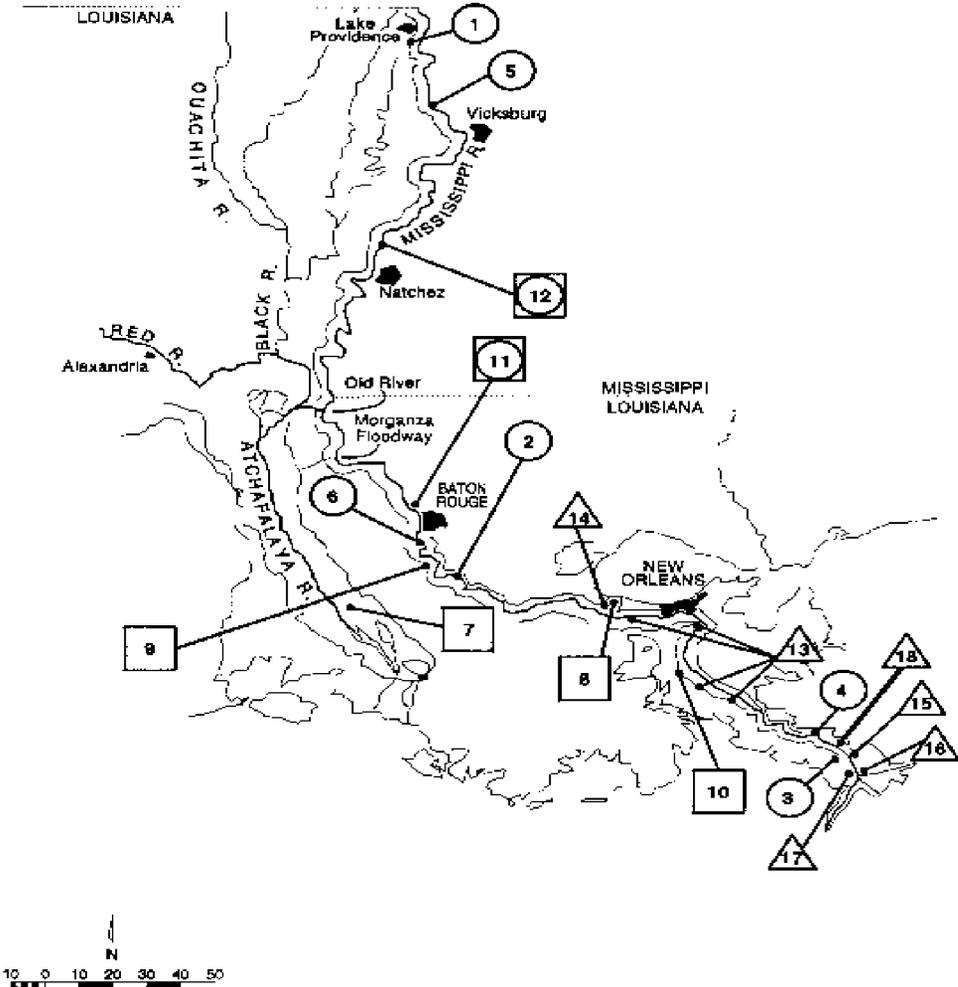
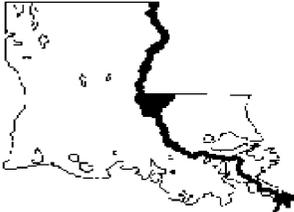


# Mississippi River Basin



## Projects

---



### Navigation

- 1 Atchafalaya River, and Bayous Chene, Boeuf, and Black
- 2 Atchafalaya Bay and Bar Channel
- 3 Lower Atchafalaya River



### Flood Control

#### Old River

- 4 Old River Control Low Sill Structure
- 5 Old River Control Overbank Structure
- 6 Old River Lock
- 7 Old River Control Auxiliary Structure
- 8 Sidney A. Murray Hydroelectric Plant
- 9 Lower Red River
- 10 Eastern Rapides and South Central Avoyelles Parishes
- 11 Atchafalaya Basin Bank Stabilization

#### Morganza Floodway

- 12 Morganza Control Structure
- 13 Lower Limit of Morganza Floodway
- 14 Pointe Coupee Drainage Structure
- 15 Pointe Coupee Pumping Station

#### East Atchafalaya Basin Protection Levee, Landside Drainage Improvements

- 16 Bayou Boeuf - Bayou Long Drainage Canal & Enlargement of Bayou Chene
- 17 Lottie to Bayou Maringouin Borrow Pit Enlargement

#### West Atchafalaya Basin Protection Levee, Landside Drainage Improvements

- 18 Bayou Beraud Drainage Canal
- 19 Bayou Courtableau Diversion Channels and Control Structure
- 20 Courtableau Drainage Structure and Channels
- 21 Bayou Darbonne Drainage Structure
- 22 Bayou Des Glaives Culvert
- 23 Bayou Des Glaives Diversion Channel, State Canal, and Bayou Roseau
- 24 Channel Improvement - Cypremort to Dauterive
- 25 Borrow Pit Enlargement between Hamburg and Courtableau
- 26 Charenton Drainage Canal
- 27 Bayou Cocodrie and Tributaries
- 28 Morgan City and Vicinity Hurricane Protection

#### Atchafalaya Basin Floodway

- 29 Atchafalaya Basin Levees
- 30 Atchafalaya River Improvement Dredging
- 31 Atchafalaya River
- 32 Bayou Boeuf Lock
- 33 Bayou Sorrel Lock
- 34 Berwick Lock
- 35 Charenton Floodgate
- 36 East-West Calumet Floodgates
- 37 Wax Lake Outlet
- 38 Atchafalaya Basin Main Channel Improvement Dredging



### Environmental Restoration

#### Atchafalaya Basin Floodway

- 39 East Access Channel
- 40 East Freshwater Distribution Channel
- 41 West Access Channel
- 42 West Freshwater Distribution Channel
- 43 Bayou Courtableau Freshwater Diversion Structure and Channel
- 44 Sherburne Freshwater Diversion Structure and Channel
- 45 Avoca Island Marsh Creation

# Mississippi River Basin

## Introduction

The Mississippi River has made remarkable contributions to the physical and economic growth of the nation. When confined within banks this great river is a valuable asset. Uncontrolled, it would be a devastating liability. The Mississippi River and its tributaries drain an area of 1.25 million square miles in 31 states and two Canadian provinces. This area represents about 41 percent of the total land area of the contiguous United States.

