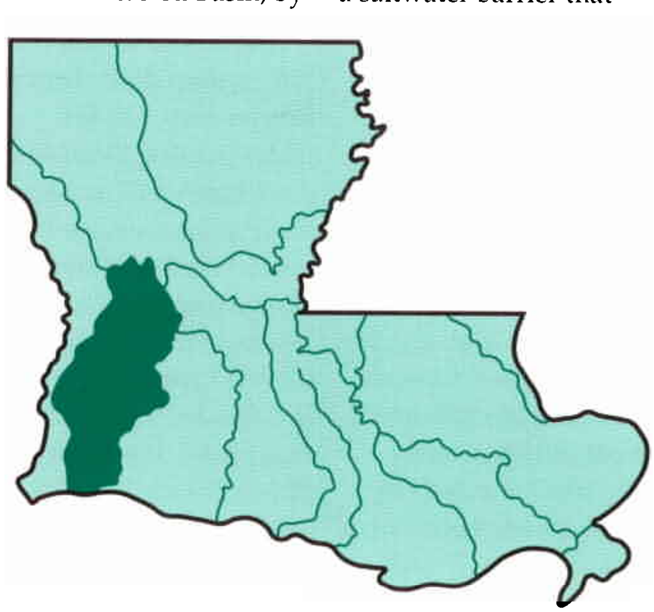
LOUISIANA'S ESTUARIES: THE CALCASIEU RIVER BASIN

Dr. Mike Waldon

The Basin System

The Calcasieu estuary has its headwaters in the hills west of Alexandria, about 160 miles from the Gulf of Mexico. Tributary creeks join the Calcasieu River to form a drainage basin of 3,772 square miles. The Sabine River basin, by comparison, is over five times larger, draining an area of over 20,000 square miles.

Overall land use in the Calcasieu Basin is one half forest land and about one quarter agriculture, with wetlands, open water, and urban areas accounting for the rest. Over eighty percent of this land lies in the Upper Calcasieu Basin, covering roughly 3,100 square miles of mostly forest and timber land. The land in the lower Calcasieu Basin, by contrast, is dominated by wetlands and lakes.



We can conveniently divide the Calcasieu basin into upper and lower sections because of a saltwater barrier that was installed just upstream from Lake Charles. Salinity in the lower Calcasieu has been increasing since the digging of the Calcasieu Ship Channel at the bottom of Calcasieu Lake. Freshwater discharge from rain and the Calcasieu River helps balance saltwater inflow from the Gulf. The freshwater inflow averages about 4700 cubic feet per second (cfs), but varies with the season by as much as 1000 cfs. Freshwater flow is highest from December through February and lowest from July through October. The U.S. Geological

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Survey monitors the flow of the upper Calcasieu at Kinder, upstream of the saltwater barrier.

Along with the Ship Channel, which runs from the city of Lake Charles to the Gulf, the dominant feature of the lower Calcasieu is a series of large, shallow lakes - Lake Charles, Prien Lake, Moss Lake, and Calcasieu Lake. The largest of these, Lake Charles, has an average depth of 4.9 feet. The tide range at the mouth of the Calcasieu is about 2 feet, and tides are small butdetectable above the saltwater barrier. Wind rather than tides really changes water levels in the estuary, and tide levels at the city of Lake Charles can fall several feet below sea level during sustained north winds.

