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Chenier Plain road log

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ABSTRACT

The field trip begins at Cameron Prairie National Wildlife Refuge, ~30 miles SSE of Lake Charles, Louisiana, at the contact of the Prairie Formation (Pleistocene) and the Chenier Plain, formed on Holocene sediments. Stops on Day 1 include Little Chenier, Calcasieu Pass mudflat, Rutherford Beach, Indian Point spit on the Mermentau River, and Grand Chenier. The overnight stop is at Rockefeller State Wildlife Refuge. Day 2 formal stops include the Holly Beach and Constance Beach communities completely destroyed by Hurricane Rita during 2005, as well as a breached regressive beach ridge at Martin Beach. Supplementary stops on the Bolivar Peninsula of Texas between High Island and Galveston illustrate the contrast between this strandplain coast and the chenier plain coast.

Keywords: Cameron Parish, Louisiana, Chenier Plain, Mermentau River, Hurricane Rita, Little Chenier, Calcasieu Pass, Rutherford Beach, Indian Point, Grand Chenier, Holly Beach, Constance Beach, Martin Beach, Johnsons Bayou, hurricane, tropical cyclone.

FIELD TRIP DESCRIPTION

Day 1. Cameron Prairie National Wildlife Refuge, Louisiana to Rockefeller State Wildlife Refuge, Louisiana (Figure 1)

Cameron Prairie National Wildlife Refuge

The wildlife refuge includes the contact between the Prairie Formation (Pleistocene), which forms the upland area from Lake Charles to the starting point of the field trip, and the Holocene deposits, which form the largely wetland area from here to the Gulf of Mexico. The Prairie surface (or terrace), which is used for agriculture, mostly grazing and rice-farming, is better drained and typically around 15 feet above sea level (such as in most of the city of Lake Charles). The Holocene surface (known as the Chenier Plain in southwestern Louisiana), which is mostly wetland area, is poorly drained and generally below 5 feet in elevation except on the crests of some chenier ridges. The storm surge of Hurricane Rita, which covered virtually all of the Cameron Parish Chenier Plain (McGee et al., 2007, Fig. 9 therein), reached nearly 7 feet above sea level (Fig. 2) near here and nearly 9 feet in the Lake Charles area. The Intracoastal Waterway, crossed 3 miles south of here at Gibbstown, is a sea-level barge canal that extends from southernmost Texas to Florida. The rest of our field trip in Louisiana will be on upper Holocene sediments, all of which are less than 3000 years old.

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Cumulative mileage *mi (km)*	*Description*
0.0 (0.0)	Leave Cameron Prairie National Wildlife Refuge, turn right onto Louisiana Highway 27 (LA 27), and head south.
2.9 (4.7)	Gibbstown Bridge over the Intracoastal Waterway.
8.1 (13.0)	Turn left onto Cameron Parish Road 201 (CPR 201), also named Little Chenier Road, and head east.
17.9 (28.8)	Pavement ends, continue heading east.
19.5 (31.4)	Stop 1 (See Fig. 1).

Stop 1. Little Chenier

Little Chenier Ridge is the oldest chenier on the Chenier Plain, originally radiocarbon-dated at 2800 yr B.P., it is now considered to be younger than 2500 yr B.P. (see Owen, 2008). Little Chenier is 12 miles long, 100–1600 feet wide, and has an elevation of up to 10 feet. The east end is a curved spit extending through a lake (Marseillaise Bayou) to the Mermentau River (see Owen, 2008; Fig. 5 therein). The chenier is composed mostly of shell hash, exposed in borrow pits and small cuts along roadside ditches.

Houses were damaged by wind and floated inland by Hurricane Rita's storm surge; many trees were uprooted or broken by Rita's high-velocity winds this far inland from its landfall near Johnsons Bayou, Louisiana on 24 September 2005. A roof and a transported house are visible through the trees in the marsh south of Little Chenier. Rita's storm surge near Little Chenier reached 7.38 feet (Fig. 2).

