# Geology of the Moss Bluff 7.5-Minute Quadrangle, LA

*Louisiana Geological Survey*

## Introduction, Location, and Geologic Setting

The Moss Bluff 7.5-minute quadrangle lies in the southwestern portion of the south Louisiana coastal plain (Figure 1), in the drainage basin of the Calcasieu River. The quadrangle lies at the northern edge of the Gulf Coast salt basin, near the southern edge of coast-parallel outcrop belts of terraced Pleistocene strata comprising Intermediate, Prairie, and Deweyville allogroups (Lissie and Beaumont alloformations, and Deweyville Allogroup undifferentiated, respectively). Its surface consists exclusively of Holocene and terraced Pleistocene strata (Figure 2) deposited by the Sabine, Red, and Calcasieu rivers. All these strata consist of terrigenous sediment with varying proportions of sand, silt, mud, and/or gravel.

The most prominent feature developed on the surface of the Beaumont Alloformation is the Houston ridge, easternmost segment of the Ingleside barrier trend (Figure 2). The area is transected by the traces of growth faults reactivated since the late Pliocene by depositional loading induced by voluminous sedimentation accompanying continental deglaciation (Heinrich, 2005; McCulloh and Heinrich, 2012).

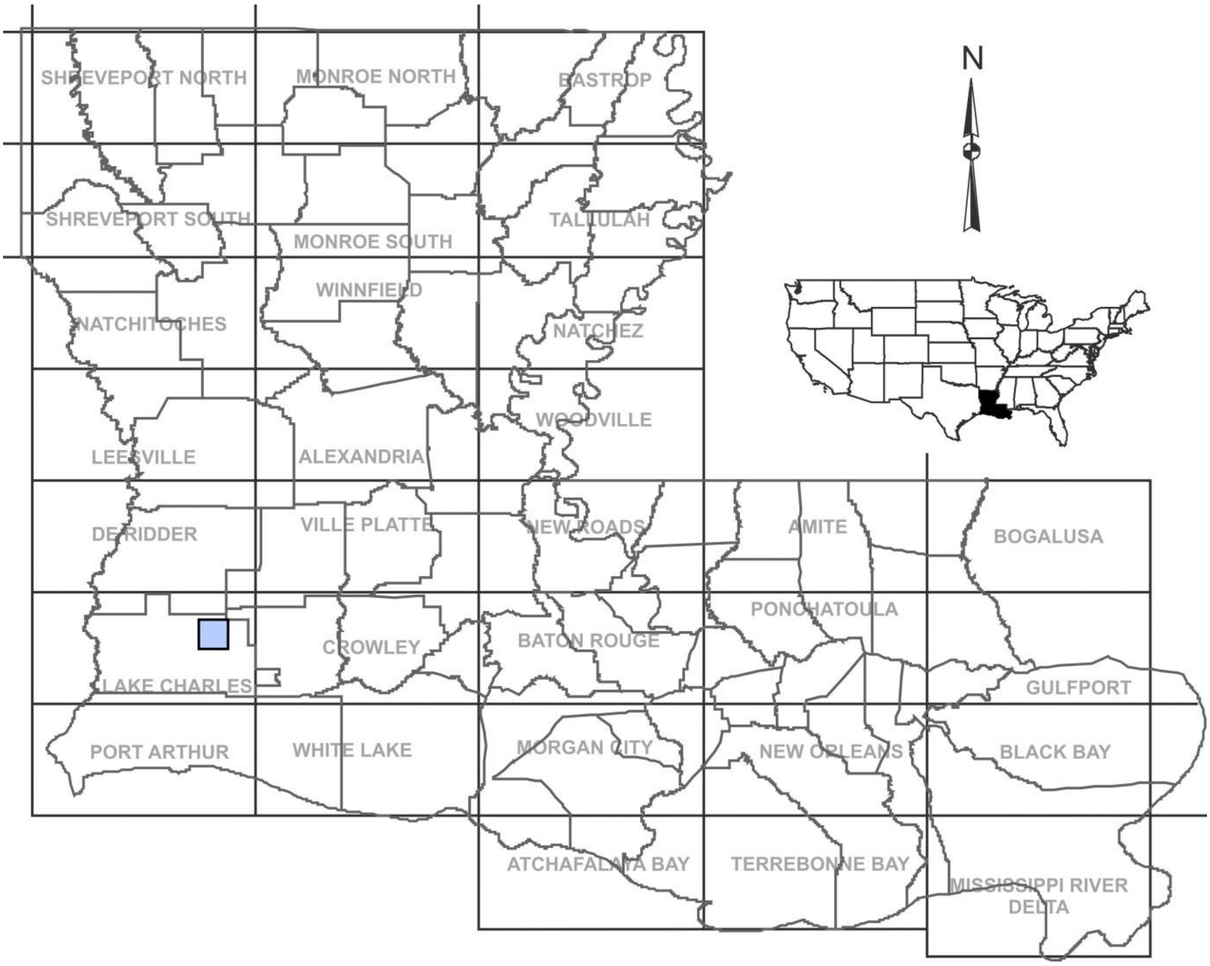
The units recognized and mapped in this investigation are summarized in Figures 3 and 4.

