Geology of the Watson 7.5-Minute Quadrangle, LA

Louisiana Geological Survey

Introduction, Location, and Geologic Setting

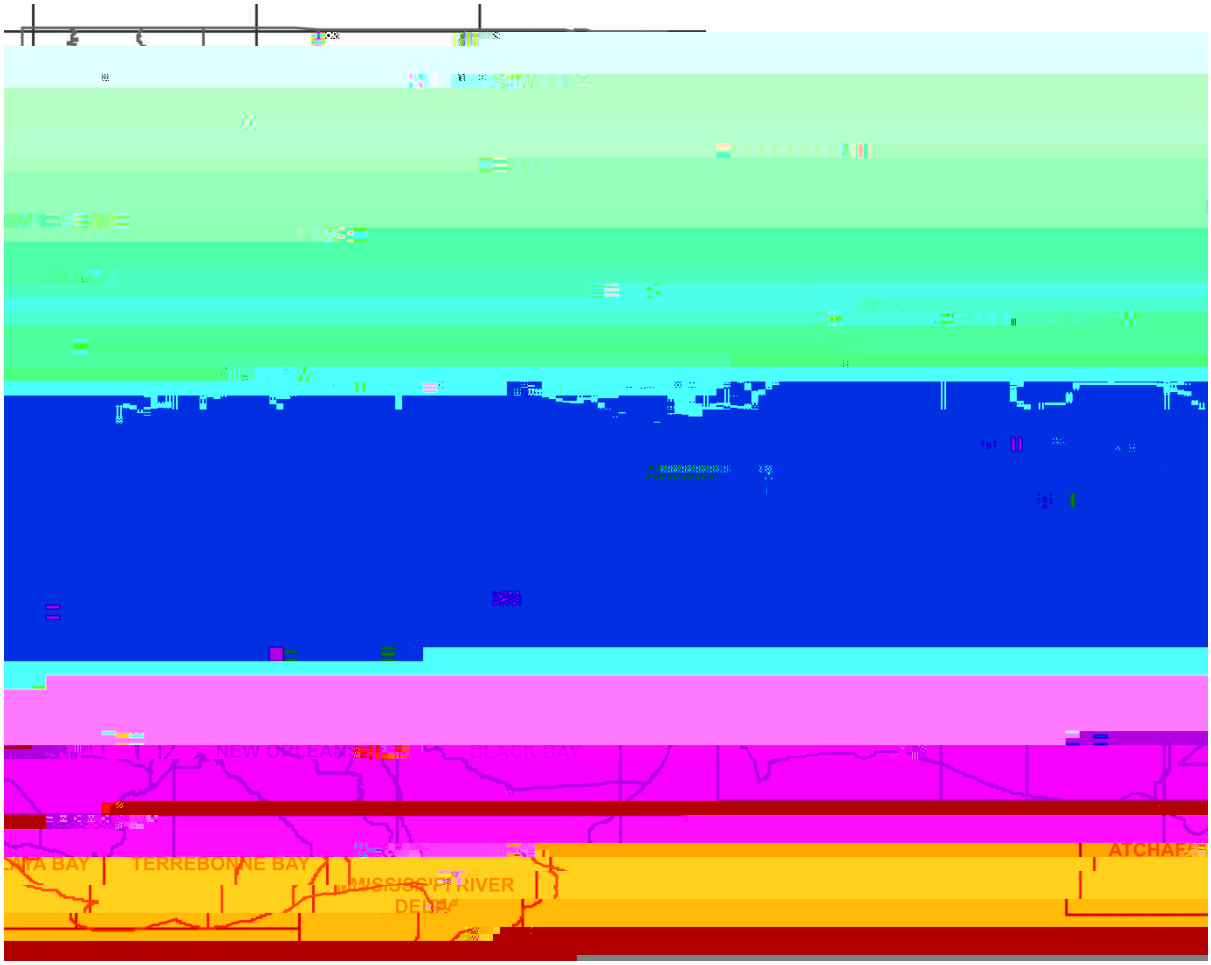
The Watson 7.5-minute quadrangle lies in the southeastern portion of the south Louisiana coastal plain (Figures 1, 2), in the drainage basin of the Amite River. The axis of the subsurface lower Cretaceous shelf edge (Toledo Bend flexure), which trends west-northwest to east-southeast, lies directly beneath the study area. The surface comprises strata of the Pleistocene Hammond alloformation, Prairie Allogroup, characterized by a preserved depositional surface with indistinct constructional topography. The Hammond is covered by late Pleistocene Peoria Loess that is generally thin, with the 1-m thickness contour traversing the quadrangle along a nearly north-south trend (Figure 2), and is incised by Holocene undifferentiated alluvium of the Amite River and its tributaries.

