History of the Mississippi

For over 6000 years the Mississippi River has been delta-switching every 1000 years, causing some areas of land to build while other areas deteriorate. The river has created seven major delta complexes containing over sixteen separate lobes extending from southwest Louisiana to the eastern shoreline of Lake Pontchartrain (See BTNEP Video Clip -shows all seven deltas).
These delta lobes experience phases of aggradation and degradation. The former represents the growth phase, when fluvial input and sedimentation rates are at their maximum. When gradient conditions are favorable, diversions are triggered at some upstream points. This initiates the delta-switching process, abandoning a particular river channel and beginning a phase of degradation within the specific lobe. The introduction of sediments being abandoned slowly decreases as a result of fluvial discharges at another location. The river now changes its course, abandons the old delta lobe and builds a new one. The old lobe will begin to subside as no new sediment is being brought in to compensate for compaction of mud (subsidence).

The Lafourche delta lobe dates back about 2000 years, being built during the fifth shifting of the river. Because of sediment starvation many lobes are being washed away. Losses have been particularly heavy in Terrebonne and Lafourche Parishes. It has been projected by the year 2050 Louisiana will lose a majority of the Deltaic Plain and Chenier Plain (Go to **Animations:** Watch how the wetlands will disappear. Requires Flash).

An integral part of the degradation phase of the deltaic processes is rapid subsidence and coastal erosion. However human influences have affected the silting process more than nature. Levees have been heightened and reinforced to prevent floods. This prevents silts and clays from reaching the interdistributary marshes, thereby stopping the yearly buildup of sediment. Louisiana marsh mud contains up to 70% water by weight. Due to the desiccation of these clays by drainage, shrinkage and subsidence becomes a problem. Adding to this, the withdrawal of fluids such as groundwater and petroleum from the subsurface removes the support of reservoirs, resulting in collapse of these reservoirs and surface subsidence (see the Indicator 2002 Report).

The barrier islands, located from Grand Terre on the east through the Timbalier Islands to the Isles Dernieres on the west, were formed during the destructive phase of delta building and mark the seaward boundary of the old

Lafourche delta lobe. The overall role of the barriers is to cushion the impact of the sea upon marsh deposits. Barrier Islands and tidal inlets in the past have been important regulators both of water exchange between the bays and the gulf and of transfer of wave energy from the gulf to the bays. As barrier islands erode and tidal inlets widen, the impact of the sea upon the bay area and lower marshes increases. The Louisiana barrier shorelines are characterized by erosion and retreat of shoreline as well as high subsidence rates. In the past, retreat rates and erosion were offset by sediment input renewal. Repeated overtopping of the Mississippi River's natural levees in the spring provided sediments necessary to maintain wetlands. Tidal forces provided distribution of these sediments within the marshes.

During the spring floods many distributaries received valuable coarse sediments (sand) and deposited them along the shoreline. Bayou Lafourche was an important conduit for river sediment until the early 1900's, when a log jam was reinforced to totally block the river. Today, the Mississippi River is contained by levees throughout the deltaic plain. Sediments are now no longer being introduced into interdistributary swamps and marshes, but are moved to the steep slopes of the outer continental shelf by way of the passes of the presently active delta at the mouth of the Mississippi River. The exception to this process is the Atchafalaya Bay delta, which is receiving 30% of Mississippi River water flow and is also contributing to mudflat accretion on the Chenier Plain shoreline. The land *accretion* is not offsetting the massive deterioration of land elsewhere along the coastline. This deterioration is amounting to over 25-35 square miles per year of coastal land loss in the deltaic plain.

Two major features of the deltaic plain are natural levees and interdistributary marshes. Natural levees border both ancient and active distributary channels. These high ground levees are a few feet above the surrounding sediments and contain sand and silt that is coarser than the surrounding sediments. Levees are formed during flood states when the river overflows, depositing the coarsest part of its load next to the channel.

Between the distributary channels and levees, the land is formed from the very fine silts and clays remaining in suspension after the coarser fractions have been deposited. As the river deposits these sediments, a considerable amount of water is trapped between the sediment particles. As time passes, and more sediment is deposited, the water is gradually squeezed out of the underlying sediment, resulting in a gradual settling of the land. The process of land settling by squeezing water out is called *subsidence*. This low-lying land is subject to flooding, and forms marshes between the distributaries, which are called interdistributary marshes. Various semi aquatic plants, including several species of the familiar marsh grass, cordgrass or Spartina, colonize these marshes. Spartina grass, unlike many plants, can tolerate salt water, colonizing both salt water and brackish water marshes (See CD Knee-Deep in Louisiana Wetlands). The common salt water marsh grass *Spartina alterniflora* has special salt glands in the leaves that excrete excess salt, and during periods of low rainfall, salt crystals actually form on the grass blades. This ability permits *Spartina* to grow in vast monospecific stands where no other higher plants can grow, forming the vast expanses of salt marsh. *Spartina* cannot, however, grow under water, and is restricted to growing on land that is at least exposed (out of water) at low tide. If marsh grass is transplanted to areas that are flooded all the time is will die.