Return to LA 27 via CPR 201.

Cumulative mi (km)	*Description*
30.9 (49.7)	Turn left onto LA 82, and head south.
34.6 (55.7)	Intersection of Louisiana Highways 27, 82, and 1143. This is the only traffic light in Cameron Parish! Turn right onto LA27/82, and head west.
48.4 (77.9)	Turn left onto Cameron Parish Road 3143 (CPR 3143), also named Davis Road, and head south.
51.2 (82.4)	Stop 2.

Stop 2. Calcasieu Pass

This is the only readily accessible tidal mudflat on the Cameron Parish coast. It is slowly prograding, much like the mudflats of the past that form much of the Chenier Plain and active mudflat of the eastern Chenier Plain downdrift of the Atchafalaya delta (see Owen, 2008, Figs. 10–12 therein). This is a very low wave-energy zone during normal weather, protected by the large ebb-tide shoal offshore of Calcasieu Pass, the jettied outlet of

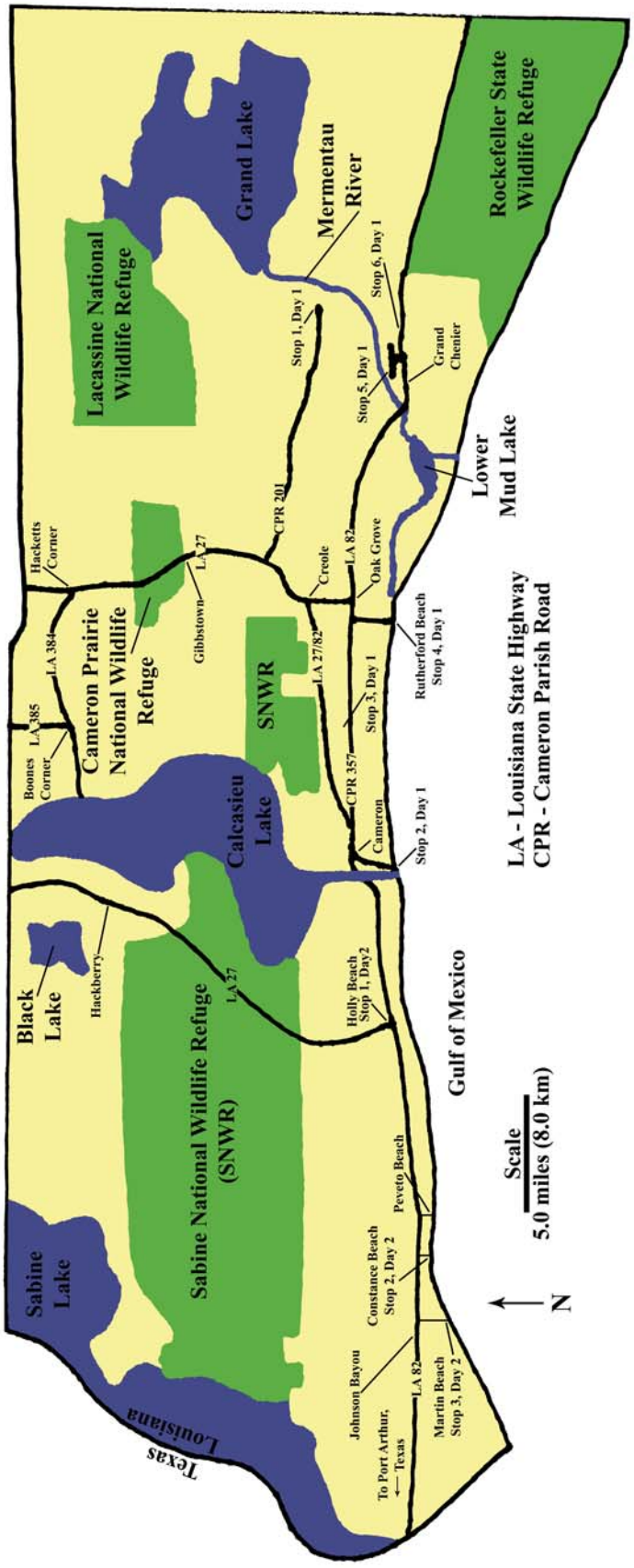

Figure 1. The map of the field trip route outlines the entire trip traveled.

