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Geology of Grindstone Bluff, A Thalweg Exposure of Wilcox Group Near Shreveport, Louisiana

Marty Horn, Paul Heinrich and Richard McCulloh

Grindstone Bluff is a topographically prominent stream thalweg feature situated at the northern limit of the City of Shreveport, LA (Lat-Long: 32°36’19” N, 93°48’56” W; UTM : N.A. Zone 15, 0423401 E, 3607659 N) (Figure 1). The bluff stands about 24 meters (80 feet) in relief, forming the southern boundary of Twelvemile Bayou flood plain, a tributary of Red River. Morphologically it consists of two distinct exposure faces, the lowermost adjacent to the active Twelvemile Bayou channel, the upper recessed from the active stream channel and separated from the lower face by a terrace blanketed by nonconsolidated sand. Both exposure facies have high angle to vertical slope and host ellipsoidal concretions up to 3 meters in size standing in relief (Figure 2).

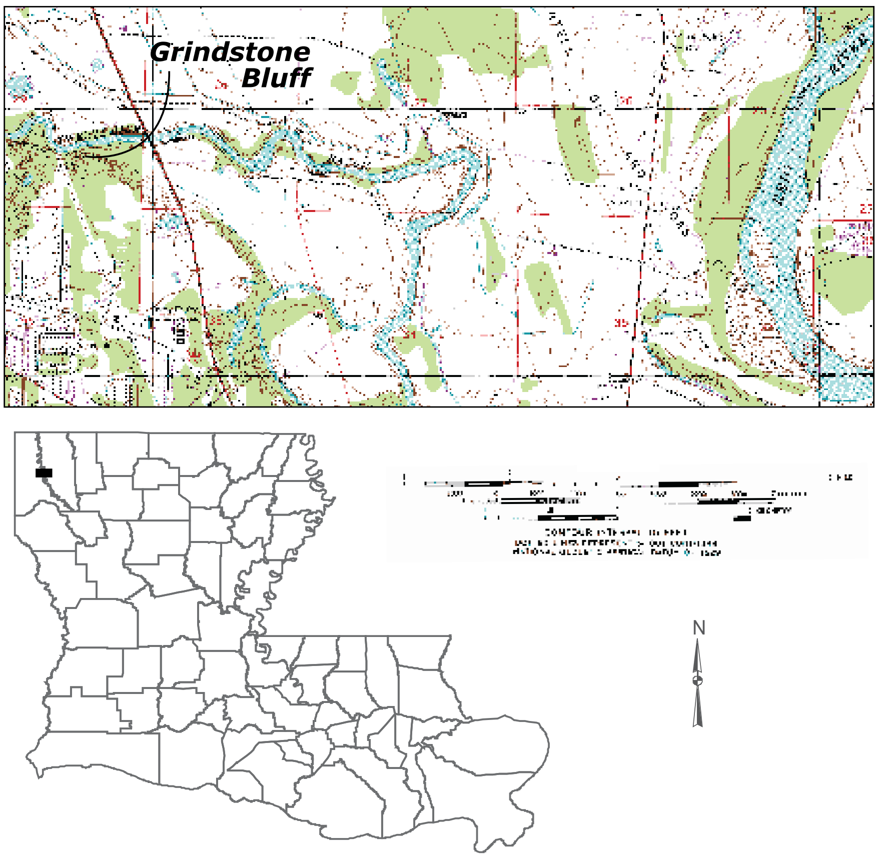

Figure 1. Location map for Grindstone Bluff exposure. Local map is a portion of the North Highlands, Louisiana, 7.5 minute U.S.G.S. topographic quadrangle. The city of Shreveport, LA is situated beyond the map edge, south of Grindstone Bluff locality.

Stratigraphy

The entirety of the exposure is mapped as undifferentiable Wilcox Group (Smith, 1970; McCulloh et al., 2009). Named formations and members of Wilcox Group have not been established or delineated in its outcrop domain in the Shreveport area, including the Grindstone Bluff locality. However, farther south Wilcox Group is recognized in the subsurface as a stratigraphic group with well defined formations historically targeted for water, oil, gas, and coal production (Durham and Smith, 1958; Glawe and Echols, 1997). Detailed studies of subsurface Wilcox from east Texas to western Mississippi model the group as a late Paleocene – Eocene fluvo-deltaic complex fed primarily by an ancestral phase of the Mississippi River, and place the Grindstone Bluff locality in a proximal delta-plain to distal alluvial-plain facies (Galloway, 1968; Galloway et al., 1991).

The sedimentary sequence exposed at Grindstone Bluff is divisible into two intervals of distinctive lithologic and sedimentologic characteristics (Figure 3).The lower interval (~ 8.0 meters) consists of interbedded mudstones, sandstones, and conglomeratic sandstones. The mudstones display lamina thickness bands of gray and gold and lack fissility; they are mostly free of sand-size particles, though very fine to silt size quartz is concentrated at some levels and fine sand-size colorless mica is distributed throughout at low (~ 0.5 %) concentration. The mudstone intervals are mostly laterally continuous at outcrop scale, the lowermost hosting lenses of sandstone and conglomeratic sandstone. Sandstone and conglomeratic sandstone intervals are also laterally continuous with normally graded channel-fill forms cut into subjacent mudstone. This coarse

Location & Mailing Address
Louisiana State University
Room 3079, Energy, Coast &
Environment Bldg.
Baton Rouge, LA 70803
Telephone: (225) 578-5320
Fax: (225) 578-3662

LGS Mission Statement

The goals of the Geological Survey are to perform geological investigations that benefit the state of Louisiana by:

(1) encouraging the economic development of the natural resources of the state (energy, mineral, water, and environmental);

(2) providing unbiased geologic information on natural and environmental hazards; and

(3) ensuring the effective transfer of geological information.

The Louisiana Geological Survey was created by Act 131 of the Louisiana Legislature in 1934 to investigate the geology and resources of the State. LGS is presently a research unit affiliated with the Louisiana State University and reports through the Executive Director of the Center for Energy Studies to the Vice Chancellor for Research and Graduate Studies.

facies consists of well sorted medium-grained sandstone and bimodally conglomeratic sandstone in which the gravel fraction consists of centimeter- to decimeter-size angular clasts of gold-gray mudstone.

The upper 12 meters is sand dominated with thin continuous beds of gray-gold mudstone near its base and discontinuous mudstone lenses in the upper two thirds. The medium- to thick-bedded sandstone layers display high-angle concave-upward cross bedding which truncates laminated mudstone into isolated lenses. The coarse facies is exclusively medium-grained, well sorted sandstone that lacks gravel-size and mud-size components.

Figure 2. *Photograph of part of Grindstone Bluff exposure. 30 cm and 3.0 m concretions stand in erosional relief in the upper, sand-dominated interval of Grindsone Bluff exposure. Cross bedding is displayed in nonconsolidated sand between the two smaller concretions.*

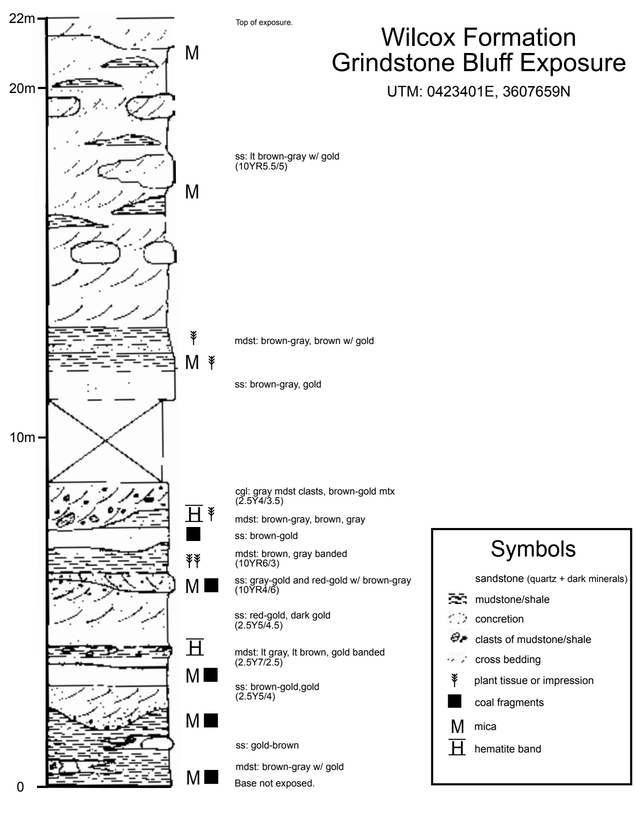

Figure 3. Stratigraphic column of Grindstone Bluff exposure, Wilcox Formation. The columnar section depicts two distinct stratigraphic intervals: mudstones and conglomeratic sandstones in lower, sandstone and mudstone in upper, separated at the exposure locality by a covered section.