The only outlets for the vast amount of water collected from the fourth largest drainage basin in the world are through the Lower Mississippi River, formed by the junction of the Ohio and Upper Mississippi Rivers at Cairo, Illinois, and through the Red-

Atchafalaya rivers. The problem, then, is to make best use of and protect against the water that drains through the Mississippi River Basin.

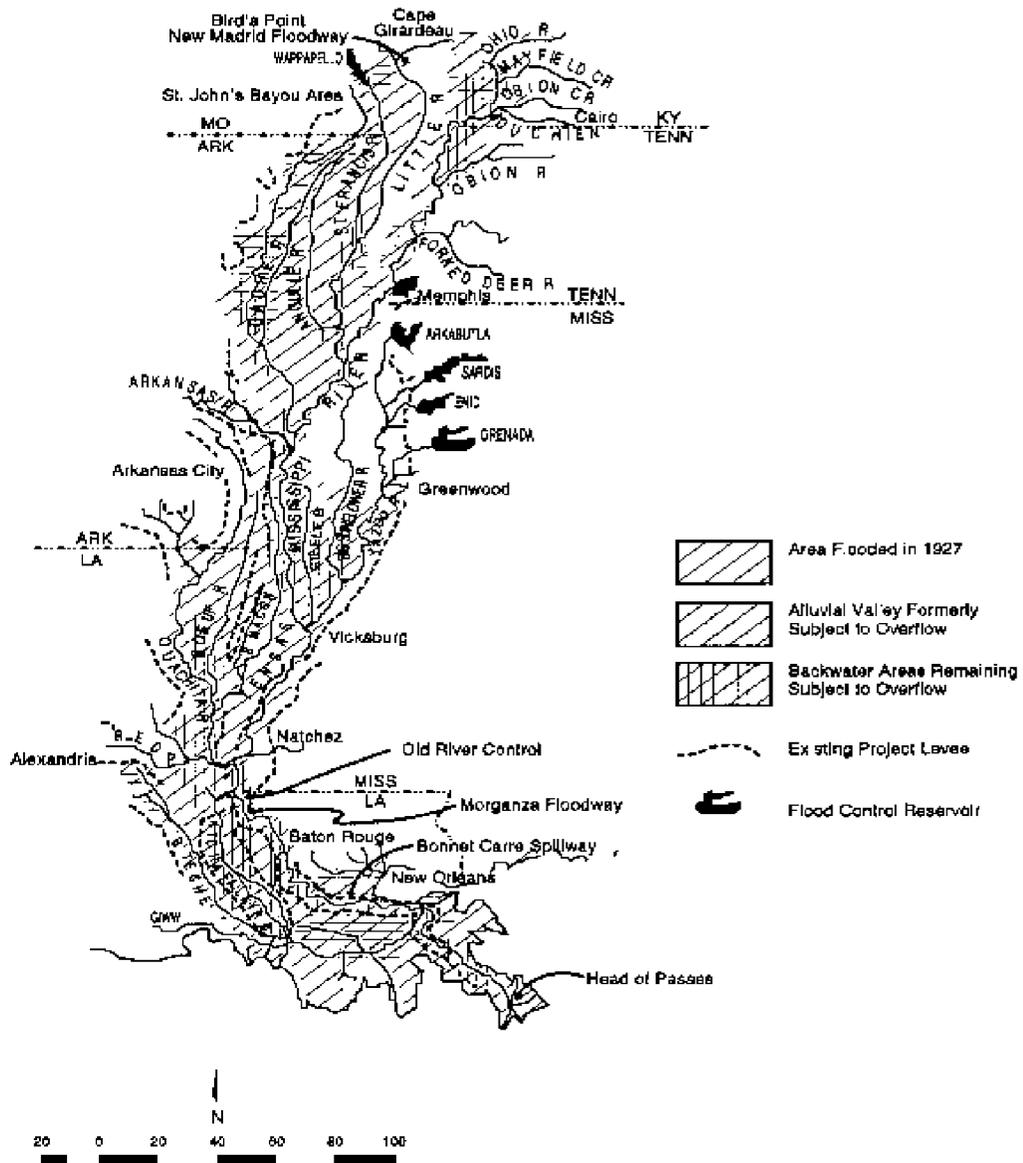
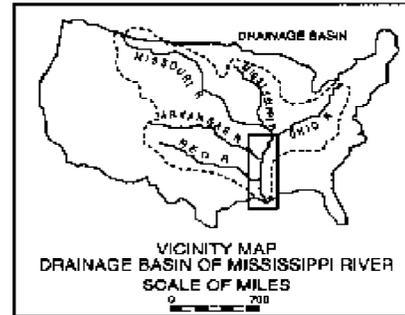
Prior to authorization of the existing project, the largest flood of record on the Mississippi River occurred in 1927. Major floods occurring since then include those of 1929, 1932, 1935, 1937, 1945, 1950, 1973, 1975, 1979, 1983, 1984, and 1997.

Without artificial protection works, about 35,000 square miles in the alluvial valley would be flooded by the occurrence of the project flood, which is somewhat larger than the largest flood of record and is used as a model in designing protective works.



# Mississippi River

## Alluvial Valley of the Mississippi River



# Mississippi River and Tributaries

Since 1804, the U.S. Army Corps of Engineers has played a constantly increasing role in adapting the alluvial valley to the requirements of people. The Corps has been charged with opening the streams to commerce, protecting farmlands and cities from flood, and cleaning up the ruin after storms.

Except for backwater areas and floodways, the alluvial valley is a highly developed agricultural and industrial region. The agricultural development is widely dispersed. The major industrial developments are measured in billions of dollars and are concentrated near the urban centers, particularly along the river below Baton Rouge.

After the disastrous flood of 1927, Congress authorized a comprehensive plan for flood control in the Mississippi River Alluvial Valley by passage of the Flood Control Act of May 1928. This act has been modified many times, the latest modification being by the Water Resources Development Act of 1986.

The Mississippi River and Tributaries (MR&T) project provides for flood protection of the alluvial valley of the Mississippi River between the Head of Passes, Louisiana and Cape Girardeau, Missouri. Because of the wide expanse covered by the project and the complex problems involved, no single improvement could afford protection against all floods.

The existing project contains a combination of features, such as levees along the main stem of the river and its tributaries in the alluvial plain to confine the floodflow; reservoirs on the tributary streams to hold back peak flows; floodways to receive excess flow from the river; and channel improvement such as revetments, dikes, and dredging to increase channel capacity. There are also other features which include control structures, cutoffs, pumping plants, floodwalls, floodgates, and freshwater diversion structures.