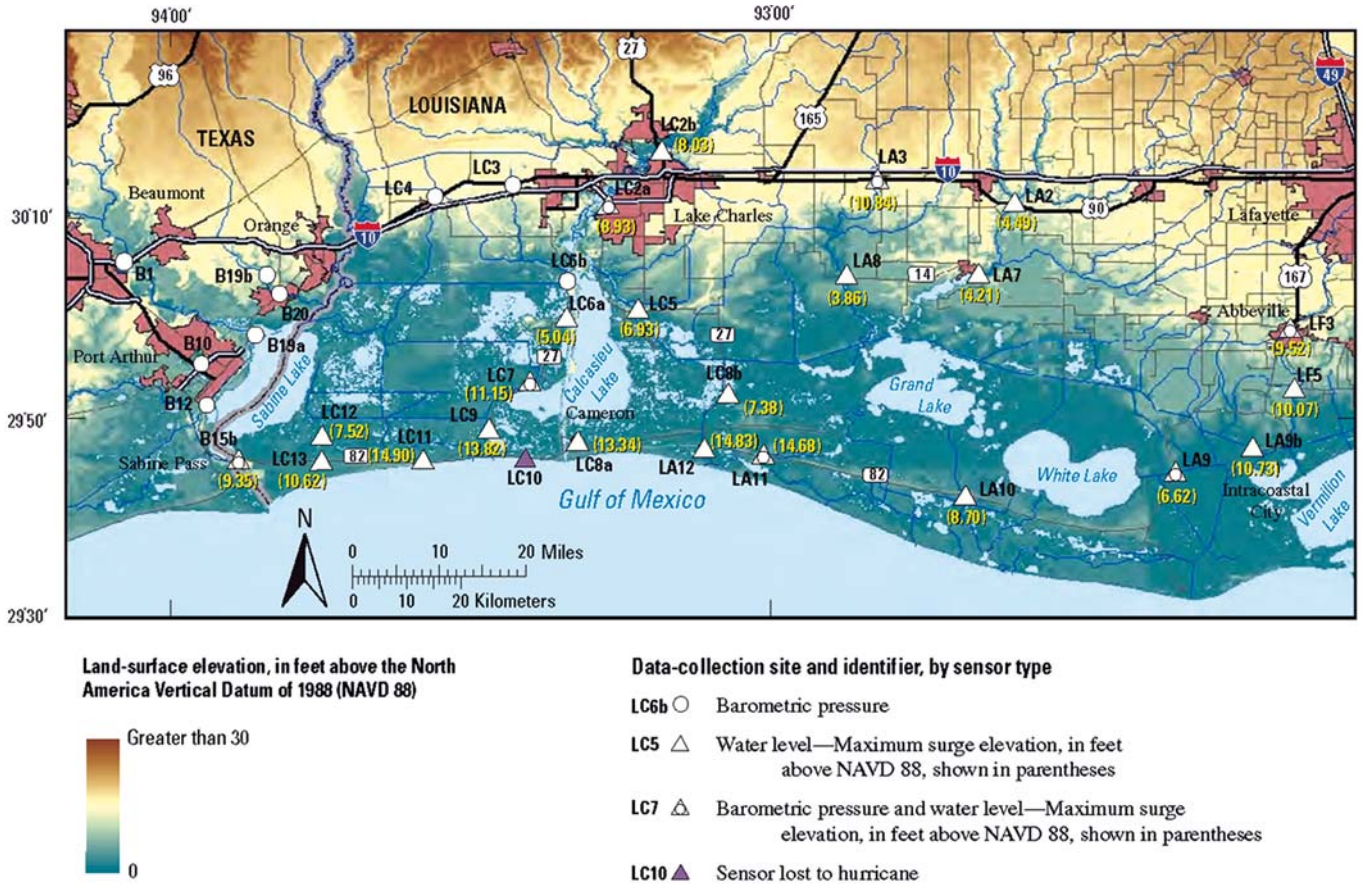

Figure 2. Location of Rita storm-surge heights in feet at data collection sites in southwestern Louisiana and southeastern Texas. Modified from McGee et al. (2006, their Figure 3; 2007, their Fig. 2).