## Previous Work

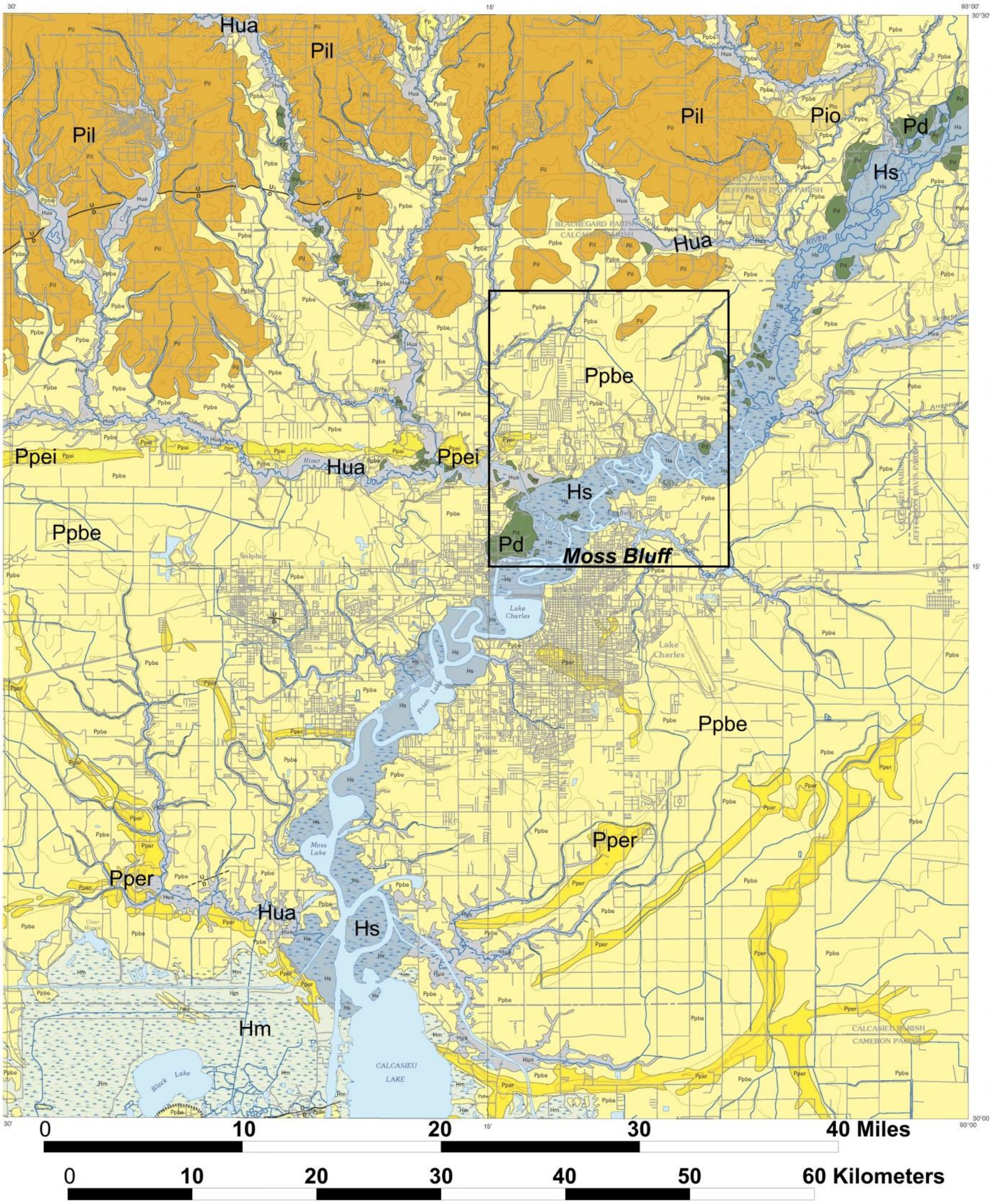
The Moss Bluff quadrangle lies in the central portion of the eastern half of the Lake Charles 30 × 60 minute quadrangle, the surface geology of which was compiled at 1:100,000 scale by Heinrich et al. (2002) with STATEMAP support. Prior to this investigation, the basic framework of surface geology of the region encompassing the quadrangles was rendered at approximately 1:1,056,000 scale by Jones et al. (1954, their plate I) drawing in part upon unpublished work by Fisk (1948), and was summarized by Aronow (1986) for Calcasieu Parish. The regional framework later was updated at 1:1,100,000 scale in the compilation by Saucier and Snead (1989). Following the STATEMAP-supported compilation by Heinrich et al. (2002), Heinrich (2005) conducted further mapping of surface faults in this and surrounding areas. Heinrich (2007) summarized the geology of the Houston ridge based on previous investigations, including those by Graf (1966), Barrilleaux (1986), and Winker (1991). Groundwater conditions in the Chicot aquifer were detailed in numerous previous investigations conducted in the Lake Charles area, including Harder et al. (1967), Zack (1971), Haque (1984), and Milner and Fisher (2009).