Changing the Hydrology

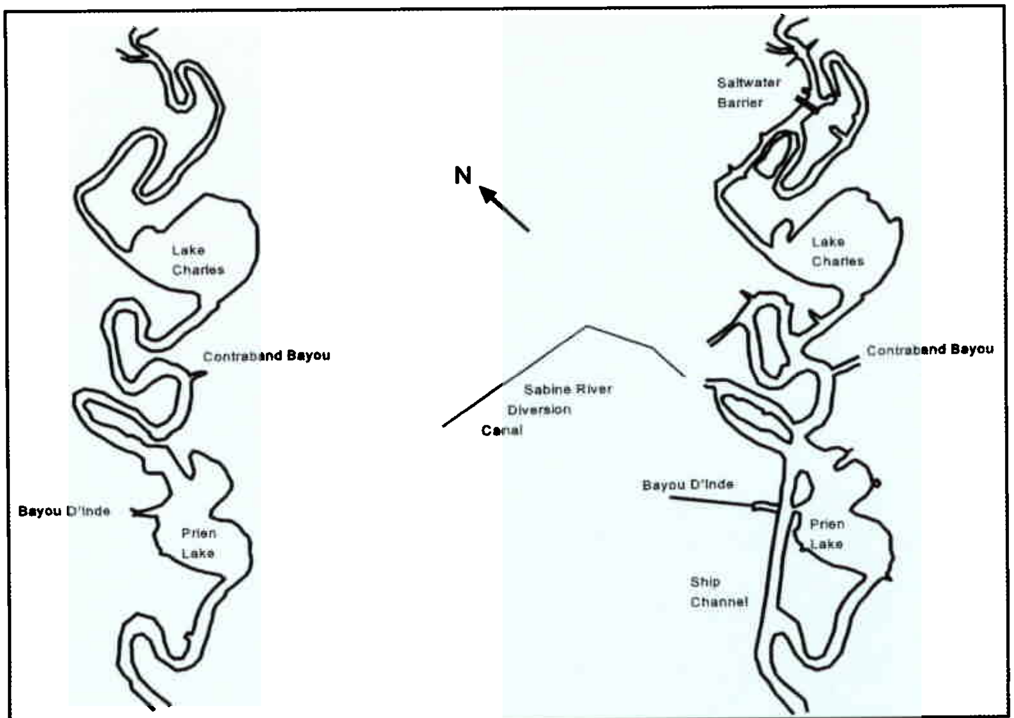
The Calcasieu Ship Channel is just one of a long series of changes to the lower basin's hydrology that were done to improve access and navigation. Originally, the natural channel through the Lake had a maximum depth of 13 feet, and a sand bar 3 feet deep lay across the northern end of Calcasieu Pass, separating the Lake and the Gulf. The US Army Corps of Engineers dug a navigation channel through the bar in 1871. The channel had deepened from five to thirteen feet deep by the late 1930's.

Between 1937 and 1940, a deep draft channel (30 feet deep, 125 feet wide) was dug between the Sabine and Calcasieu River along the route of the Intracoastal Waterway. The present-day Gulf Intracoastal Waterway (GIWW) passes just north of Calcasieu Lake, and is maintained at a depth of 12 feet. A lock 2.5 miles east of the Ship Channel reduces saltwater flow to the Mermentau Basin.

The Calcasieu River Ship Channel was begun in 1941 with a depth of 30 feet, and a width of 250 feet, and was enlarged in 1968 to a depth of 40 feet and a width of 400 feet.

With the shallow bar at Calcasieu Pass long gone, saltwater can now move deep into the basin. A highly saline saltwater "wedge" flows up the channel trench beneath fresher water flowing down from the north. The increase in estuary salinity caused by the Ship Channel trench led to construction of the saltwater barrier at Lake Charles to protect fresh-water swamps and water habitats of the Upper Calcasieu.