Petrography

Mudstone intervals at Grindstone Bluff exposure are clay dominated; clay composition is not rigorously determined in this study, although X-Ray diffraction analysis of concretions indicate the presence of kaolinite (Figure 4), and tactile processing qualitatively suggests dominance of clay-size clasts and abundance of clay mineral(s). The muddy intervals contain localized trace amounts (< 1.0 %) of silt and very fine sand-size quartz and feldspar, and widely disseminated colorless mica. The mud facies also hosts sub-centimeter size plant fragments and plant impressions and sub-millimeter size flecks of coal. Despite the presence of the organic tissue no trace fossil evidence of burrowing organisms was recognized in mudstone intervals.

The sand facies is well sorted, medium-grained sand (average size 0.3 mm) and shows marked compositional immaturity. About 60 percent of the sand fraction consists of angular, colorless quartz, about 30 percent consists of angular finely crystalline meta-quartzite, and the remaining 10 percent comprises fresh and angular detrital feldspar, colorless mica, chlorite, zircon, and trace amounts of quartz-mica schist, amphibole and magnetite. Most feldspars are albitic plagioclase and a smaller number are microcline; amphibole clasts appear to be of hornblende or actinolite composition.

The Grindstone Bluff exposure stands as a precipitous cliff face despite weak induration. A fraction of the mechanical strength is likely due to the coefficient of internal friction due to interlocking of angular sand-size grains. Some measure of induration could be due to the presence of goethite and/or hematite as indicated by whole-rock tinting in shades of gold, yellow, and brown, by bands of concentrated red and gold shades, and by gold-orange limonite adherent to sand-size clasts. Calcite and silica which typically occur as cementing minerals in clastic sedimentary rocks are not pervasive; silica is in low to zero abundance, but calcite is present in concretions. Clay, though present, appears to be of insufficient abundance in the sand facies to act as an effective cement.

Concretions

Although cementing minerals are not pervasive in abundance, they are concentrated in ellipsoidal concretions that resist erosion and stand in visual relief (Figures 2, 3). The concretions are roughly divisible into two compositional and textural groups: (a) decimeter- to meter-scale concretions with internal concentric color banding have muddy texture situated in mudstone intervals near the base of the exposure, and (b) decimeter- to meter-scale concretions of sandy texture concentrated in the thick upper sandstone interval. X-Ray diffraction analysis (Figure 4) shows a preponderance of clay (kaolinite signal) and siderite in the mud-grained concretions. Their dark gold-brown, hard rind is probably a concentration of goethite derived from oxidation of siderite but in abundance too low to be detected by XRD analysis. The population of sand-grained concretions consists of mineral components as described above cemented by calcite (Figure 4, Figure 5). Both concretion forms cross-cut and preserve sedimentary depositional structures indicating the concretions are of diagenetic origin.

Interpretations

Stratigraphic and sedimentologic characteristics displayed in the Grindstone Bluff exposure are consistent with deposition from a fluvial system of sufficient kinetic energy to channel and truncate consolidated muddy substrate. The presence of angular clasts of mudstone as the gravel-size population in trough-filling conglomeratic sandstone facies in the lower sequence implies channeling, extraction of gravel-size chunks of mudstone, and deposition of the bimodal mix as a consequence of ephemeral kinetic episodes.

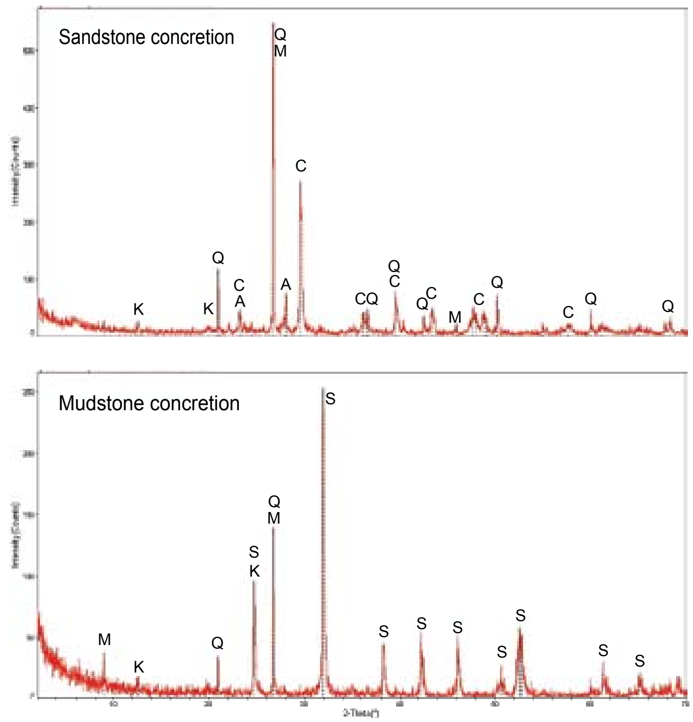

Figure 4. X-Ray Diffraction Patterns for Grindstone Bluff Concretions. The analyses were performed on whole-rock powders extracted from concretion samples. XRD peaks for the following standard minerals are positioned according to their peaks: A=albite, C=calcite, K=kaolinite, M=muscovite, Q=quartz, S=siderite. The XRD peak pattern for the sandstone concretion sample indicates a dominance of quartz in the clast population and calcite as the cementing mineral. The XRD pattern for the mudstone concretion sample shows an abundance of kaolinitic clay with quartz as detrital components and siderite as the cementing mineral.

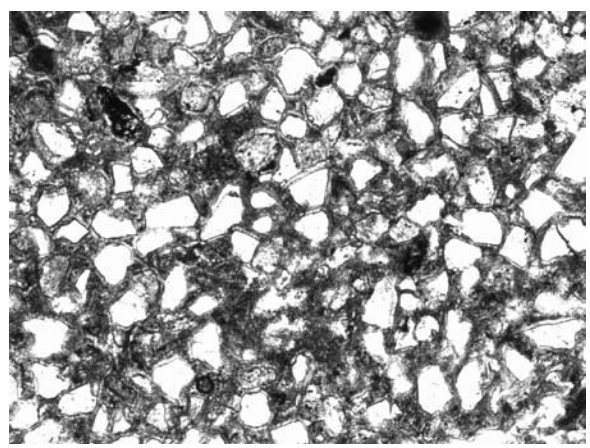

Figure 5. Photomicrograph of sandstone concretion. Angular quartz grains are ~ 0.3 mm. Clasts are fringed with calcite that extends into the interstitial areas, cementing the concretion.