Freshwater marshes are colonized by a greater variety of semi aquatic plants, such as the common cattail *Typha*, in addition to grasses. Freshwater marsh plants can tolerate being constantly submerged. They have a salinity range of 0-2 ppt. Death will occur if exposed to high salinity areas.

Freshwater marshes are formed much further inland than salt marshes. Because of this, these marshes contain much less silt and clay sediment, and more organic matter from decaying vegetation. Salt marshes also contain organic matter from dead grass blades. Marsh grasses, like most grasses, die back each winter, and produce new shoots and blades each spring. Marshes can balance subsidence with accretion by trapping sediment and organic matter. If sediment input is curtailed, as it had been by high human levees along the Mississippi, then new sediment cannot reach the marshes and build them up. Subsidence continues to occur, and gradually the soft land that supports the marshes sinks below the low tide level and remains submerged all the time (BTNEP Video Clip). The dominant salt marsh and brackish marsh grass, Spartina, dies because of the continuous submergence, and eventually the marsh turns into shallow open water.

Another consequence of this sinking of vast stretches of former salt and brackish marshland is that salt water, like any water, "seeks its own level," in this case sea level, and flows farther and farther inland. This flow eventually reaches far enough inland to flood the freshwater marshes, killing the freshwater marsh plants that are not salt tolerant (eg. Cypress trees-low salt tolerant).

There are several ways in which human structures hasten the demise of the marshes. Canals, which cut through the protective salt and brackish marshes, can bring salt water directly into freshwater marshes and swamps, which then die because they are not salt tolerant. Dead-end canals in salt and brackish areas kill large areas of marsh (see BTNEP Video Clip). The spoil banks, the long piles of clay and silt made when the canals are dug, may reach heights of three to four feet above the marsh surface, and interfere with the normal flooding and draining of water that occurs with each tide. Water is trapped behind these long piles, which act like man-made levees, causing the marsh to remain submerged and waterlogged. This is a killing stress for the marsh grass *Spartina* that cannot tolerate constant submergence. Large areas die and become open water ponds behind the spoil banks of dead-end oil canals in salt and brackish marshes.

Locally, Lafourche and Terrebonne parishes are on the surface of the abandoned Lafourche subdelta that was active between approximately 1700 and 700 years ago (early and late Lafourche deltas). The Mississippi flowed down what is now Bayou Lafourche as far as Thibodaux where it broke up into several distributaries. During the active early Lafourche stage, the major distributaries flowed south along Bayous Terrebonne, Blue, and Little Black. They branched again in the vicinity of Houma forming a dense network of distributaries. A true delta-shaped landmass formed an arc that extended approximately one mile seaward of the Isles Dernieres. Lower Bayou Lafourche was nonexistent at this time. The early Lafourche distributaries were then abandoned, and this part of the subdelta began to undergo the destructional phase.

The subdelta then entered the late Lafourche stage when lower Bayou Lafourche became the chief distributary. This diversion was not a sudden event and may have taken up to 100 years to complete. The river broke into a series of distributaries first at Lockport then at Larose, forming small lobes to the east of the present bayou. Eventually, Bayou Moreau became the principal distributary and the delta progressed well beyond the destructional barrier shoreline of the early phase.

About 700 years ago, the Mississippi River abandoned the Lafourche delta. Subsidence and coastal erosion have removed surfaced expressions of the seaward portions of the distributaries allowing Timbalier and Terrebonne Bays to form. These bays have enlarged rapidly as marshland deteriorates. Bayou

Lafourche carried some Mississippi River water until 1906 when it was dammed off from the Mississippi at its head at Donaldsonville. As a result, the Lafourche delta has been deprived of fresh water. Rapid deterioration has occurred with distributary levees being reduced in height, width, and length and marshes have become ponds, lakes, and bays.

Saline waters and marshes migrated inland into brackish and freshwater environments. Old deltaic sediments are presently being reworked which now form the beaches at Fourchon and Grand Isle. Due to coastal erosion, subsidence, lack of new sediment, and other contributing factors, theses beaches are slowly disappearing.

Ask an elder in your family about the view from the Leeville Bridge then and now. See the activity, "When you were my age …"