## Methods

The investigators reviewed legacy information and made new interpretations consulting remotely sensed imagery (comprising aerial photography, LIDAR DEMs, and other sources) and soils databases published by the Natural Resources Conservation Service (NRCS) to 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 Moss Bluff 7.5-minute quadrangle, southwestern Louisiana.




**2.** Surface geology of the area encompassing the Moss Bluff 7.5-minute quadrangle (excerpted and adapted from Heinrich et al., 2002). (**Pil**, Lissie Alloformation, undifferentiated; **Pio**, Oakdale alloformation; **Ppbe**, Beaumont Alloformation; **Ppei**, Relict Pleistocene barrier ridge (Houston ridge); **Pper**, Relict Pleistocene ridges; **Pd**, Deweyville Allogroup, undifferentiated; **Hm**, Mermentau Alloformation; **Hs**, Small river deposits, undifferentiated; **Hua**, Holocene undifferentiated alluvium).

QUATERNARY SYSTEM

HOLOCENE

| | |
|---|---|
| Hua | Holocene undifferentiated alluvium |
| Hs | Small river deposits, undifferentiated |

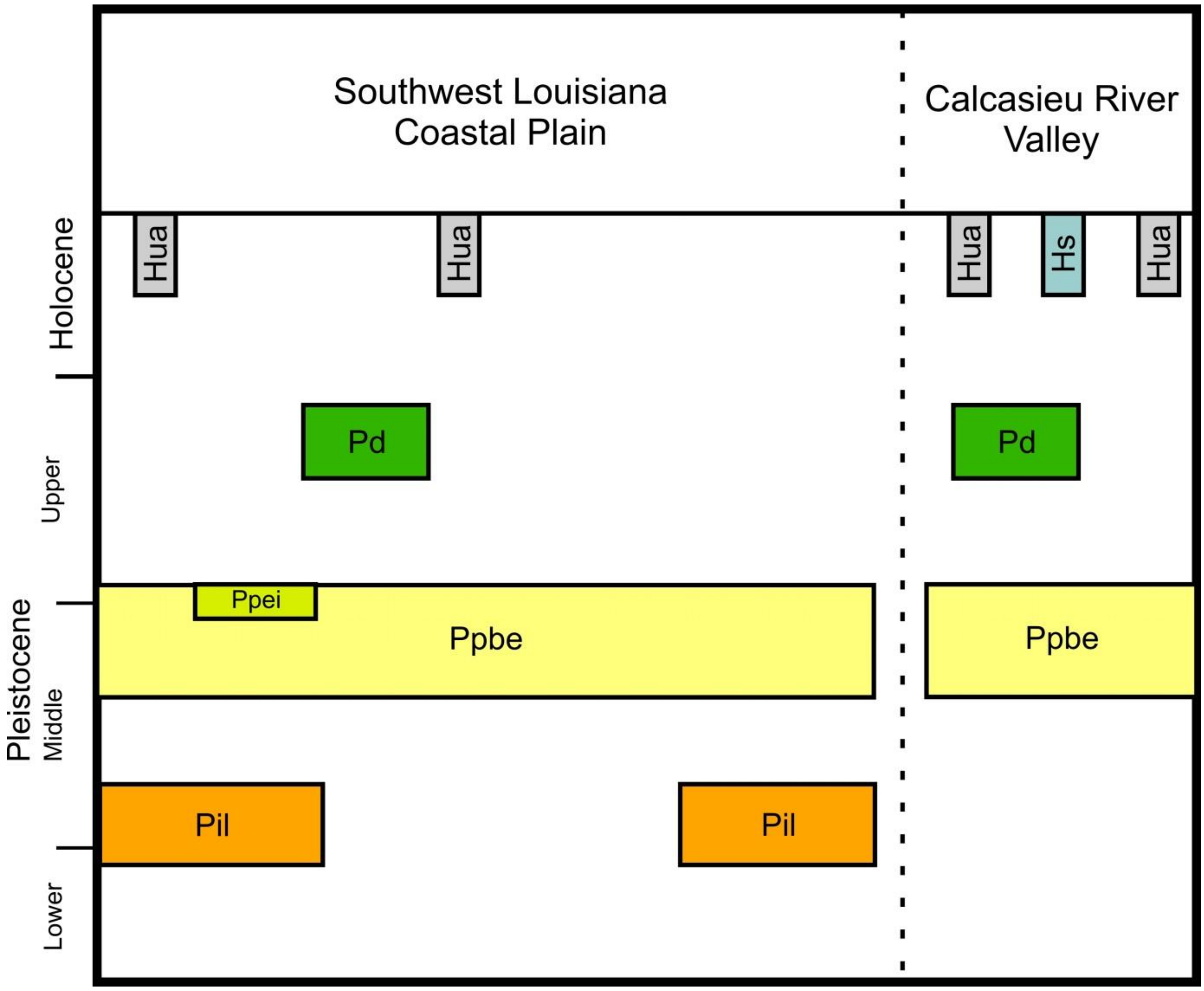
PLEISTOCENE

DEWEYVILLE ALLOGROUP
Pd Deweyville Allogroup, undifferentiated

PRAIRIE ALLOGROUP
Ppei Relict Pleistocene barrier ridge (Houston ridge)
Ppbe Beaumont Alloformation

INTERMEDIATE ALLOGROUP
Pil Lissie Alloformation, undifferentiated

**3.** Units mapped in the Moss Bluff 7.5-minute quadrangle.




**4.** Correlation of strata mapped in the Moss Bluff 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 to trace relicts and remnants of older strata persisting in the coastal outcrop belt and on high ridgetops in places updip of it. Allounit nomenclature has figured heavily in the STATEMAP-funded