The units recognized and mapped in this investigation are summarized in Figures 3 and 4.

Previous Work

The Watson quadrangle covers portions of East Baton Rouge and Livingston parishes (Figures 1, 2). It lies at the southwestern corner of the Amite 30 × 60 minute quadrangle, the surface geology of which was compiled at 1:100,000 scale by McCulloh et al. (1997) and digitally recompiled by McCulloh and Heinrich (2008), both with STATEMAP support, and later prepared as a Louisiana Geological Survey (LGS) lithograph (McCulloh et al., 2009). The original 1996 1997 investigation benefited from a drilling component by which the most problematic map-unit assignments were tested with a total of 15 holes drilled with a Giddings hydraulic probe. Prior to this compilation, Self (1980, 1986) mapped the surface geology of

develop a draft surface geology layer for the study area. Field work was conducted to test the subsoil with hand-operated probes and examine and sample the texture and composition of the surface-geologic map units. Field observations were then synthesized with the draft surface geology to prepare an updated integrated surface geology layer for the 7.5-minute quadrangle.



1. Location of Watson 7.5-minute quadrangle, southeastern Louisiana.

2. Surface geology of Watson quadrangle and vicinity (adapted from McCulloh et al., 2009). (**$P_o$uc**, Citronelle Formation, Upland allogroup (Pliocene); **Pimo**, Montpelier alloformation, Intermediate allogroup (Pleistocene); **Ppi**, Irene alloformation, Prairie Allogroup (Pleistocene); **Pph**, Hammond alloformation, Prairie Allogroup (Pleistocene); **Pp**, Prairie Allogroup, undifferentiated (Pleistocene); **Hua**, Holocene undifferentiated alluvium.)