Since 1927, floods from the Mississippi River in Louisiana have been confined within levees, without overtopping. However, high stages in the unprotected backwater areas continue to cause considerable damage.

In addition to the flood control features, the MR&T Project also provides for construction and maintenance of a navigable channel from Baton Rouge to Cairo. The Lower Mississippi, the main stem of about 10,000 miles of natural and artificial waterways with navigable depths of 6 feet or more, is of vital importance to the Nation's transportation system.

The Mississippi River Commission, under the direction of the Secretary of the Army and supervision of the Chief of Engineers, is responsible for accomplishment of work on this project. The commission was created by Congress in 1879. The total authorized cost of the project, including all modifications, is over \$11.6 billion of which about \$9.6 billion has been spent to date. Recent cost of annual maintenance is \$133 million. Accumulated benefits of the existing project from its inauguration in 1928 to date amount to \$351.2 billion. New Orleans District Fiscal Year 1994 (FY 94) expenditures amounted to \$43,500,000.

The MR&T project is extensive in scope and involves a number of tributary basins. The features of the MR&T project located within the Louisiana portion of the Mississippi River Basin are discussed within this section.

## **Levees-Main Line**

### **(Mississippi River Commission)**

The levees within the lower Mississippi River Valley are considered as one project. Obviously, levees that protect any one area also influence the degree of protection afforded to downstream areas. The MR&T Levee System consists of 2,204 miles of levee, of which 1,838 have been completed to design grade and section. In New Orleans District, 961 miles are authorized and 847 miles are completed.



Mississippi River Levee above Nine Mile Point

There are 1,610 miles of levee and floodwalls now authorized along the Mississippi River main stem below Cape Girardeau, Missouri. In New Orleans District, 512 miles are authorized and 480 miles are completed.

Additional levees and structures included in the main stem levee system are those along the south bank of the Arkansas River (85 miles); along the south bank of the Red River (59 miles); and 449 miles in the Atchafalaya River Basin. Graveled or hard-surfaced roads have been constructed on 2,095 miles of the levee system and 544 miles of berms are completed.

In the New Orleans District, about 308 miles of levee are protected against river wave wash by levee-slope pavement. Foreshore protection works extend along 140 miles of levee. Additional work in progress includes enlargement of levee sections, construction of riverside and landside berms, construction of wave-wash protection, provision of seepage control measures, and construction of concrete floodwalls in highly urbanized areas.

The levee line begins just south of Cape Girardeau, Missouri, and extends unbroken to Venice, Louisiana, near the Gulf of Mexico, except for gaps where tributaries join the Mississippi, and openings for navigation locks, floodways, hydropower, freshwater diversion, and control of the Atchafalaya

River. The longest continuous levee line in the MR&T project, and probably in the world, begins at the high ground near Pine Bluff, Arkansas, follows the south bank of the Arkansas River to its mouth, and continues down the Mississippi River to its terminus in the vicinity of Venice, a distance of more than 650 miles.

During the 1973 flood it became evident that portions of the levee system between the Arkansas-Louisiana state line and Donaldsonville, Louisiana, were inadequate based on a new project flow line developed from data generated by the flood. Work was initiated in fiscal year 1974 to bring the levees up to the revised standards.

The east bank is protected by levees alternating with high bluffs except for back water areas.

Continuations of the main-line levees extend up the north bank of the Ohio River to high ground near Mound City, Illinois; the north bank of White River to Old Town lake, Arkansas; and the south bank of Arkansas River to Pine Bluff.

Levees authorized under provisions of Section 6, 1928 Act include 129.4 miles of levee along the banks of the Mississippi River between Cape Girardeau, Missouri, and Rock Island, Illinois, and 306.2 miles along tributaries within the limits of the Mississippi River backwater. These include 20.7 miles along the Red River and 68.5 miles on the east bank of the Ouachita River.

The main-line Mississippi River levee system in Louisiana is 710 miles in length.

## **Channel Improvement**

(Mississippi River Commission)

Channel improvement in the interest of both navigation and flood control in the lower alluvial valley below Cairo, Illinois, is an integral part of the Mississippi River project. The project, authorized by the Flood Control Act of May 1928 and subsequent amendments, provides for stabilization of the channel by means of revetment, dikes and dredging.



Vicksburg mat laying plant at Smoke Bend (mile 177)

***Revetment and Foreshore Protection.*** Bank stabilization is important for flood control and navigation, and the protection of existing industrial facilities located along the river below Cairo. On the Mississippi River it is flexible in scope and application.

The best means of protecting banks for erosion and caving is revetment, an articulated concrete mattress underwater and riprap above the waterline. Operative revetment in place between Cairo and Head of Passes covers over 973 miles of bank of which 438 miles are in Louisiana. The construction of 160 miles of foreshore protection is also authorized under this project, of which 140 miles have been completed in New Orleans District.

***Dikes and Dredging.*** In the 725-mile reach of the Mississippi River between Cairo, Illinois, and Baton Rouge, Louisiana, a low-water navigation channel 9 feet deep and 300 feet wide is maintained by dredging and training works.

This work includes channel contraction by dikes, realignment by dredging, and closure of secondary channels, as required. In September 1992, there were 301 miles of operative dikes on the Mississippi River between Cairo and Baton Rouge, of which 3 miles were in New Orleans District.

In carrying out an authorized channel

improvement program between Cairo and Baton Rouge, 16 cutoffs were developed between 1933 and 1942. These, combined with chute channel development and alignment improvements, decreased channel length between these cities by about 170 miles. However, current velocities increased the attack on the banks, and the river began to regain its length. As a result, the net shortening between 1933 and 1962 was 114 miles of the theoretical 170-mile cutoff.

### **Off-Main-Stem Flood Control (Mississippi River Commission)**

Supplementary improvements for local protection have been built in those portions of the lower alluvial valley located in the basins of St. Francis and Little Rivers in Missouri and Arkansas; at Cairo, Illinois, and vicinity; along east bank tributaries in western Kentucky and Tennessee; in the lower White and Arkansas River basins in Arkansas; in the Tensas River Basin in Arkansas and Louisiana; in the Atchafalaya Basin in Louisiana; and in the Yazoo Basin in Mississippi.

### **Floodways and Outlets (Mississippi River Commission)**

Three major supplementary flood outlets are designed to pass one-half of the project flood flows from the Mississippi River channel to the Gulf of Mexico.