geologic mapping projects of the past two decades because Quaternary strata occupy approximately three-fourths of the surface of Louisiana. The preponderance of Quaternary strata in the present study area dictated continuation of this practice for this investigation.

## Lissie Alloformation (Intermediate Allogroup)

The Lissie Alloformation is an unconformity-bounded stratigraphic unit that is separated from the underlying Willis Formation and the overlying Beaumont Alloformation by regional unconformities that have been defined and mapped by Young et al. (2012). Beneath this part of the Louisiana coastal plain, these authors found that the Lissie Alloformation consists predominantly of 120 to 140 m (~395–460 ft) of dip-oriented fluvial sands surrounded by interchannel muds. Gulfward, these sediments grade downdip into shore-parallel sands and muds. These sediments accumulated as short depositional episodes during multiple high-frequency glacio-eustatic sea-level fluctuations. The lower and upper contacts of the Lissie Alloformation are regionally extensive and laterally extensive flooding surfaces that are correlated with micropaleontological zones offshore and updip as far as possible. These flooding surfaces were correlated toward the outcrop along the bases of major channel sands (Young et al., 2012). In the case of the upper contact, it becomes the surface of the Lissie Alloformation within and northward of the quadrangle. The surface of the Lissie Alloformation has been dissected and lost the majority of its original depositional features. According to downdip correlations by Young et al. (2012), the Lissie Alloformation accumulated between 1.4 and 0.6 Ma.

