associated features and landforms has recently become feasible for the first time in decades as a direct result of cooperative programs with the USGS.

Cooperative Agreement Programs with the U.S. Geological Survey

Since the late 1980s the Louisiana Geological Survey (LGS) has sustained ongoing mapping of the state's surface geology with a view toward ultimate production of a new geologic map of the state. Cooperative agreements between the USGS and LGS were begun in 1989, initially under the COGEOMAP program, with the compilation of the geology of the Shreveport 1:250,000-scale quadrangle in northwestern Louisiana.

Since then, study areas of cooperative agreements have proceeded southward and eastward, and have permitted LGS to complete initial compilation of new, intermediate-scale coverage of the state's upland landscapes and alluvial bottoms above the coastal zone. Streambottom deposits, young terrace deposits, and escarpments associated with active surface faults of the coastal plain are mapped from new, high-quality 7.5-min. topographic quadrangles, aerial photographs, and other types of imagery, and then spot-checked in the field; other elements of the geology are compiled from various sources and from field checking. New technologies, such as Geographic Information System (GIS) and Global Positioning System (GPS), have been added to traditional techniques in the late 1990s.

With the advent of the National Cooperative Geologic Mapping Program, COGEOMAP was transformed into the current STATEMAP program; together these programs have permitted the systematic and comprehensive new mapping of the geologically youngest river and delta deposits that underlie three-fourths of Louisiana. North Louisiana was covered at a scale of 1:250,000 and south Louisiana was covered at a scale of 1:100,000.

During the past two years LGS has conducted mapping of quadrangles in the southwestern and southeastern parts of the state; these projects and the current year's formulation of a statewide classification of the youngest surface strata provide the basis for a new compilation of Louisiana geology at a scale of 1:500,000, which has been the ultimate goal of previous cooperative agreements.

A relatively new sister program dubbed EDMAP has provided support for student geologists from LSU to undertake detailed geologic mapping of areas of timely interest. The first EDMAP awards have supported mapping of the geology in the Fort Polk area, west-central Louisiana. This work provides an essential update of the previously existing mapping of the area, the field work for which was done 60 years ago in conjunction with the mapping of the whole of Vernon Parish. Socioeconomic value of the new mapping derives from the added detail, which provides for the clearer identification of aquifer recharge areas and of regions susceptible to ground-water pollution and soil erosion.

LGS SURFACE GEOLOGIC MAPPING ACTIVITIES 1985-1998

Quadrangle or Area Name	Scale	Area (mi²)	Years of Project	Funding Source
Ville Platte (digital)	1:100,000	2,100	1996-97	STATEMAP
Bogalusa	1:100,000	1,220	1996-97	STATEMAP
Gulfport	1:100,000	460	1996-97	STATEMAP
Amite	1:100,000	2,100	1996-97	STATEMAP
Ponchatoula	1:100,000	2,100	1996-97	STATEMAP
Crowley	1:100,000	2,100	1996-97	STATEMAP
Lake Charles	1:100,000	1,550	1996-97	STATEMAP
De Ridder	1:100,000	2,100	1994-95	STATEMAP
Ville Platte	1:100,000	2,100	1994-95	STATEMAP
Baton Rouge	1:100,000	2,100	1993-94	STATEMAP
Jackson-Natchez	1:250,000	6,900	1992-93	COGEOMAP
Alexandria	1:250,000	8,500	1991-92	COGEOMAP
New Roads	1:100,000	2,100	1991-92	COGEOMAP
Cote Blanche and Weeks Islands	1:24,000	5	1991-92	Dept. oF Energy (DOE) through Sandia Laboratories
East Baton Rouge Parish	1:24,000	990	1990-91	City-Parish of East Baton Rouge
Shreveport	1:250,000	8,750	1989-90	COGEOMAP
Avery Island	1:24,000	3	1985-86	•

• [Though this was not an officially sponsored or supported project DOE funds made available through the LGS Nuclear Division helped defray certain expenses.]

A comprehensive listing of surface geologic maps produced by LGS shows the importance of cooperative agreements with the USGS to geologic mapping efforts in Louisiana.

The Value of Geologic Mapping

Geologic mapping in Louisiana has a multitude of uses that are of great importance to many timely issues.

- A critical problem in our state is coastal land loss; geologic maps provide basic information applicable to the guidance of development in Louisiana's coastal zone. Detailed mapping of permeable and impermeable sediments in the coastal zone and the lower Mississippi River flood plain is crucial in the effort to rationally plan the permitting of activities in the coastal zone in ways that minimize the threat of land loss.
- It is essential to the proper location of waste-treatment facilities relative to the recharge zones of aquifers that are important sources of drinking water—the Chicot aquifer is the principal source of ground water for 13 parishes in southwestern Louisiana, yet the surface unit corresponding to the outcrop of the uppermost portion of the aquifer historically has been a favored setting for the siting of solid-waste repositories.
- Detailed mapping of active—but apparently nonearthquake-producing—surface faults of the south Louisiana coastal plain provides a framework for assessment of fault-related damage potential and damage reduction strategies.
- Digital geologic maps are badly needed in many statewide GIS applications by government and university programs. Louisiana's first digital 1:100,000-scale geologic quadrangle has been completed, while 29 others remain to be done with STATEMAP assistance.

There can be little doubt that such basic geologic information will figure prominently when addressing additional environmental issues of increasing importance in years to come.

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