Bonnet Carré Spillway opening in March 17, 1997

The Bonnet Carré Spillway, located on the east bank about 33 river miles above Canal Street in New Orleans, is capable of passing a flow of 250,000 cubic feet per second into Lake Pontchartrain and thence into the Gulf. The Morganza Floodway, located on the west bank about 50 river miles above Baton Rouge, is capable of passing a flow of 600,000 cubic feet per second into the Atchafalaya Floodway and thence into the Gulf. The Old River project, located about 80 river miles above Baton Rouge, is capable of passing a flow of 620,000 cubic feet per second into the Atchafalaya Floodway and thence into the Gulf (see Project Design Flood diagram on page 173).

**Bonnet Carré Spillway.** Residents in the area consider Bonnet Carré Spillway in St. Charles Parish a pleasant place to picnic, camp, and crawfish. But the purpose for which it was built is of far greater importance. The spillway is an integral part of the comprehensive plan for flood control in the Mississippi Valley. It serves to ensure the safety of New Orleans and the downstream delta area during major floods on the Lower Mississippi.

The project, which was completed in 1936 at a cost of \$14,212,200, is designed to introduce floodwaters from the Mississippi to Lake Pontchartrain to prevent overtopping of levees at and below New Orleans.

Situated between the Mississippi River and Lake Pontchartrain some 33 river miles above New Orleans, the project consists of a reinforced concrete control structure located in the riverbank and guide levees extending about 5.7 miles from the river to the lake. These levees, averaging about 19 feet in height, form a floodway flaring from 7,700 feet in width at the river end to about 12,400 feet 3.5 miles from the river, beyond which point the width is constant to the lake.

The structure consists of 350 individual bays for controlling the flow. Each bay is 20 feet wide and is equipped with movable timber needles, 8 by 11-1/2 inches in cross section. In 174 bays the weir crest is at elevation 15.35 feet National Geodetic Vertical Datum (NGVD)\*; in the remaining bays, it is 2 feet higher. The timber needles are set in place and removed by two operating cranes which ride on a service bridge crossing the control structure.

\* Unless noted otherwise, all elevations are referenced to NGVD, formerly, mean sea level.

The spillway and floodway have a design capacity of 250,000 cubic feet per second and are operated to prohibit the discharge and stage at Carrollton (located near river mile 104) from exceeding safe levels.



Bonnet Carré Spillway closing on April 18, 1997

The spillway is crossed by the Yazoo and Mississippi Valley Railroad, the Kansas City Southern Railway, and the Illinois Central Railroad, all roadbeds of which are on timber trestles. U.S. Highway 61 (Airline Highway) and Interstate Highway 10 cross the spillway on reinforced concrete bridges.

Revenue is realized through the lease of project lands and mineral rights. Material deposited during operation of the spillway provides a convenient source of high-grade fill material which has been used extensively in highway and heavy construction projects in the surrounding area. This use has served to preserve the flow capacity of the spillway.

Approximately 250,000 visitors annually enjoy the outdoor recreational opportunities offered by the spillway. Permits have been granted to the St. Charles Parish Police Jury to operate a recreation area, a boat launch, and park on spillway lands.

The spillway was completed in 1936 and has served its intended function on eight occasions--in 1937, 1945, 1950, 1973, 1975, 1979, 1983, and 1997.

## **Mississippi River, Cairo, Illinois, to Baton Rouge, Louisiana.**

(Mississippi River Commission)

In 1896, Congress authorized a channel 9 feet deep and 250 feet wide at low water between Cairo, Illinois, and the Head of Passes, Louisiana. In 1928, this authorization was extended under the newly enacted "Flood Control, Mississippi River and Tributaries" project to include an increased channel width of 300 feet. In 1944, the authorized channel depth from Cairo to Baton Rouge was increased to 12 feet at low water, with the authorized width remaining at 300 feet.

Presently, in this 725-mile reach, a low-water navigation channel 9 feet deep and 300 feet wide is maintained by dredging and training works. The low-water depth will be increased as the Mississippi River channel is stabilized and contracted.

Closure of secondary channels (Mississippi River Channel Improvement) will result in increased efficiency of the main channel, with attendant lowering of navigation maintenance cost between Cairo and Baton Rouge. Maintenance performed during the low-water season now involves dredging through 20 to 35 crossings (shallow areas created as the river swings out of one bend and into another), out of a total of about 200. Dredging required to maintain the 9 foot-deep channel through these river crossings ranges from about 20 to 30 million cubic yards annually.

Aids to navigation on the Lower Mississippi River include fixed shore lights and markers and buoys marking the navigation channel. The total traffic between Minneapolis, Minnesota, and the Gulf of Mexico in 1995 was 520,287,000 tons, as compared with an average annual traffic of 490,994,000 tons in this reach during the 5-year period, 1991-1995.

## **Baton Rouge Harbor-Devil's Swamp**

In the northern portion of East Baton Rouge Parish, on the left descending bank of the Mississippi River, a barge channel 5 miles long, 12 feet deep, and 300 feet wide was authorized by the Rivers and Harbors Act of July 1946. This project was later incorporated into the MR&T project by the Flood Control Act of June 1948. The purpose of the channel was to provide an industrial expansion area for the Port of Baton Rouge.

The sum of \$649,000 was voluntarily contributed by the Greater Baton Rouge Port Commission toward construction of the first 2.5 miles of the channel. This offer of participation above and beyond requirements of the authorizing act was made in the interest of speeding the appropriation of Federal funds for construction and indicated a sense of urgent need for the project by local interests.

The initial 2.5-mile channel was completed in 1959 at a cost of \$699,200. The remaining 2.5 miles was deauthorized in 1979.

The Rivers and Harbors Act of October 1962

authorized the construction of additional dikes and retaining structures to raise the dredged material bank of the first 2.5 miles above Mississippi River stages at a Federal cost of \$299,500, provided local interests contributed \$100,500 toward the cost of the work.

### **Mississippi Delta Region**

The objective of this project, which authorizes four salinity control or freshwater diversion structures, is to reduce saltwater intrusion which will decrease future wetland loss and increase wetlands productivity by establishing an ecological regimen favorable to the production of oysters, shrimp, fish, fur-bearing animals, and migratory waterfowl. Authorized by the Flood Control Act of 1965, the Water Resources Development Act of 1974 and of 1986, the project consists of four gated salinity control structures on the banks of the Mississippi River, with connecting levees and a channel that will introduce fresh water from the Mississippi River to the bays and wetlands of the Mississippi Delta. Salinity control structures are authorized on the east bank of the river at Bohemia and Caernarvon (Scarsdale) and on the west bank at Davis Pond and Homeplace. The estimated project cost (1997) is \$131.2 million of which \$98.5 million is Federal and \$32.7 million is non-Federal. The Caernarvon structure was completed in 1991. The Davis Pond structure is scheduled for completion in 2000.