In contrast, the lack of mud- and gravel-size components in the upper sandstone facies suggests that sediment was deposited in sustained channel systems. The interlayered structure of mudstones and well sorted sandstones with channel cutting and tapering imply a dynamic fluvial system in which active sand delivery channel(s) continuously migrated over sand-poor inter-channel mud platforms with flood episodes that caused sudden channeling and subsequent deposition. The presence of coal and leaf fragments clearly suggests a source for plant material and emplacement and subsequent diagenetic processes that preserve the material to some extent. However, the paucity of organic tissue, its confinement to the mud fraction, and the apparent lack of burrow trace fossils indicate a depositional setting unsuited to burrowing organisms. These characteristics and implications are consistent with a fluvial delta plain model as previously interpreted (Coleman and Prior, 1982; Galloway et al., 1991).

Compositional immaturity of the sandstone facies and the largely unaltered state of otherwise weathering-succeptible minerals suggest these components were not reworked from older sedimentary deposits but were transported directly from their provenance source. The minerals albitic feldspar, microcline, and zircon could represent either metamorphic or plutonic igneous sources, but fresh chlorite, amphibole, actinolite in particular, mica and fragments of mica-bearing meta-quartzite were likely supplied by a dominant or exclusive meta-pelitic source with some measure of mafic chemistry.

Interpretation of diagenetic and post-diagenetic mineral components is limited to concretion cement and modern whole-rock and concretion coloring. There is no obvious evidence, such as nodules, for a source of iron that is currently bound in siderite in the muddy concretions, although given the presence of coal and plant fragments in the mudstone layers, the mud facies may have hosted fine crystallites of one or more phases of iron sulfide. The source for calcium currently sequestered by calcite in sandstone concretions is also not obvious given the lack of carbonate fossil fragments in the sandstone facies, although calcareous tests of marine fauna are present throughout Wilcox in the subsurface to the south (Durham and Smith, 1958). Nevertheless, that the concretions are bound by carbonate minerals suggests high CO2 partial pressures during post-emplacement diagenesis. The presence of goethite rinds on mudstone concretions suggests that conditions which favored low oxidation potential subsequently progressed to a state of greater oxidation potential, liberating iron from siderite.

Meter-scale carbonate-cemented concretions have been reported from several locations throughout the world. Sandstone concretions such as the Moeraki boulders of New Zealand (Forsyth and Coates, 1992); the "red rocks" of Red Rock Coulee Natural Area, Alberta (Anonymous, 2002; Heinrich, 2007); and concretions in the Ferron Sandstone Formation, Wyoming (McBride et al., 2003) occur in sedimentary strata of marine origin. Meter-scale "cannonball" concretions also occur within nonmarine sedimentary strata at Rock City, Ottawa County, Kansas and Theodore Roosevelt National Park, Billings County, North Dakota (McBride et al., 2006).

Further Study

Information from a single exposure of any stratigraphic interval necessarily limits the geological interpretations and implications, however the data presented here for the Grindstone Bluff exposure of Wilcox Group provide additional perspective on Wilcox geology that can inform and motivate new hypotheses and regional studies of this unit. Obvious questions that remain concern sediment provenance, conditions and history of diagenesis, and correlation of the Grindstone Bluff interval with equivalent Wilcox intervals formally recognized in studies of its subsurface occurrence.

Acknowledgements

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University Field

Warren Schulingkamp

The area south of LSU between Highland Road and Nicholson Drive, as far as West Lee Drive, is a bustling area containing numerous housing units and businesses. (Figure 1) Thousands live in the area, and thousands more travel across it daily. (Figure 2) Yet it is likely that only a few of them know that below the surface of the ground lies what is a very large oil field. There are few signs of its existence, as its currently-producing wells and associated equipment are mostly hidden from sight by vegetation. Most of the formerly-producing wells in the field have been abandoned and their surface features erased. Yet this once-great field continues to produce oil and gas.

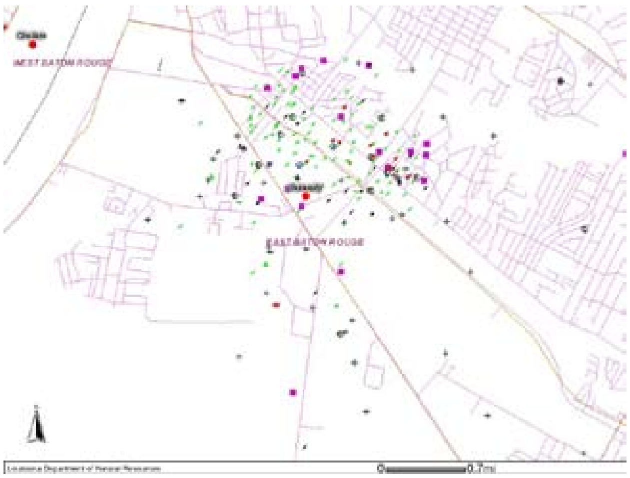
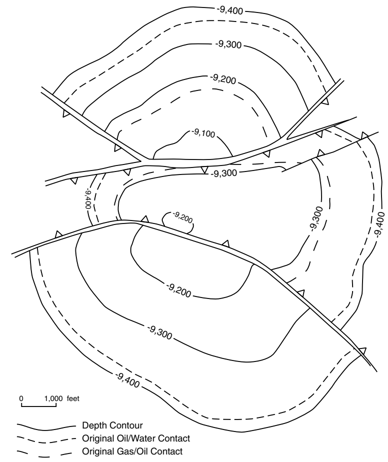


Figure 1. Location of University Field, East Baton Rouge Parish, LA

Figure 2. Burbank Drive cuts across the crest of the University Field structure.

University Field was named for its close proximity to the campus of Louisiana State University. In fact, a part of the field does underlie University lands on its northern and western flanks. A request for an evaluation of further potential at University Field prompted a study which led to this article.

The field is a broad domal structure with relatively minor faulting associated only with the deeper sands. (Figure 3) It was located by reflection seismograph work done in the mid-1930's. The discovery well was drilled in March, 1938, by the Wm. G. Helis Company. Development of the field continued through the 1940's and 1950's. A deep (12,434 foot) test drilled by Helis in 1949 encountered only shale of Eocene age in the lowest 2000 feet. Since then, most of the field activity consisted of recompletions and workovers, with sporadic drilling in the 1970's and 1980's which, despite minor discoveries, yielded little to the field reserves. The most recent activity has been the plugging and abandoning of wells which were no longer commercially productive. Production began in 1940 and has continued up to the present. Initially expected to produce about 17 MMBO by no less an expert than famed independent oilman, the late Michel T. Halbouty, the field has currently produced over 52 MMBO and 97 BCF gas. Deeper potential at University field exists but is as yet unknown.



Production is from more than 20 Miocene and Oligocene sands ranging in depth from 4400 feet to 9900 feet. Some of the sands are discontinuous, adding a stratigraphic component to the trapping mechanisms and adding complexity to the field.

Figure 3*. Structure contour map of the 9300 foot A Sand, University Field. Map modified from a map in the LA Geological Survey files, original author unknown.*

As alluded to above, visible surface signs of the oil field are few and far between. Yet a closer examination of the roads and streets shown on Figure 1 shows that University Field underlies a large and growing residential and commercial area which grew up south of LSU and which continues to be developed (Figure 4). The extraction of millions of barrels of oil and billions of cubic feet of natural gas has not rendered the surface of the land unfit for further development. Indeed the property is now as valuable, or even more, than it has ever been.

Figure 4. Recent development over a portion of the south flank of University Field.

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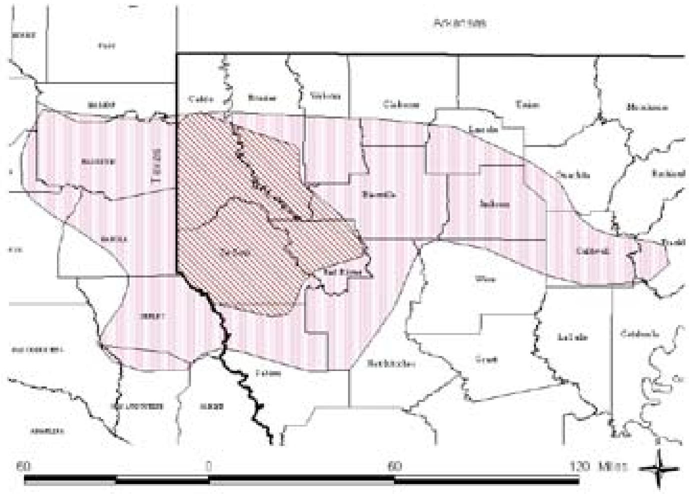

Figure 1. Location of the Haynesville gas play (larger hachured area) and of the current exploration activities (inset hachured area) (sources: Chesapeake Energy and the Louisiana State Mineral Board).