the Calcasieu River, and the dredged ship channel that extends inland to Lake Charles, Louisiana. Shell-armored mud balls may be seen—they are eroded and rounded by storm waves and were quite abundant after Hurricane Rita. Marsh grass quickly colonizes the upper part of the mudflat. Note the shells contained in the mud—these are concentrated into cheniers by erosion and lag accumulation.

Hurricane Rita and its 13.34 foot storm surge here (Fig. 2) eroded part of the mudflat, but its effects are most evident at the smashed concrete fishing pier, the bent girders of the former restrooms and picnic area, and the destroyed buildings along the road leading to the mudflat. Almost all of the town of Cameron was heavily damaged—many buildings, including a two-story brick school were destroyed. Only ~1600 of the 3600 homes in Cameron Parish were considered repairable. The Cameron Parish Courthouse survived Rita, much as it did the similar Hurricane Audrey during 1957.

Return to LA 27/82 via CPR 3143.

Cumulative mi (km)	*Description*
54.0 (86.9)	Turn right onto LA 27/82, and head east.
59.4 (95.6)	Intersection of LA 27/82 and Cameron Parish Road 357 (CPR 357), also named Trosclair Road. Continue heading east on CPR 357.
64.1 (103.2)	Stop 3.

Stop 3. Roadside Borrow Pit

This recently used borrow pit, on the north side CPR 357, exposes a Holocene tidal-mudflat deposit which has been preserved between two cheniers. The lower part of the exposure is apparently composed of subtidal deposits with a Gulfward dip of a few degrees, and the upper part may contain near-horizontal intertidal deposits. In a similar pit ~10 miles to the west, Wells (1986, p. 489) described landward-dipping overwash deposits on the back side of a chenier. Examination of the sediment piles around the pit shows the abundant shell debris, along with considerable silt and some sand that can be reworked into cheniers. Note the very delicate, thin clam shells that are unbroken in this low-energy deposit. More durable snail shells are also present. The low chenier to the north is Front Ridge (ca. 1100 yr B.P.); the unnamed chenier to the south on the modern coast (ca. 500 yr B.P.) currently is being eroded by waves at Rutherford Beach, the next stop.

All of this area was inundated by Hurricane Rita's storm surge, which was 14.83 feet near here (Fig. 2).

Turn left onto CPR 357, and head east.

Cumulative mi (km)	*Description*
65.7 (105.7)	Turn right onto Cameron Parish Road 359 (CPR 359), also named Rutherford Beach Road.
68.2 (109.8)	Stop 4.

Stop 4. Rutherford Beach

The steep, coarse beach here is due to modern coastal erosion that is reworking an ~500 yr old chenier. Note the shell content and sand grain size in this deposit. Small, low dunes were present here before Hurricane Rita. This is the best beach on the Chenier Plain coast. The natural mouth of the Mermentau River was located at this locality until recently. Following dredging of an artificial inlet 7 miles (11.3 km) east of here, the river's mouth gradually closed under the influence of the dominant westerly longshore current.

The small beach community of Rutherford Beach was completely destroyed by Hurricane Rita. Almost all the other beach houses on the Louisiana Chenier Plain were destroyed as well. The only surviving beach houses were new ones subject to the recent building codes that specify higher pilings, which placed the cabin floors above Rita's storm surge, limiting damage to that by the wind rather than the waves.

Return to CPR 357 via CPR 359.