The structures at Bohemia and Homeplace were deauthorized in accordance with Section 119(a) of the Water Resources Development Act of 1990, Public Law 101-640, on 1 May 1997.

### **Mississippi-Louisiana Estuarine Areas**

The Louisiana wetlands provide about 30 percent of the Nation's commercial fish harvest and about 40 percent of the fur harvest. The productivity of fish and wildlife is being adversely affected by wetland loss. This project, authorizing a fresh water diversion structure at the Bonnet Carré Spillway, would reduce saltwater intrusion and significantly increase the production of oyster, white shrimp, blue crabs, croakers, and menhaden. About 10,500 acres of wetlands

and wooded wetlands adjacent to Lakes Maurepas and Pontchartrain would be saved over the 50-year project life, since nutrients from the fresh water would result in healthier wetlands and reduced land loss. Oyster production is estimated to be increased by 5.7 million pounds annually in Louisiana and 1.9 million pounds annually in Mississippi. Authorized by the Water Resources Development Act of 1988, the project consists of six box culverts with associated inflow and outflow channels designed to divert fresh water from the Mississippi River into Lake Pontchartrain and western Mississippi Sound. The project will be located at the upstream end of the Bonnet Carré spillway structure. The estimated project cost (1997) is \$88.6 million of which \$64.5 million is Federal, \$24.1 million is non-Federal, and \$2.6 million is utility relocation costs which are the responsibility of the facility owners, and not creditable to the states' share. The structure is scheduled for completion in 2009.



The Caernarvon Freshwater Diversion structure can pass up to 8,000 cfs of river water into the Breton Sound Basin

### **Grand Bay Crevasse**

The project was authorized by the Coastal Wetlands Planning, Protection, and Restoration Act (Public Law 101-646, Title III) on the 4th Priority Project List. The project is located at the Jurjevich Canal near Mississippi River Mile 16.3 Above Head of Passes (AHP). The project area consists of 3,150 acres

of brackish marsh and 3,150 acres of saline marsh. Grand Bay and adjacent marshes experienced significant fresh water and sediment input with annual Mississippi River flooding until artificial levees were constructed along the river bank. This, and the subsequent placement of rocks along the river banks to stabilize the channel, have choked the flow of fresh water and sediment to the area. An opening through the rock lining would reestablish a pathway for fresh water and sediment into Grand Bay and the adjacent marshes. Grand Bay is a semi-enclosed body of water which will maximize sediment retention and marsh creation. The project will consist of rearranging approximately 1,500 tons of rock at the head of the Jurjevich canal, allowing an estimated maximum of 20,000 cubic feet per second (cfs) of Mississippi River water into the canal, Grand Bay, and adjacent wetlands. The entrance of the canal will be lined with additional rock to prevent scouring of the canal. In addition, two pipelines crossing the Jurjevich Canal will be relocated. Due to an uncooperative major landowner, the project is being proposed for deauthorization.



The brilliant dolphin frequents the blue water just outside the plume of the Mississippi River

### **Channel Armor Gap Crevasse**

The project was authorized by the Coastal Wetlands Planning, Protection, and Restoration Act (Public Law 101-646, Title III) on the 3rd Priority Project List. The

project is located on the east bank of the Mississippi River at river mile 4.8 Above Head of Passes (AHP). The outfall area, about 2,097 acres of fresh/intermediate marsh, is located adjacent to the river channel and Main Pass, within the boundary of the Delta National Wildlife Refuge. The area adjacent to the river channel no longer receives marsh-nourishing sediment due to enhancement of the bank line. Shallow gaps in the stone armor are insufficient to produce splays of emergent delta. Enlarging the existing crevasse will allow additional flow and sediment deposition, and will convert an area of 60 percent open water to an area of about 90 percent emergent wetland. Over the 20-year life of the project, the crevasse will create approximately 1,000 acres of emergent marsh. The authorized project would lower the invert of the existing 150-foot gap to -4.0 feet NGVD, and enlarge an existing earthen channel leading from the armored gap to the open water area to an invert of -3.5 feet NGVD and a bottom width of 150 feet. However, at the request of U.S. Fish & Wildlife, the alignment is being straightened and the new configuration calls for a channel with an 80-foot bottom width at an invert of -4.0 feet NGVD throughout. This design allows about the same 2,500 cfs flow to enter the outfall area. About 100,000 cubic yards of material will be excavated and cast adjacent to the channel in a manner conducive to marsh nourishment (top elevation not to exceed + 3.0 NGVD). Construction began in Sep 97 and was completed in Nov 97. The construction contract was awarded for \$193,200.

### **Dustpan/Cutterhead Dredging for Marsh Creation Demonstration**

The project was authorized by the Coastal Wetlands Planning, Protection, and Restoration Act (Public Law 101-646, Title III) on the 6th Priority Project List. The marsh creation sites of the demonstration project are located in the Mississippi River Delta in Plaquemines Parish, Louisiana. Specific areas in this region are the Delta National Wildlife Refuge, Pass a Loutre Wildlife Management Area, and the West Bay designated maintenance dredge materials placement areas. The project will demonstrate

the logistical and engineering feasibility of the 1) dustpan/ cutterhead beneficial use maintenance dredging concept for routine implementation and 2) hopper dredging scenario in the Mississippi River Deep Draft Crossings for successful replacement of the dustpan dredging operation for routine implementation. A dustpan dredge would remove channel maintenance materials and place these materials in storage areas outside of the channel and within the banks. A cutterhead dredge would then rehandle and transport the sediments from the waterway storage areas into marsh creation sites located within the Delta. The project would involve switching the dustpan dredges at the Crossings with hopper dredges from the Delta. Construction is scheduled for May-June 1998.

### **Beneficial Use of Hopper Dredged Material Demonstration Project**

The project was authorized by the Coastal Wetlands Planning, Protection, and Restoration Act (Public Law 101-646, Title III) on the 4th Priority Project List. The project will use material dredged from the Mississippi River near Head of Passes in Plaquemines Parish. The deposition site is just below Head of Passes, located on the left-descending bank of the Southwest Pass between Mile 2.95 BHP and 3.2 BHP. Material dredged for maintenance of the navigation channel will be beneficially used to create wetlands, in lieu of an ocean disposal site. The purpose is to evaluate the cost effectiveness of creating wetlands using hopper dredged material. The project will consist of engaging a hopper dredge performing navigation channel maintenance, once critical dredging has been accomplished, to pump material from the hopper into the designated deposition site until all dredging is complete, or until the available CWPPRA funds set aside to cover incremental cost are exhausted. Construction is scheduled for February-March 1999.