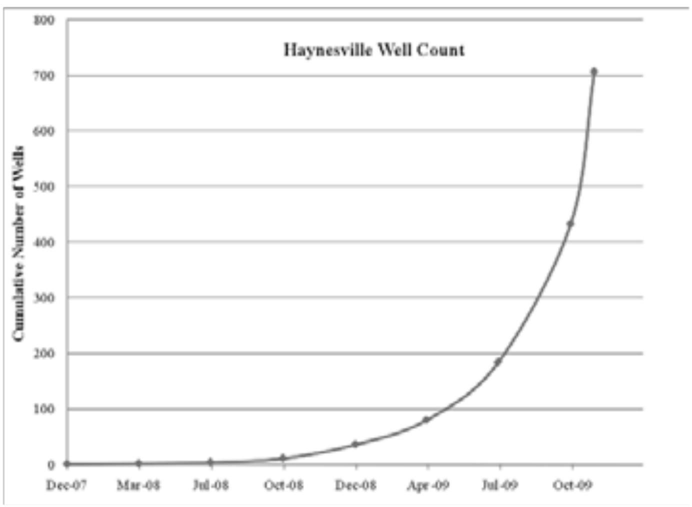

Figure 2. Cumulative number of Haynesville wells (source: LDNR SONRIS accessed 11/4/09)

Figure 3. Population growth in the six northwest parishes (source: U.S. Census)

Growth of Rig Water Supply Wells in Northwest Louisiana

Thomas P. Van Biersel

The development of the Haynesville Shale, an unconventional natural gas play (Figs. 1 and 2), and expansion of other plays in northwestern Louisiana has occurred at the same time as sustained population and economic growth, and urban sprawl into areas not supplied by municipal water systems have occurred (Fig. 3). This play development provides an economical boost to the local economy, but also requires a large steady supply of freshwater for drilling and hydraulic fracture stimulation (HFS) in an area where a large volume of water can be difficult to secure outside the Red River alluvial valley. Regionally, the Carrizo-Wilcox Aquifer (Wilcox) is used to supply the domestic water needs of rural residences (Figs. 4 and 5). The Wilcox is a marginal (e.g. low yielding) aquifer, composed of up to five discontinuous fine- to medium-grain sand layers, interspersed among clay layers. These layers range in thickness from a few feet along the Texas border, to more than 100 feet in southern De Soto, and northern Caddo and Bossier parishes (away from the Sabine uplift). The Wilcox exhibits a broad range of hydraulic conductivities [ranging between 1.6 and 3.8 m/day (1.9- 4.6 darcy)]. These relatively low values are consistent with the deltaic origin of the deposits. Based upon this data, it can be established that the Wilcox yields approximately 0.5 gal/min per foot of drawdown (Van Biersel et al, 2009). In comparison, the Red River Alluvial Aquifer has an hydraulic conductivity ranging between 8.3 and 65.5 m/day (10-79 darcy) and yields 5.6 gal/min per foot of drawdown (Van Biersel et al, 2009).

An analysis of the growth rate of domestic and rig-supply well registration was performed for Northwestern Louisiana (Fig. 1). The analysis looked at the sometime conflicting use between domestic needs and economic growth, and its aerial distribution (Fig. 6). The Louisiana Department of Transportation and Development (LDOTD) Water Resources Section October 2009 database of registered water well shows that there are 5,142 rig supply and 9,436 domestic water supply wells in the six northwest Louisiana parishes. The results are likely to be biased, due to the lack of state registration requirement prior to November 1st, 1985. A review of the LDNR SONRIS database indicates that there are 60,155 oil and gas wells listed for the

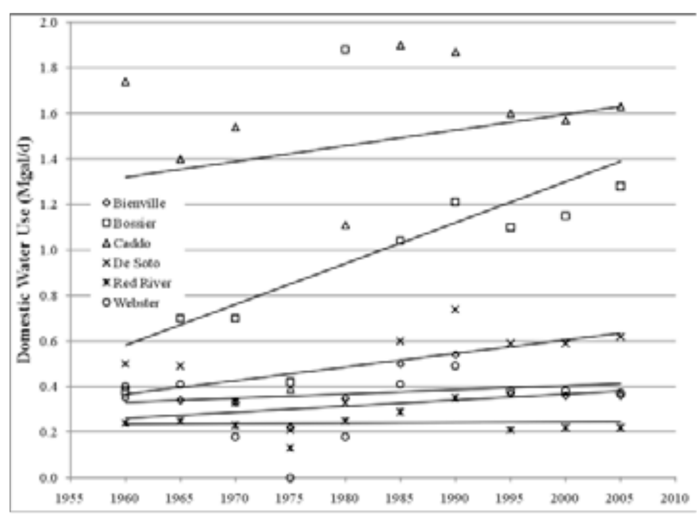

Figure 4. Domestic water use in the six northwest parishes (source of data: USGS)

subject parishes. It should be noted that wells for which a drilling date was not available were assigned to the prevalent decade, based upon their position in the sequential well number. It is likely that many of those oil and gas wells required a rig supply well drilled, since 45,108 of those wells were drilled prior to 1985.

Since the onset of exploration of the Haynesville Shale play in northwestern Louisiana, the drilling pace has increased exponentially (Fig. 6). Based upon the Louisiana Department of Natural Resources (LDNR) Strategic Online Natural Resources Information System (SONRIS) database, one well was completed in the Haynesville Shale in 2007. In 2008, there were another 35 wells, and, as of October 30, 2009, another 671 wells were drilled or are in the process of being completed. Assuming that each of those wells used ~25,000 barrels (bbls) of freshwater for drilling, and another 75,000 bbls of freshwater for fracturing (Satterfield, 2008); that would suggest that in 2007 ~100,000 bbls of water were used. In 2008 another ~3.5 million bbls were used and at least another ~67.2 million bbls of water were used in 2009. The cumulative total (~70.7 million bbls or ~9,100 acre-foot) represents a volume of freshwater equal to ~5,900 olympic swimming pools, or the annual indoor water use of ~27,000 family of four [assuming 400 gal/day (source: USEPA, 2009)]. Based upon rig count predictions (Briggs, 2009; and Loren Scott, 2009), it can be estimated that for the near future, the yearly freshwater supply needed by the operators will remain relatively stable, unless the price of natural gas increases above its current level.