Cumulative mi (km)	*Description*
70.7 (113.8)	Turn right onto CPR 357, and head east.
71.8 (115.6)	Intersection of CPR 357 and LA 82. Continue heading east on LA 82.
78.0 (125.5)	Mermentau River Bridge.
84.6 (136.2)	Turn left onto Cameron Parish Road 229 (CPR 229), also named Carl McCall Road, and head north.
85.3 (137.3)	Turn left onto Cameron Parish Road 230 (CPR 230), also named E. Miller Road, and head west.
87.0 (140.0)	Stop 5.

Stop 5. Indian Point Spits at the Mermentau River

Two low-elevation (~5 feet and less) curved spits are visible here (See Owen, 2008, Fig. 5, therein), built as the mouth of the Mermentau River migrated westward. As the larger spit to the south that forms Grand Chenier was built, these smaller spits were abandoned. Grand Chenier is a composite chenier which is younger westward because of spit growth at the westward-migrating mouth of the Mermentau River.

All of the houses visible here were built to replace ones destroyed by Hurricane Rita. The storm surge a short distance west of here was 14.68 feet (Fig. 2).

Return to CPR 229, via CPR 230.

Cumulative mi (km)	*Description*
88.8 (142.9)	Turn right onto CPR 229, and head south.
89.4 (143.9)	Turn left onto LA 82, and head east.
91.7 (147.6)	Stop 6.

Stop 6. Grand Chenier Shelly Excavation

A brief stop here is made to examine a poorly exposed, very coarse shell deposit at the edge of a water-filled excavation in the western part of Grand Chenier east of the Mermentau River bridge. Large clam shells form most of the deposit.

Although Grand Chenier is one of the higher elevation cheniers near the coast with elevations of ~10 feet, it was inundated by the Rita storm surge of up to 14.68 feet (Fig. 2) in this area. The small family cemeteries that line the higher cheniers were also damaged by the waves of Rita. Some graves were opened and caskets and human remains floated away into the marsh to the north. Many of the houses and other buildings which lined the chenier were destroyed by Rita—some are being rebuilt today.

Continue heading east on LA 82 to Rockefeller State Wildlife Refuge. The Rita storm surge gradually decreased eastward to 8.7 feet (Fig. 2) at Rockefeller State Wildlife Refuge.

Cumulative mi (km)	*Description*
95.0 (152.9)	Rockefeller State Wildlife Refuge. End of Day 1.

Day 2. Rockefeller State Wildlife Refuge, Louisiana to Martin Beach, Louisiana

Cumulative mi (km)	*Description*
0.0 (0.0)	Leave Rockefeller State Wildlife Refuge, turn right onto Louisiana Highway 82 (LA 82), and head west.
36.1 (58.1)	Board ferry at Cameron, Louisiana, and cross over Calcasieu River.
45.1 (72.6)	Stop 1.

Stop 1. Holly Beach

The rather low, sand beach here lacks dunes and has a much lower shell content than typical beach ridges and cheniers in the area. It is located at the former mouth of the Calcasieu River, which flowed through the present Mud Lake (Owen, 2008; Fig. 4 therein). A very gentle offshore slope may also be observed, resulting in relatively low wave energy during normal weather (but, not during tropical cyclones!). Hurricane Rita's storm surge here was 13.82 feet (Fig. 2).

The thriving "Louisiana Riviera" community of Holly Beach existed here before Hurricane Rita destroyed all 580 beach

cabins as well as stores, motels, churches, and every other human structure here, leaving only broken concrete slabs, piling stumps, and electrical transformers. Only the water tower (Fig. 3), one mile inland, remained standing after Rita. The 20 or so cabins and houses that have reappeared during 2007 and 2008 provide strong evidence of the human instinct to defy nature!

Continue on LA 82, heading west.

Cumulative mi (km)	*Description*
51.2 (82.4)	Peveto Beach.