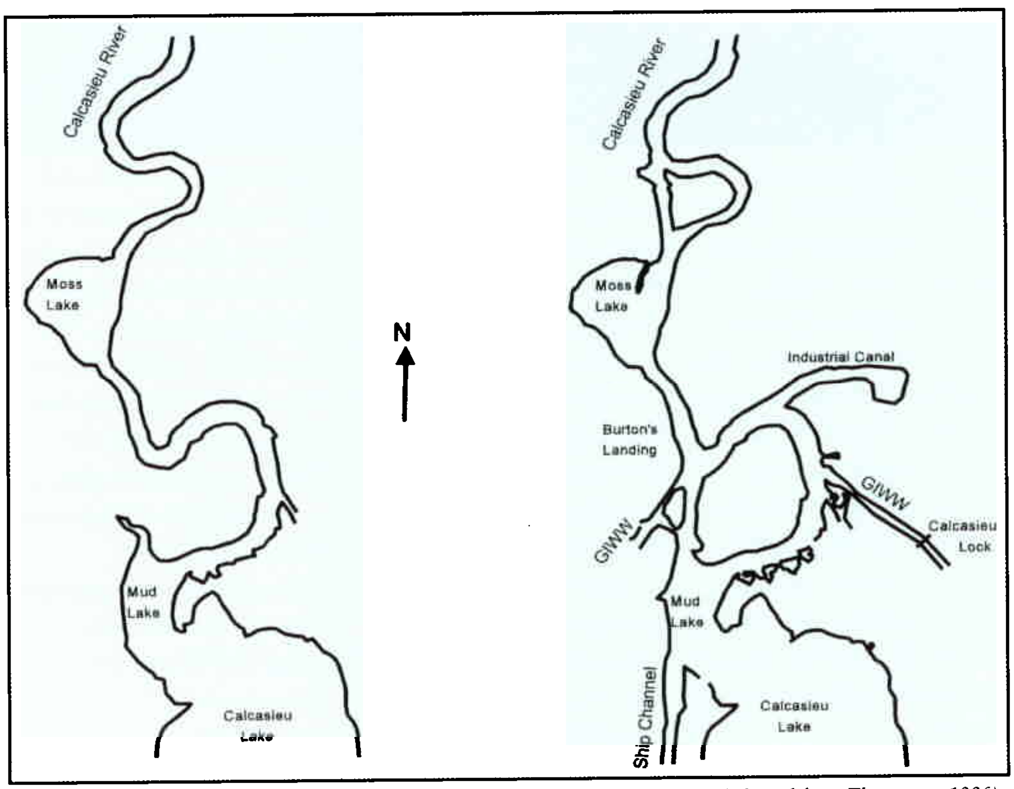
The GIWW and a checkerboard of smaller canals have increased the water flow between the Calcasieu and Sabine estuaries, and marshes between the two have become a large interlinked system with water draining and circulating throughout. This circulation, along with the Channel and saltwater wedge, allows higher salinity water into interior marshes, stressing plant communities and leading to increased erosion and loss of sediment.



Hydrologic modifications in the northern portion of the Lower Calcasieu Estuary (adapted form Thompson, 1986).

Other Problems in the Calcasieu Basin

The Lower Calcasieu Basin receives discharges from numerous municipal and industrial point sources. Most of the dischargers are located in the area between the saltwater barrier and the Intracoastal Waterway. Municipal dischargers include the cities of Lake Charles and Sulphur, and the town of Westlake. A few dischargers are located south of the Intracoastal Waterway.



Hydrologic modifications in the southern portion of the Lower Calcasieu Estuary (adapted form Thompson, 1986).

Several segments of the Calcasieu Basin have been listed by the La. Dept. of Environmental Quality (LDEQ) for failing to meet water quality standards under the Clean Water Act, including Bayou Verdine, Bayou D'Inde, the Calcasieu River and Ship Channel, and Prien Lake.

Portions of the Calcasieu River, Lake Charles, and Prien Lake have been found to contain priority organic pollutants. These are typically produced by the organic chemical industry and used in plastic production and other manufacturing. Subsegments of the Calcasieu River, Calcasieu Lake, and Prien Lake are

The Ellender Bridge on LA Highway 27 south of Lake Charles.
Land loss in the coastal marshes of the Calcasieu Basin is clearly evident. Photo © Dr. Bill Good.

under "informational fishing advisories" by the state Dept. of Health and Hospitals and LDEQ, confirming that priority organic contamination has been found. Consumption of seafood from these areas, as well as swimming, wading, and water sports in Bayou D'Inde are all advised against. This pollution is listed as industrial point source, or as discharge from the end of a pipe.