### **Pass a Loutre Crevasse**

The project was authorized by the Coastal Wetlands Planning, Protection, and Restoration Act (Public Law 101-646, Title III) on the 3rd Priority Project List. The

project is located in the Mississippi River Birds Foot Delta, on the east side of the river. It is comprised of 1,869 acres of fresh/intermediate marsh. The area north and east of Pass a Loutre no longer receives marsh-nourishing sediment from the river due to the enhancement of the bank line. The mouth of the pass is routinely used as a hopper dredge disposal area. A crevasse would allow the deposited sediments to enter and fall out in the shallow open water area between Pass a Loutre and Raphael Pass. Initial construction will create about 80 acres of new marsh, and an additional 80 acres, ten years later, when the channel is dredged for maintenance. Over the 20-year project life, about 1,000 acres of emergent marsh will be created. A hydraulic cutterhead pipeline dredge will cut a crevasse channel with a 430-foot bottom width and an invert elevation of -6.0 feet NGVD, removing and depositing about 380,000 cubic yards of material to elevation +2.5 feet NGVD north of the channel cut. This material should settle to an elevation between + 1.5 and + 2.0 feet NGVD, which is conducive to marsh development. Due to high, unanticipated relocation costs, the project is being proposed for deauthorization.

### **West Bay Sediment Diversion**

The project was authorized by the Coastal Wetlands Planning, Protection, and Restoration Act (Public Law 101-646, Title III) on the 1st Priority Project List. The project diversion site is located on the west bank of the Mississippi River at Mile 4.7 Above Head of Passes (AHP), and would divert sediments into West Bay, on the west side of the River. The project would divert sediments in an effort to create, nourish, and maintain about 9,831 acres of fresh to intermediate marsh in the West Bay area over the 20-year project life. The project consists of a conveyance channel for large scaled uncontrolled diversion of the sediments from the River. The diversion channel would be constructed in two phases: Construction of an initial channel with a discharge of 20,000 cubic feet per second (cfs) at the 50% duration stage on the river; then, after a period of intensive monitoring, enlargement of the channel to a 50,000 cfs discharge. High costs

associated with maintaining impacted anchorage areas have resulted in this project being reevaluated. Local sponsor support is unsure.

### **New Orleans to Venice Hurricane Protection**

Because the developed areas along the Mississippi River below New Orleans are particularly vulnerable to hurricane flooding, increased protection was authorized by the Rivers and Harbors Act of 1962. Features of the project include increasing the height and cross section of the existing back levees, constructing new back levees, modifying existing drainage facilities, and raising the West Bank Mississippi River Levee from City Price to Venice to exclude tidal surges coming from the marshes to the east.

The total project costs are estimated to be \$169 million for the Federal government and \$72 million for non-Federal interests. Location and estimated (October 1997) total costs are:

<b>Location</b>	<b>Estimated Cost (\$)</b>
Reach A St. Jude to Tropical Bend	46,836,000
Reach B1 Tropical Bend to Fort Jackson	41,400,000
Reach B2 Fort Jackson to Venice	36,615,000
Reach C Phoenix to Bohemia	25,990,000
West Bank Mississippi River levee St. Jude to Venice	90,159,000
<b>Total</b>	<b>241,000,000</b>



New Orleans to Venice Hurricane Protection Levee at Phoenix, LA

Levee construction in Reach A began in 1988. Construction of the first enlargement levees was completed in 1995. Construction was initiated in 1968 on Reach B1 near Empire. The Empire floodgate on Reach B1 has been completed and was placed in operation in 1976. The remaining construction is continuing on this reach. Construction was initiated on Reach B2 in 1974 and is continuing. Under an agreement with the Corps of Engineers, the construction of all the first and second enlargements of the Reach C levee, currently 90 percent complete, was accomplished by local interests. Local interests have been given credit for cost incurred for this reach as part of the 30 percent required non-Federal participation for the entire project. Construction on the West Bank Mississippi River levee began in 1988. Construction of the first enlargement levees was completed in 1994. The project completion date is scheduled for 2030 and is approximately 76 percent complete.

Mitigation for Reach B consists of the construction of 5 crevasses in the bank at Main Pass to promote marsh creation. The first crevasse was constructed in 1986 and had accreted 34 acres of marsh by 1990. The remaining 4 crevasses were constructed in 1995. A supplemental mitigation plan was developed for Reaches A, C, and the West Bank River levee. Construction of this remaining mitigation work, consisting of creating and preserving marsh, was completed in 1997.

### **Louisiana State Penitentiary Levee, Mississippi River**

The Louisiana State Penitentiary at Angola is located on the left descending bank between miles 294 and 310 of the Mississippi River. The penitentiary is afforded some flood protection by a system of locally constructed levees. This project provides for raising and strengthening the existing main-line levee to provide protection from the Project Design Flood. The improved levee would be incorporated into the MR&T system. The project was authorized by the Water Resources Development Act of 1986.

Total project cost is \$33.5 million (October 1997). The Federal share would be \$25.1 million, the non-Federal share would be \$8.4 million including \$984,000 in lands, easements, and rights-of-way.



Seepage berm and sand boils at Angola State Penitentiary levee during 1997 floodfight.

Continuation of authorization was received in the WRDA 1990, PL 101-640, Section 107(a)(5) dated 28 November 1990. The additional 5-year period extended to 28 November 1995. Congress added funds in FY96 and funds were reprogrammed into the project in FY97 to continue PED. Congress also added funds in FY98 to complete PED and initiate construction. PED is scheduled to be completed in FY98 with construction scheduled as funds and priorities allow.

During the Flood of 1997, extensive emergency repairs (berm construction) and flood fighting was conducted. Future work was ordered following the 1997 Flood.

### **Alluvial Valley Mapping**

Topographic maps of the alluvial valley are prepared as a part of the work on the MR&T project. Quadrangle maps, scale 1:62,500, and topographic maps, scale 1:250,000, covering the alluvial valley and adjacent areas have been published and are periodically revised. These maps are available for sale to the public at the U.S. Army Engineer Districts, New Orleans, LA, and Vicksburg, MS.