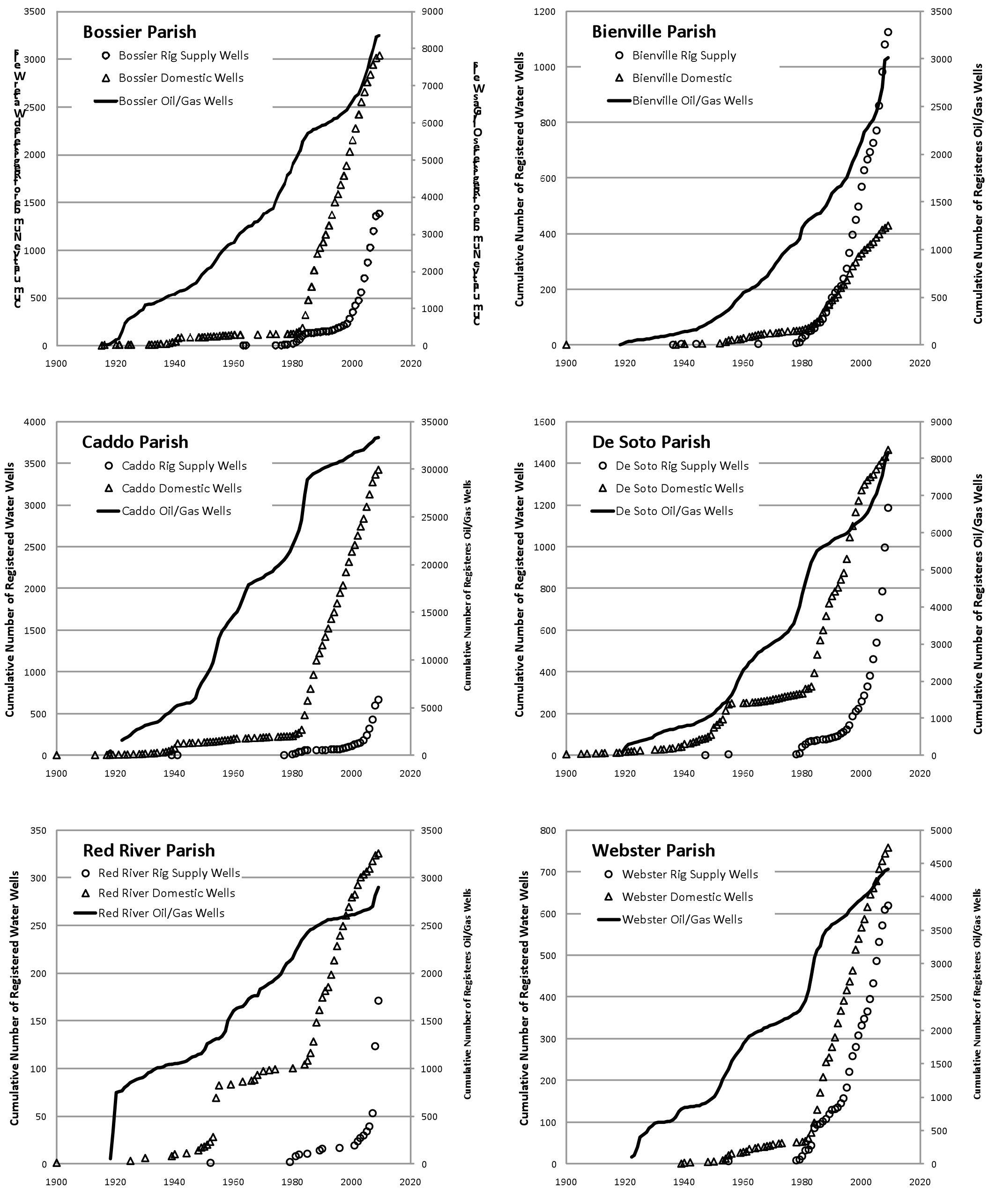

***Figure 5.** Plots of the number of registered oil/gas, rig supply and domestic wells (source: LDOTD and LDNR)*

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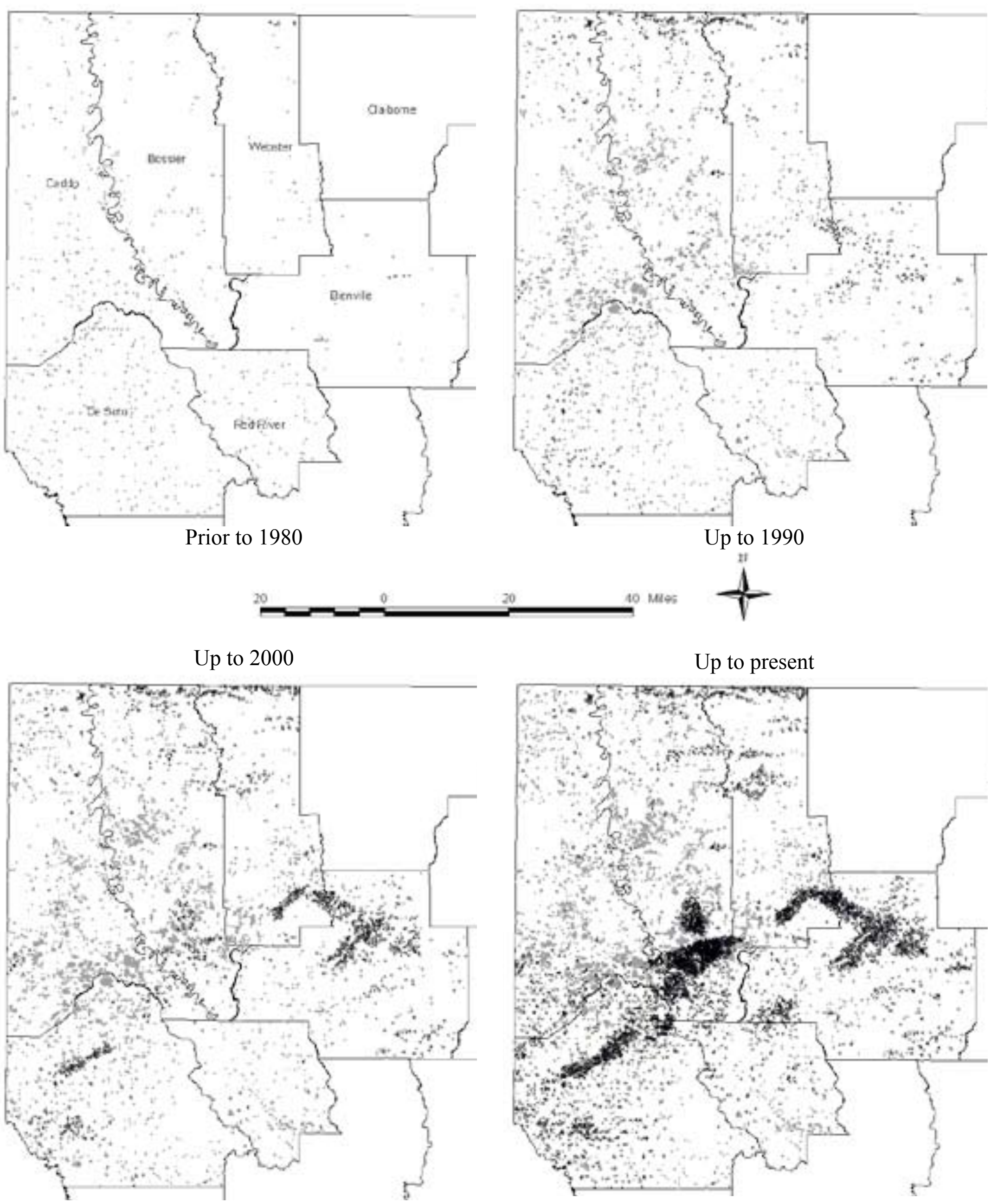

Figure 6. Aerial distribution of registered rig supply (black Xs) and domestic wells (gray dots) overtime. (source of data: LDOTD)

Fisk's Cartographic Error

John Snead

Harold N. Fisk's 1938 report *"The Geology of Grant and LaSalle Parishes"* established his famous four-terrace Pleistocene depositional sequence. It is a much-quoted work, but contains a small but significant cartographic error that may have misled some subsequent investigations.

On the black and white figure entitled *Physiography of Grant and LaSalle Parishes*, Waddel Bluff is mislocated 3 miles up-river to a bluff mapped as Montgomery. The true location of Waddel Bluff on this figure is mapped as Prairie.

On the colored *Geologic Map of Grant Parish* plate in the same volume, Waddel Bluff is correctly located but the Quaternary terraces are undifferentiated. So, did Fisk work on an incorrect base map and consider Waddel bluff to be Montgomery? Or did Fisk's cartographer mislocate Waddel Bluff after Fisk had mapped it as Prairie?