Coastal Restoration in the Calcasieu

The coastal wetlands of the Calcasieu-Sabine basin cover about 579 square miles (312,500 acres), consisting mostly of brack-ish and intermediate marsh. 226 square miles (122,000 acres), or about one quarter of the original marsh, have been lost since 1932. Strateg-ies for coastal restoration in the basin include controlling salinity, restoring and managing hydrology, protecting shorelines, maintaining freshwater inflow during the dry season, and beneficially using dredged materials. Any dredge material will have to be carefully tested for contaminants.

While some individual and corporate landowners have taken steps to protect their property, the hope for large scale restoration lies with the government. A number of projects have been carried out under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), and more are planned. (See Table 1 on oposite page).

A number of Regional Strategies for the Calcasieu Basin have also been identified in the Coast 2050 Plan. These strategies will focus on restoring hydrology, controlling salinity, and re-establishing and maintaining the integrity of natural landforms now at risk.

There are many challenges in the Calcasieu Basin. The challenges are serious and will require every level of government, along with the private sector, to work together. Resolving these challenges will ultimately depend on the public, which continues to value the estuary for recreation, fishing, and all that it adds to their lives. While navigation and industry have contributed much to the region, the estuary is a resource we can't afford to lose.

ABOUT THE AUTHOR
Dr. Mike Waldon is an Associate Professor of Civil Engineering at USL. His research involves hydrology and water quality issues in Louisiana.

The Damage Assessment Center of the National Oceanic and Atmospheric Administration (NOAA) prepared a Contamination Extent Report and Preliminary Injury Evaluation for the Calcasieu Estuary in 1997. The report assessed the extent of chemical contamination within the surface water, sediment, and fish and shellfish of the estuary. It also inventoried the manufacturing processes, waste water treatment systems, and waste management practices of nine major industrial facilities within the estuary, and identified contaminants that can injure the natural resources of the Calcasieu system.

For a copy of the report, call NOAA at 813-570-5391.

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Table 1. CWPPRA Restoration Sites for Calcasieu and Sabine Basins

PROJECT	PARISH	ACRES RESORED	CONSTRUCTION STARTED	CONSTRUCTION END
Black Bayou Hydrologic Restoration	Cameron	3594	January 1, 1999	July 31, 1999
Brown Lake	Cameron	282	July 15, 1998	May 1, 1999
Cameron-Creole Maintenance	Cameron	2602	September 30, 1997	July 31, 1998
Cameron-Creole Watershed Hydrologic Restoration	Cameron	600	October 1, 1996	January 28, 1997
Clear Marais Bank Protection	Calcasieu	1067	August 29, 1996	March 3, 1997
Compost Depot	Cameron	7		
Highway 384	Cameron	150	August 30, 1998	February 28, 1999
Mud Lake	Cameron	1520	October 1, 1995	June 15, 1996
Perry Ridge Bank Protection	Calcasieu	1203	June 15, 1998	January 15, 1999
Plowed Terraces Demo	Cameron	90	August 1, 1998	January 30, 1999
Sabine Refuge Marsh Creation	Cameron	238		
Sabine Refuge Structures (Hog Island)	Cameron	953	October 1, 1998	July 1, 1999
Sabine Wildlife Refuge Erosion Protection	Cameron	5542	October 24, 1994	March 1, 1995
Sweet Lake/ Willow Lake, Ph 1	Cameron	247	June 1, 1998	June 1, 1999
Vegetative Plantings – West Hackberry	Cameron	98	April 15, 1993	March 30, 1994
Vegetative Plantings – Dewitt-Rollover	Vermilion	312	July 11, 1994	August 26, 1994
CWPPRA Projects in These Basins		18505	ACRES BENEFITED	

The source for this table is the CWPPRA web site. Address is www.lacoast.gov