## Gages and Observations

Gages have been established and are maintained at various places on the Mississippi River, its tributaries and outlets. Records of stream height (stage) and volume of flow (discharge) are published annually by each district of the Corps of Engineers.



Carrollton Gauge at New Orleans District headquarters

Other observations are made by the Corps of Engineers to determine the quality of water in streams, lakes and coastal areas. Measurements taken include those for salinity, temperature, dissolved oxygen and suspended material. These data are used in studies related to construction of projects and normal operating procedures in the interest of preventing saltwater intrusion, maintaining navigation channels at proper depths, promoting a favorable ecological regimen for fish and wildlife, and other considerations.

## Emergency Flood Activities

(PL 84-99)

Flood fighting and natural disaster responses are authorized under this law. The New Orleans District activated flood fight forces in 1997 to battle flooding on the MR&T flood control system, and operated the Bonnet Carré Spillway for the first time since 1983. Although erosion and seepage problems

developed, they were quickly taken care of and the flood control system remained intact. There were numerous navigation incidents resulting from the higher river velocities. Also, emergency dredging was required in the Mississippi River at Southwest Pass.

## Mississippi River

Navigation projects not part of the MR&T project for the Mississippi River Basin are described below.

### Lake Providence Harbor (Vicksburg District)

Lake Providence Harbor consists of a dredged channel connecting with the west bank of the Mississippi River near mile 484 above the Head of Passes, and a turning basin at the landward end of the channel. The channel is 1.7 miles in length, with a depth of 9 feet over a bottom width of 150 feet. The turning basin is 1,000 feet long, flaring from a bottom width of 150 feet at its junction with the channel to 400 feet at a point 400 feet landward of the junction. The depth in the turning basin is 9 feet.

Excavated material from the channel and turning basin was deposited adjacent to the turning basin for a raised port area. Local interests constructed the dikes that were required to retain all dredged material. They also constructed a fill for railroad and highway access to the area.

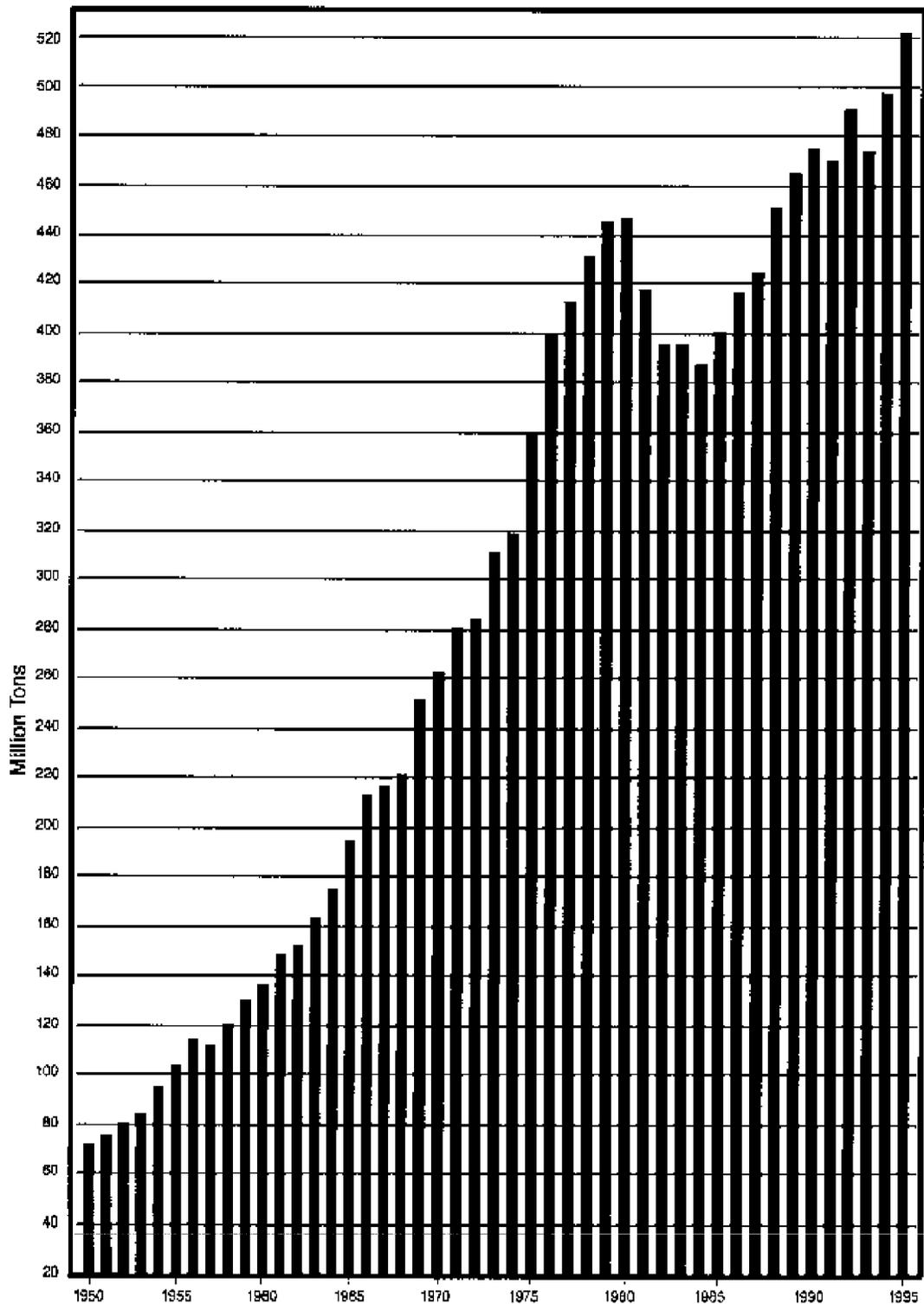
Constructed under Section 107 of the Rivers and Harbors Act of 1960, as amended, the project was completed in 1963 at a Federal cost of \$198,859.

Subsequent to completion of the project, local interests have made additional expenditure on port facilities. Average annual traffic moving through this harbor, 1986-1995, was 707,800 tons.