This part of the coast, from here back through Holly Beach to the east, has been undergoing a major erosive reorientation during the last few decades, straightening the former Calcasieu Headland (see Owen, 2008, Fig. 9 therein) and truncating beach ridges from Holly Beach to the beaches near Johnsons Bayou to the west. Along the highway both east and west of here, breakwaters have been built, as well as a pre-Rita revetment to temporarily protect the highway. Sand was added by artificial beach nourishment prior to Rita. Much of the sand remains. New snow fences have been added and incipient dunes are forming.

Cumulative mi (km)	*Description*
52.3 (84.2)	Stop 2.

Stop 2. Constance Beach

A field of breakwaters lies offshore of this beach, which is partially protected by broken concrete blocks, etc., at the back of the narrow beach. Old marsh sediments crop out on the beach, reflecting past and current wave erosion. Much of the modern beach ridge near Johnsons Bayou was derived from erosion of the Calcasieu Headland.

Figure 3. Holly Beach's water tower was the only structure to survive Hurricane Rita.

The small beach-cabin community here was completely destroyed by Hurricane Rita's 14.9 foot storm surge, Rita's highest measured storm surge (Fig. 2), in the early morning of 24 September 2005. The only cabin that partially survived was on pilings higher than the storm surge. Cabins on the usual lower pilings were completely destroyed. The breakwaters and revetments did nothing to help the buildings survive here during Rita (Fig. 4). The storm surge here rose at a maximum rate of 5.8 feet/hour during Rita (McGee et al., 2006).

Continue on LA 82, heading west.

Cumulative mi (km)	*Description*
57.5 (92.5)	Turn left onto Cameron Parish Road (CPR 532), and head south to Martin Beach.
58.3 (93.8)	Stop 3.

Stop 3. Martin Beach

This modern beach and dune field is a good analog for conditions on cheniers when they are forming, even though this ridge probably is a regressive beach ridge rather than a transgressive chenier ridge (see Owen, 2008, p. 7). The two low ridges crossed between the beach and highway are also beach ridges, perhaps formed during prehistoric tropical cyclones. The beach sediment

Figure 4. Hurricane Rita storm surge swept entire buildings off of their foundations at the Constance Beach Community.

Figure 5. This return-flow channel was carved by Hurricane Rita's retreating storm surge waters, destroying Cameron Parish Road 532.

is composed of alternating layers of sand and shell, typical of both beach ridges and cheniers in this area. Either sand or shell may dominate at the time of a visit. The dominant longshore current along the whole Chenier Plain coast is to the west.

Waves and the storm surge of Hurricane Rita severely eroded this beach, flattened dunes that were more than 10 feet high, and cut many return-flow channels across the dune terrace and beach, removing part of the paved road to the beach (Fig. 5). Dramatic aerial photographs and topographic profiles of a beach 5.5 miles west of here, before and after Rita erosion, are illustrated in Stockton et al. (2007, p. 121). A beach cabin on low pilings near the telephone boxes west of the road was removed by the storm, but the two cabins visible to the east, which were on pilings above the storm surge, survived. Storm surge height was not measured here by McGee et al. (2006), but it is estimated at 13 feet. Rita storm surge height decreased west of here near landfall of the eye down to 9.35 feet at Sabine Pass (Fig. 2). Migrating ridges of sand from the inner shoreface are slowly repairing the storm beach erosion.

Return to LA 82, via CPR 532.

Cumulative mi (km)	*Description*
59.1 (95.1)	Turn left onto LA 82, and head west toward the Texas and Louisiana State Line. Most of the highway is built on low cheniers that gradually curve inland toward Sabine Lake (see Owen, 2008, Fig. 4 therein), an estuary. A barge was grounded on the south shoulder of this highway during Rita.
74.3 (119.6)	Sabine River Bridge, Texas and Louisiana State Line. Continue on Texas Highway 82 (TX 82) into Port Arthur, Texas. Supplementary stops on the Bolivar Peninsula of Texas between High Island and Galveston will be made to illustrate the contrast between this strand plain coast and the chenier plain coast.

End of Day 2. End of Field Trip and Trip Log. Two-day total mileage: 169.3 (272.5 km).

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