Many writers who have studied Fisk believe that he considered Waddel Bluff to be Montgomery (*Alford, et al., 1985*). Indeed Fisk did describe a Waddel Bluff section in his chapter on the Montgomery but may be suggesting that the Montgomery Formation is only exposed in the lower part of the section, leaving the possibility that he considered the top of the Bluff to be a Prairie surface as mapped.

Others have considered the bluff to be Prairie (Smith and Russ, 1974) also citing Fisk. Now that the Corps of Engineers have armored the base of Waddel Bluff with concrete matting, the site cannot be studied any further.

(Revised from Autin and Snead, 1993)

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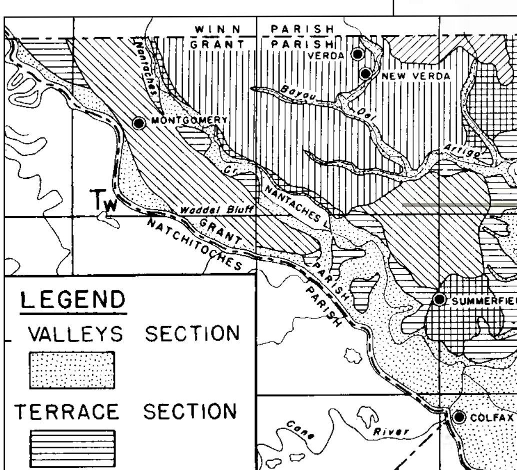


Figure 1. Detail from the Physiography of Grant and LaSalle Parishes plate in Fisk 1938, showing Waddel Bluff incorrectly located.

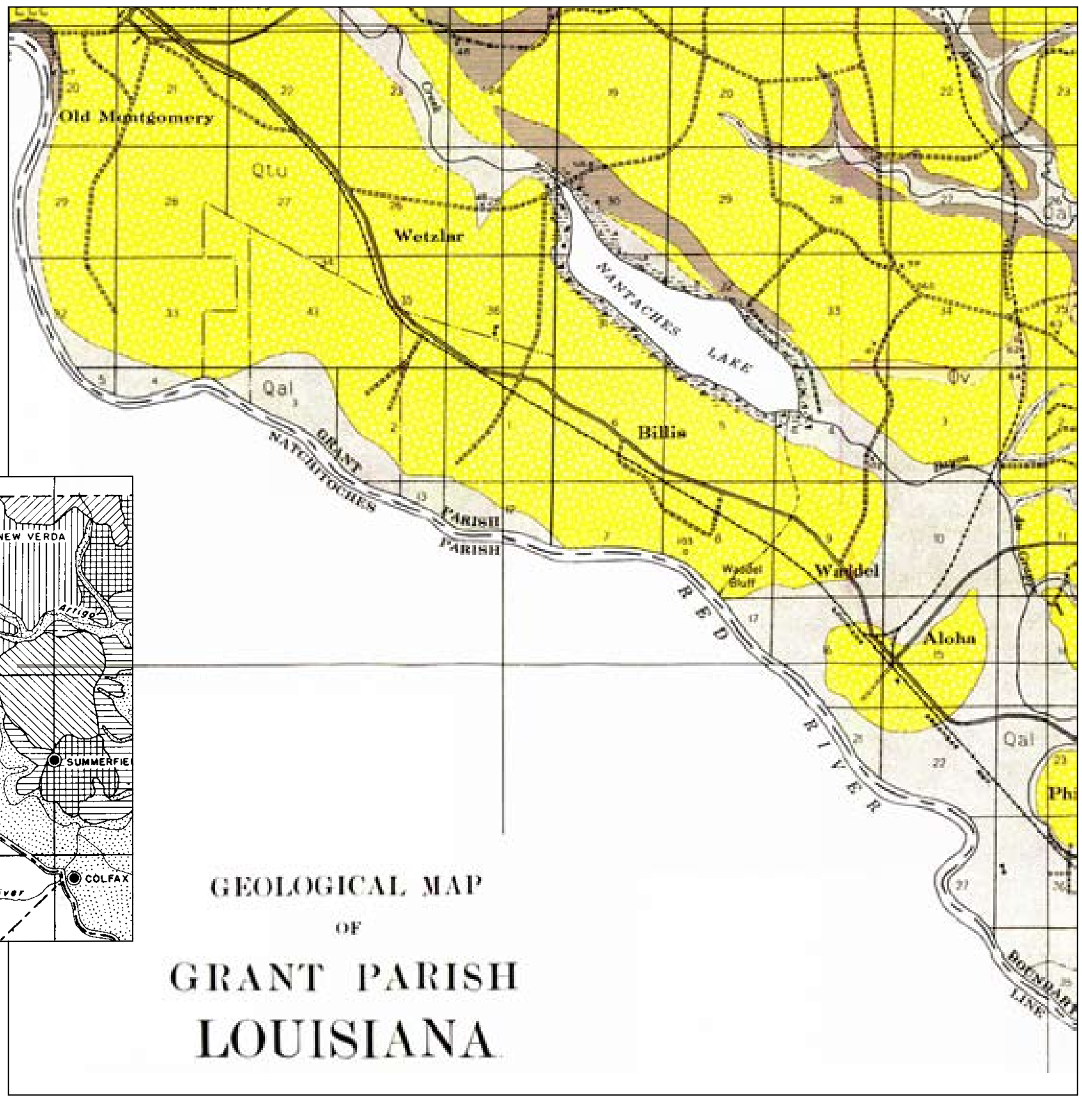
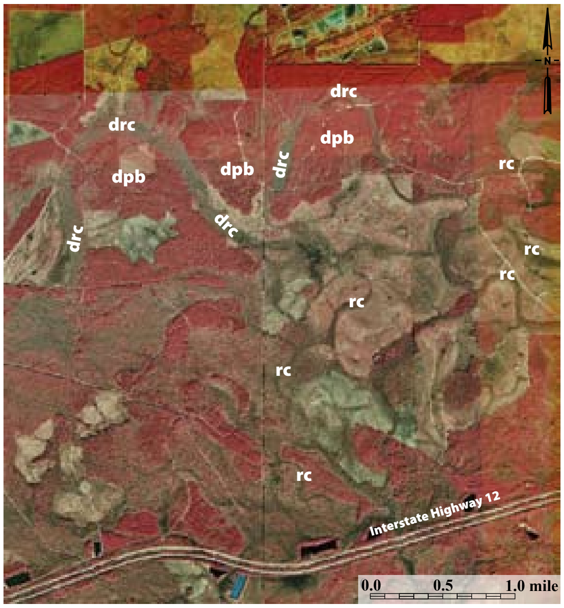


Figure 2. Detail from the Geologic Map of Grant Parish plate in Fisk 1938, showing Waddel Bluff correctly located.



Excerpt from the 2007 1-Meter, Ortho Rectified Mississippi Compressed County Mosaic for Hancock County, Mississippi. Courtesy the Mississippi Automated Resource Information System (MARIS) at http://www.maris.state.ms.us/.