QUATERNARY SYSTEM

HOLOCENE

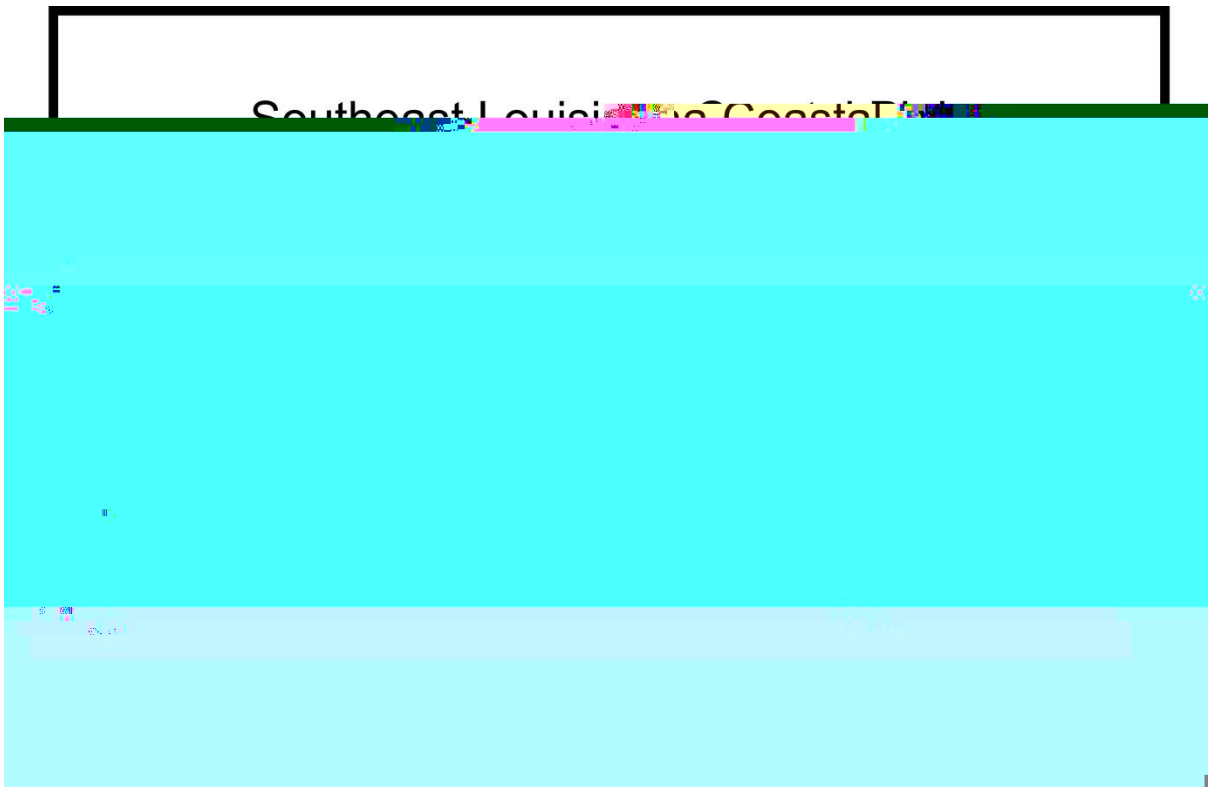
Hua Holocene undifferentiated alluvium

PLEISTOCENE

LOESS
[pattern] Peoria Loess

PRAIRIE ALLOGROUP
Pph Hammond alloformation

3. Units mapped in the Watson 7.5-minute quadrangle.



4. Correlation of strata mapped in the Watson 7.5-minute quadrangle.

Allostratigraphic Approach to Pleistocene Unit Definitions

In the late 1980s the LGS had begun exploring the application of allostratigraphic concepts and nomenclature to the mapping of surface Plio Pleistocene units (e.g., Autin, 1988). In Louisiana these units show a series of geomorphic attributes and preservation states correlative with their relative ages, which eventually led LGS to conclude that allostratigraphy offers an effective if not essential approach to their delineation and classification (McCulloh et al., 2003). The Plio Pleistocene strata for which allostratigraphic nomenclature presently has value to LGS all are situated updip of the hinge zone of northern Gulf basin subsidence, and show a clear spectrum of preservation from pristine younger strata

that typically are stratified. The upper silty facies consist of gray and brown silt. The gray silt occurs as lenticular to V-shaped fills of abandoned chute and thalweg channels. The brown silt comprises natural levees and the upper portion of abandoned chute and thalweg channel fills (Autin, 1985, 1989; Mossa and Autin, 1989). These sediments were differentiated by Autin (1989) into three alloformations, known as the Magnolia Bridge, Denham Springs, and Watson alloformations on the basis of unconformable boundaries, landscape morphology, and relative pedogenic development. These units were not mapped in this investigation because of lack of the detailed information needed to differentiate them.

Summary of Results

The surface of the Watson quadrangle comprises the Pleistocene Hammond alloformation, Prairie Allogroup, consisting of sediment deposited by the Amite River and by coastal processes. The Hammond forms part of a coast-parallel belt of terraced Pleistocene strata, and is covered by late Pleistocene Peoria Loess up to slightly greater than 1 m thick. Holocene strata comprise undifferentiated alluvium of the Amite River and its tributaries.

The geologic map of Watson quadrangle provides basic geologic data of potential value to the conduct of aggregate-mining activities in the Amite River flood plain. The area hosts sizable sand and gravel resource potential in Holocene floodplain sediment, Pleistocene strata of the Prairie and Intermediate allogroups, and Pliocene sediment of the Citronelle Formation (Heinrich and McCulloh, 1999). The area has produced significant sand and gravel in the past decade (U.S. Geological Survey, 2011), and production activities have moved progressively northward in recent years. The 1:24,000-scale surface-geologic map of the study area also should serve efforts at protection of the Southern Hills aquifer system in the upper Amite River area.

Acknowledgments

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References

Autin, W. J., 1989, Geomorphic and stratigraphic evolution of the middle Amite River valley, southeastern Louisiana: Ph.D. dissertation, Louisiana State University, Baton Rouge, 177 p.

Autin, W. J., 1988, Mapping alloformations in the Amite River, southeastern Louisiana:

Autin, W. J., S. F. Burns, B. J. Miller, R. T. Saucier, and J. I. Snead, 1991, Quaternary geology of the Lower Mississippi Valley, *in* Morrison, R. B., ed., Quaternary non-glacial geology: conterminous United States: Boulder, Colorado, Geological Society of America, The Geology of North America, v. K 2, Chapter 18, p. 547 582.

DuBar, J. R., T. E. Ewing, E. L. Lundelius, Jr., E. G. Otvos, and C. D. Winker, 1991, Quaternary geology of the Gulf of Mexico Coastal Plain, *in* Morrison, R. B. ed., Quaternary non-glacial geology: conterminous United States: Boulder, Colorado, Geological Society of America, The Geology of North America, v. K 2, 672 p.

Miller, B. J. (compiler), [1983], [Distribution and thickness of loess in Jackson, Louisiana