## Beaumont Alloformation (Prairie Allogroup)

The Beaumont Alloformation is an unconformity-bounded stratigraphic unit. It is separated from the underlying Lissie Alloformation by a regional unconformity that has been defined and mapped by Young et al. (2012). Except where cut by valleys formed during sea level lowstands of the last glacial epoch, the upper boundary of the Beaumont Alloformation within the study area consists of the surface of the coastal plain. The Beaumont Alloformation consists of 30 to 60 m (~100–200 ft) of clay-rich sediments enclosing dip-oriented fluvial sands and sandy deltaic-distributary channels. It also includes an isolated segment of a coast-parallel, sandy beach ridge known as the Ingleside barrier/strandplain system (Barrilleaux, 1986). These sediments accumulated as short depositional episodes during multiple high-frequency glacio-eustatic sea-level fluctuations. The lower contact of the Beaumont Alloformation is a regionally extensive and laterally extensive flooding surface that was correlated with micropaleontological zones offshore and updip as far as possible.

This flooding surface is correlated northward along the bases of major channel sands to where it crops out and the Beaumont Alloformation onlaps on the surface of the Lissie Alloformation (Young et al., 2012). According to downdip correlations by Young et al. (2012), the Beaumont Alloformation accumulated after 0.6 Ma. The surface of the Beaumont Alloformation exhibits moderately well preserved relict depositional topography of the Calcasieu River and small streams (Aronow, 1986).

## Deweyville Allogroup

The Deweyville Allogroup consists of largely coarse-grained fluvial sediments that fill the valleys of the Calcasieu and Houston rivers and their tributaries. It consists of separate unconformity-bounded allostratigraphic units with terraces as their upper boundaries and fluvial entrenchment surfaces as their lower boundaries. The coarse-grained valley fills of the Deweyville Allogroup represent (a), the abandonment and entrenchment of valleys within the Beaumont alluvial plains by river systems ca. 100 ka; and (b), multiple episodes of lateral migration, aggradation, and/or degradation within those valleys during Marine Isotope Stages 4, 3, and 2. These fluvial systems were graded to shorelines at midshelf or farther south (Blum et al., 1995). Where buried at the base of the Calcasieu River Valley, the sediments of the Deweyville Alloformation are separated from younger undifferentiated Holocene fluvial and estuarine sediments by a flooding surface created by the accumulation of sediment during postglacial sea-level rise and by local erosion surfaces created by the postglacial lateral migration of streams and rivers. The exposed surface of the Deweyville exhibits well-preserved oversized fluvial features.

## Small River Deposits, Undifferentiated

Filling a valley cut by the Calcasieu River and its tributaries during the last glacial epoch, Marine Isotope Stage 2, are sediments mapped as undifferentiated small river deposits. These consist of a post-glacial valley-fill sequence that is approximately 15–20 m (~50–65 ft) thick. This sedimentary sequence consists of a basal silty clay and clay estuarine and bay sediments that contain dip-oriented, sandy clay to sand delta-front deposits that are overlain by sand and sandy distributary deposits of a bayhead delta. Covering these sediments and forming the top of this sequence of Holcoene sediments within this part of the Calcasieu River valley is a blanket of organic-rich mud that accumulated within cypress swamps (Nichols et al., 1996). The base of these sediments lies on the top of fluvial deposits and terraces of the Deweyville Allogroup, which fills the bottom of the Calcasieu River valley. This contact is a regional unconformity known as the “Holocene–Pleistocene surface” (Milliken et al., 2008).

## Summary of Results

The Pleistocene strata comprise units of the Intermediate, Prairie, and Deweyville allogroups, and consist of sediment deposited by the Sabine and Red rivers and by coastal processes. The Lissie Alloformation, Intermediate allogroup, and the Beaumont Alloformation, Prairie Allogroup, form part of a coast-parallel belt of terraced Pleistocene strata. Coastal ridges developed on the surface of the Beaumont Alloformation belong to a barrier trend, Houston ridge, the eastern terminus of the Ingleside trend of Texas. Deweyville Allogroup strata occur along the Calcasieu River valley and its tributaries, where they form low terraces. This investigation recognized less Deweyville than previously mapped by

Heinrich et al. (2002). Holocene strata comprise undifferentiated alluvium of the Calcasieu River and its tributaries.

Detailed mapping of the Houston ridge on the surface of the Beaumont Alloformation should be applicable, in combination with subsurface data, to the prediction of sand resource occurrence and groundwater contamination susceptibility.


## Acknowledgments

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