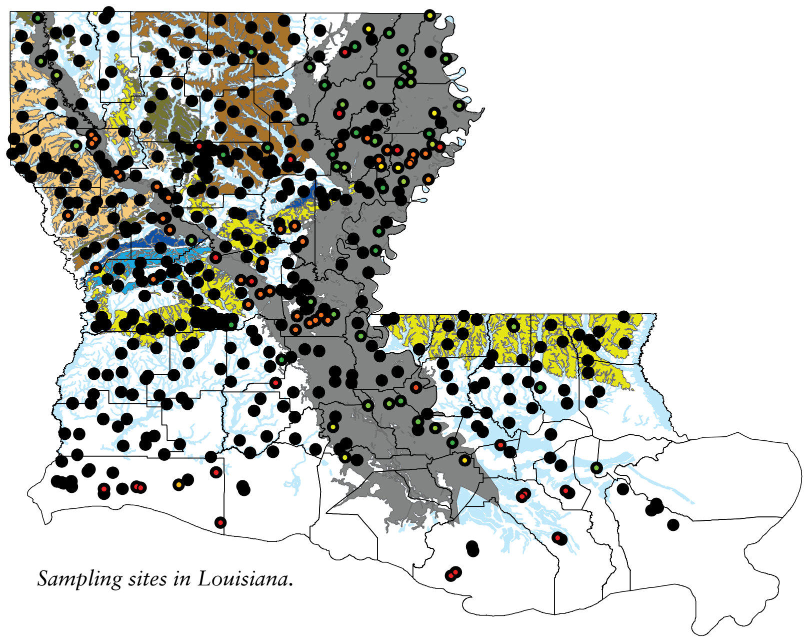
This image shows segments of relict Pleistocene channels of Pearl River meander belts that once extended across Hancock County from the Pearl River east to Bay St. Louis, Mississippi. The relict fluvial features include Deweyville-size meanders and channels (drc), their associated point bars (dpb), and smaller and younger relict channels (rc). The area illustrated by this image lies just east of the Stennis Space Center.

For more information, read:

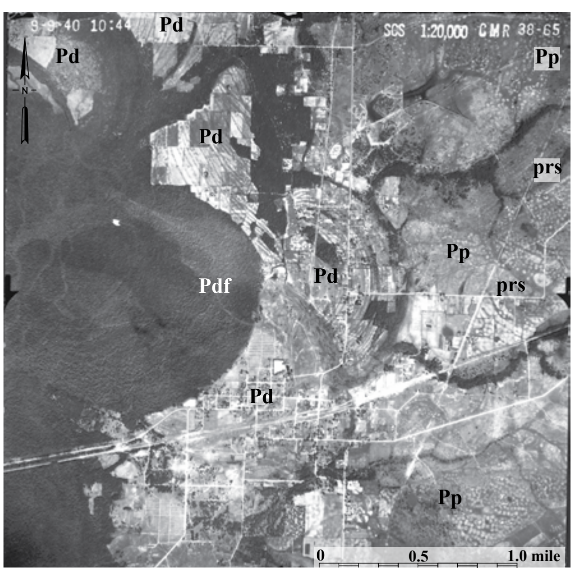
Heinrich, P., 2006, Pleistocene and Holocene Fluvial Systems of the Lower Pearl River, Mississippi and Louisiana, USA. Gulf Coast Association of Geological Societies Transactions. vol. 56, pp. 267–278.

The USGS National Geochemical Survey Database for Louisiana

In September, 2008 the USGS published their National Geochemical Survey – Database for Louisiana. The Louisiana Geological Survey was contracted to collect the 510 soil samples (Figure 1) across the state with a minimal density of one sample per 289 km^2 (i.e. based on a 17x17 km sampling grid). Each of the 510 samples were analyzed by the USGS using analytical methods to include 40-element ICP package plus single element determinations of As, Se, and Hg by atomic absorption. The principal samples were based on stream sediments, and if no stream or bayou was located near the pre-chosen sample location a solid field soil sample was collected. Stream sediments were chosen because they integrate all sources of sediment in the stream's drainage basin, and field soil samples represented a much smaller source area. The database can be acquired from the USGS Mineral Resources web site http://tin.er.usgs.gov/geochem/package.php.



Sampling sites in Louisiana.



Excerpt from Agricultural Stabilization and Conservation Service no. CMR 38-65, Taken September 9, 1940, of the Merryville, Louisiana area. Courtesy the Cartographic Information Center, Department of Geography and Anthropology, Louisiana State University, Baton Rouge.

This image shows the surface of the Deweyville Allogroup (Pd) and Beaumont Alloformation (Pp) along the east side of the Sabine River Valley in Beauregard Parish. The surface of the Deweyville Allogroup exhibits well-preserved fluvial ridge (light-colored) and swale (dark-colored) topography. The surface of the Beaumont Alloformation exhibits numerous pimple mounds (light-colored circular features). In a few places on the surface of the Beaumont Alloformation (prs), arcurate pimple mound alignments reveal very poorly preserved, relict ridge swale topograpy. Within the floodplain of the Sabine River (Pdf), a lower terrace surface of the Deweyville Allogroup lies buried beneath a veneer of floodplain sediments.

For more information, look at:

Snead, J., Heinrich, P.V., and McCulloh, R.P., compilers, 2002a, De Ridder 30 x 60 Minute Geologic Quadrangle: scale 1:100,000. Louisiana Geological Survey, Baton Rouge, Louisiana.

Discovery Channel News Cites Louisiana Geological Survey Research

The work of Louisiana Geological Survey research associate Paul Heinrich was recently cited in two Discovery Channel website news articles about the discovery of a giant clawed dinosaur unearthed in a Utah desert. The dinosaur, *Nothronychus graffami*, stood 13 feet tall and had nine-inch-long hand claws. One mystery surrounding the skeleton is how the well-preserved remains of the terrestrial dinosaur came to rest in marine sediments about 60 miles from the nearest contemporaneous prehistoric shoreline.

In a Discovery.com interview July 17, Lindsay Zanno, John Caldwell Postdoctoral Fellow in the Department of Geology at the Field Museum and the lead author of the Proceedings of the Royal Society B paper that describes the new dinosaur, mentions that one possible solution to this mystery was suggested by Heinrich at the 2008 Geological Society of America (GSA) Meeting Houston. In his GSA paper, Heinrich proposes that this dinosaur drifted out to sea on a solid mass of vegetation called a "floating island," a formation solid and buoyant enough to have transported animals as large and heavy as this dinosaur. Floating islands offer a similar solution to other anomalous finds of well-preserved dinosaur remains in marine sedimentary rocks far from contemporary shorelines.

The recently discovered Nothronychus graffami might have drifted out to sea on a "floating island," a formation described by LGS research associate Paul Heinrich. Credit: © Victor Leshyk, 2007. Used with permission.

DOE Announces Industry-LGS Partnership Awards for Geothermal Research

The U.S. Department of Energy has announced awards for three geothermal energy research projects totaling $672,799 to the Louisiana Geological Survey through industry-university partnerships. The first award will fund a project to capture, condition, and transport CO_2 from facilities located along the Mississippi River between Baton Rouge and New Orleans for geologic storage. The LGS will perform a technical review of geologic information, assist in obtaining geologic data, and provide technology transfer and local outreach. LGS funding is $75,000 for the first seven months. The project is headed by Shell International Exploration and Production Company.

The second award, to a consortium led by Louisiana Geothermal, funds a three-year project to demonstrate the feasibility of a geo-pressured-geothermal power plant in Cameron Parish, Louisiana. The proposed plant could potentially generate enough electricity to power 2,000 to 5,000 homes. The LGS award is $297,820.

The third award funds the Natural Geothermal Data System (NGDS), an integrated distributed and searchable data system of state-specific geothermal data, which is expected to drive renewed efforts to identify, assess, and exploit geothermal energy resources in the U.S. A consortium put together by the Association of American State Geologists (AASG) and headed by the Arizona Geological Survey and including 40 state geologic surveys will participate in populating the data system with relevant geothermal data. LGS funding from this award is $299,979 over three years.

Chacko John, state geologist and director of LGS, is principal investigator for the projects. LGS research associate Brian Harder is the co-principal investigator.

Research into geothermal power generation is not new to LGS. "The Survey was a participant in the Gulf Coast Geopressured-Geothermal program in the 1990s," said John. "We have known for a long time that there is tremendous potential for geothermal energy production on the Gulf Coast. With the right economic conditions, and with today's emphasis on alternative energy resources, and increasing energy costs, this could be a potential boon for Louisiana."

The DOE and the lead agencies for the three projects are currently in negotiations to finalize the terms of the funding.

Earth Science Week

Earth Science Week 2009 was celebrated from October 11-17, 2009. This year the week focused on promoting scientific understanding of a current timely and vital topic – the Earth's Climate. At the request of the Louisiana Geological Survey, Governor of Louisiana Bobby Jindal issued a proclamation declaring October 11-17, 2009 as Earth Science week in the State of Louisiana. Earth Science week is sponsored annually by the American Geological Institute (AGI) and all its member societies on behalf of the geoscience community. More information about AGI and Earth Science week can be found on their websites (*www.agiweb.org* and *www.earthscienceweek.org*).

The Louisiana Geological Survey received 50 teaching kits containing teaching materials related to the focus area and these were distributed to Earth Science Teachers through the Program Coordinator (Jean M. Brett) of the East Baton Rouge Parish Schools Division of Standards Assessment and Accountability.

United States of America

State of Louisiana

Governor

Bobby Jindal

Proclamation

WHEREAS, the earth sciences are integral to the discovery development, and conserving of mineral, energy, and water resources needed for Louisiana's continuing prosperity; and

WHEREAS, the earth sciences provide the basis for and mitigating wetland loss and natural hazards such as earthquakes, floods, coastal erosion, hurricanes, landslides, droughts, and subsidence experienced from time to time in Louisiana; and

WHEREAS, the earth sciences are critical to environmental and ecological issues ranging from water and air quality to waste disposal; and

WHEREAS, geological factors of resources, hazards, and environmental are vital to land management and land use decisions made in Louisiana; and

WHEREAS, the Louisiana Geological Survey, since its establishment in 1934 has served the state and its citizens with valuable and relevant earth science investigations and information.

NOW, THEREFORE, I, Bobby Jindal, Governor of the State of Louisiana, do hereby proclaim October 11 – 17, 2009 as

EARTH SCIENCE WEEK
in the State of Louisiana.

In Witness Whereof, I have hereunto set my hand officially and caused to be affixed the Great Seal of the State of Louisiana, at the Capitol, in the City of Baton Rouge, on this the 11th day of October A.D. 2009

Governor of Louisiana

Attest By The Governor

Secretary of State

Data Preservation Techniques Workshop

LGS was represented by Research Associate Patrick O'Neill at a workshop on Geoscience Data Preservation Techniques sponsored by the National Geological and Geophysical Data Preservation Program (NGGDPP) administrated by the USGS and the Association of American State Geologists (AASG) and hosted by the Indiana Geological Survey in mid July at Bloomington, Indiana. LGS has a research grant from the NGGDPP for cataloging cores at the LGS Resource Center and entering the information into a National Data base being compiled by the USGS. This 2 day workshop was attended by data-preservation specialists from the USGS and State Geological Surveys and served as a forum for providing information and discussion on preservation, cataloging and data management of geoscience materials at the participating Surveys. For more information of the NGGDPP program, please visit the USGS website at *http://datapreservation.usgs.gov/*.

Workshop participants in front of the Indiana Geological Survey office at Indiana University, Bloomington.

LGS Resource Center Moving to New Location

The LGS Resource Center, the only one of its kind in the State of Louisiana, located on the LSU Campus consists of a core repository and a well log library. It is currently being moved and all its holdings consolidated at a warehouse located behind the LSU Graphic Services building on River Road. This work is expected to be completed by the end of this year.

The core facility has over 30,000 ft. of core from wells mostly in Louisiana and some from the neighboring states. The well log library contains over 50,000 well logs, mostly from Louisiana. The LGS Resource Center is available for use by industry, academic, government agencies and those who may be interested. For more information on the LGS Resource Center contact Patrick O'Neill at 225/578-8590 or by email at *poneil2@lsu.edu*.

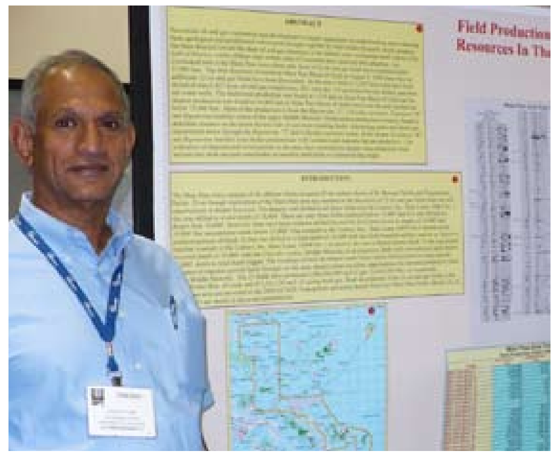
Conferences

GCAGS/GCSSEPM 2009 Convention

The Shreveport Geological Society was host to the 59th Annual Joint Convention of the Gulf Coast Association of Geological Societies and the Gulf Coast Section of the Society of Sedimentary Geology (SEPM) from September 27-29 at Shreveport, LA The Convention theme was "A Fusion of Geology and Technology" and was held at the new Shreveport Convention Center. The technical program was preceded by an all day Symposium concentrating on the Haynesville Shale on Sunday, September 27 and the meeting hall was packed to capacity.

LGS Faculty and Staff made a total of nine presentations the titles of which are listed under comprehensive list of publications in this issue. Douglas Carlson was co-chair of the oral session titled "The Wilcox-Outcrop to the Abyss: Part Two". LGS also had an exhibit booth displaying publications and maps produced by LGS which was manned by Riley Milner assisted by other LGS attendees at the convention. Rick McCulloh participated as co-leader of Field Trip #1 titled "Midway Group and Wilcox Group (Paleocene) Contact".

LGS exhibit booth in Shreveport.



Poster presentation titled "Field Production and Potential for Deeper Hydrocarbon Resources in the Main Pass Area, Louisiana State Waters" by co-author Chacko John.

LGS Advisory Board Adds Two New Members

LGS welcomes and thanks Don Briggs and Raymond Lasseigne for agreeing to serve on the LGS Advisory Board. Don Briggs is the President of the Louisiana Oil and Gas Association (LOGA) and Raymond Lasseigne is the Chairman of TMR Exploration Inc., Bossier City, LA.

William Marsalis the previous LGS Director and State Geologist and now retired who was a member of the Board has decided to opt out of the Board due to personal reasons. LGS would like to express its sincere thanks to Bill for his service on the board and he is always welcome to visit LGS when in town.

Our last Advisory Board meeting which was originally scheduled for November 11, 2009, had to be postponed due to lack of quorum and will be rescheduled later.

Staff Recognition

LSU Service awards certificates were presented by LGS Director Chacko John on October 1, 2009, to Lisa Pond (20 years) Patrick O'Neill (20 years) and Riley Milner (15 years) in recognition of dedicated service to LGS/LSU.

Richord P. McCulloh, Louisiana Geolical Survey, inspecting one of numerous meter-scale concretions that are eroding out of the Wilcox Group in a sand pit in Park Eddie D. Jones, Caddo Parish, Louisiana.

LGS Publications (authored/co-authored) 2008-present

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Carlson, Douglas and T. Van Biersel, 2009, Influence of Facies, Fractures, and Weathering on the Hydraulic Properties of the Monroe Gas Rock: Gulf Coast Association of Geological Societies Transactions, v. 59, p. 159-170.

Carlson, Douglas and T. Van Biersel, 2009, Is Chloride Concentration Increasing in the Sparta Aquifer Of North-Central Louisiana?: Gulf Coast Association of Geological Societies Transactions, v. 59, p. 171-180.

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Carlson, Douglas and T. Van Biersel, 2008, Can Mississippi River Flooding Save the Delta Parishes of Louisiana?: Program for Baton Rouge Geological Society's 2nd Annual Louisiana Subsidence and Land Loss Symposium, November 17, 2008, Baton Rouge, Louisiana, v. 2, p. 25-28; Baton Rouge Geological Society Archives http://www.brgs-la.org/web=content/2008ProgramSubsidenceSymposium.pdf (accessed October 9, 2009).

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