# Mississippi River Traffic

## Minneapolis, Minn., to Head of Passes

Net Tons 1950-1995

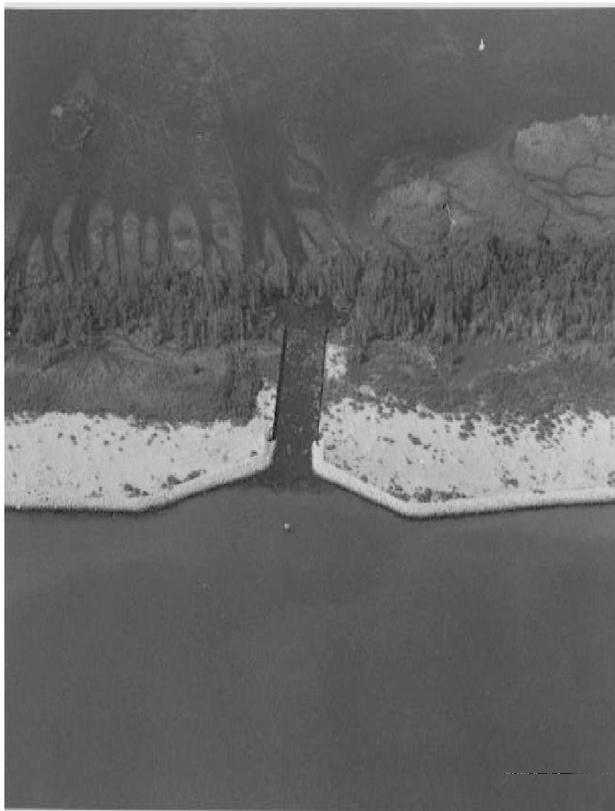


## **Madison Parish Port (Vicksburg District)**

A feasibility study (detailed project report) prepared under authority of Section 107 of the 1960 Rivers and Harbors Act, as amended, recommended improvements to river access to the Madison Parish Port.

Local interests requested assistance in obtaining river access to the port by removal of a sandbar, which had shifted to the point where it blocked port access. The sandbar blockage occurred after initial development of the port by the Madison Parish Port Commission.

The recommended plan of improvement provided for construction of a 150-foot-wide by 1,000-foot-long navigation access channel, transitioning into a 200-foot-wide channel, 400 feet in length, and a turning basin 350 feet wide and 1,100 feet long. The access channel is maintained at a minimum depth of 9 feet. The project was completed in 1980 at a cost of \$656,000. In 1995, 190,000 tons moved through this port.



Sediment and freshwater diversion and bank restoration on the Mississippi River below Venice, LA

## **Mississippi River, Baton Rouge to Gulf of Mexico**

Maintenance of sufficient navigation depths on the Mississippi River from Baton Rouge to the Gulf is a project of major importance. The Port of South Louisiana, which is about 95 miles above the Head of Passes on the Mississippi River, is the largest port in the United States in waterborne commerce. Baton Rouge, located 135 miles upstream from New Orleans, is the fifth largest port in the nation. The infrastructure of ports in Louisiana along the Mississippi River make up the world's largest seaport.

The average annual traffic on the Mississippi River between Baton Rouge and the Gulf for the years 1990-1995 was 426,338,000 tons. Corn, soybeans, crude petroleum, coal and lignite, and gasoline account for the majority of cargo that travels this waterway. Other major cargoes of the more than 150 categories listed for this waterway include wheat, residential fuel oil, animal feed, basic chemicals, salt, and food products.

Several separate projects for the Mississippi River, Baton Rouge to New Orleans, South Pass, and Southwest Pass were combined by the Rivers and Harbors Acts of 1945 and 1962 and subsequently authorized to a 55-foot-deep channel by the Rivers and Harbors Act of 1985. Current dimensions are: Baton Rouge to New Orleans, 45 feet deep by 500 feet wide; 45 feet deep for a width of 750 feet within the 35-foot-deep by 1,500-footwide channel in the Port limits of New Orleans; New Orleans to Head of Passes, 45 feet deep by 750 feet wide; Southwest Pass 45 feet deep by 750 feet wide; Southwest Pass bar channel, 45 feet deep by 600 feet wide; South Pass, 17 feet deep by 450 feet wide, and South Pass bar channel, 17 feet deep by 600 feet wide.

The initial project is complete. In 1974 additional bank restoration works (foreshore dikes, bank nourishment, bulkheads, jetty heads and lateral pile dikes) were determined to be required to restore the banks of the Mississippi River below Venice and in Southwest Pass that were severely damaged by the 1973 high water. Additional deterioration

has occurred subsequently, requiring an increase in scope of these works and the restoration of the east and west jetties at the mouth of Southwest Pass. Construction of the works started in June 1985. As of 1990, approximately 50 miles of rock foreshore dikes and bank nourishment have been completed. Some of the bank nourishment needs have been and will continue to be satisfied with maintenance dredging material. Any dredged material not required for bank nourishment will be used to create wetlands. Estimated construction cost is about \$268 million, plus \$29,000 for U.S. Coast Guard aids to navigation.



Sandbars on the Mississippi River above Baton Rouge during the 1988 drought

Construction of the modifications will make possible maintenance to the authorized depth 90 percent of the time for the foreseeable future, with substantially less dredging than at present. Presently, an average of 20 million cubic yards of material is dredged annually. Without the project, the average would be about 54 million cubic yards over the next quarter century, at which time it will be impracticable to maintain a 40-foot-depth at all. With completion of the project, the average annual maintenance dredging requirements will be 13 million cubic yards.

The project was modified in 1956 to include construction of the Mississippi River Gulf Outlet, a seaway canal 36 feet deep over a bottom width of 500 feet from the Inner

Harbor Navigation Canal in New Orleans to Breton Island and then 38 feet deep over a bottom width of 600 feet to the Gulf of Mexico. This was completed to project dimensions in January 1988.

The first soft dike project used on the Mississippi River outside of Southwest Pass was completed in fall 1994 at Red Eye Crossing. The soft dikes, constructed of geotextile bags filled with approximately 300 cubic yards of sand, were built perpendicular to the channel to narrow the channel and prevent shoaling. The completion of this project represents a significant accomplishment in terms of navigation safety and dredging savings.

### **Mississippi River Ship Channel, Gulf to Baton Rouge**

The river between Baton Rouge and the Gulf is maintained at a 45-foot depth. A study was initiated in 1968 to review the existing project, with particular reference to providing a channel having a minimum depth of 50 feet and bottom width of 750 feet from New Orleans to the Gulf of Mexico, and a channel from New Orleans to Baton Rouge having a minimum depth of 50 feet and bottom width of 500 feet.

The study was completed in 1981.

Recommendations in the final report were that the navigation channel in the Mississippi River be enlarged from its present 40-foot depth to a depth of 55 feet over a bottom width of 750 feet, that a turning basin be provided at the upstream end of the channel in Baton Rouge, and that measures be constructed to mitigate the effects of increased saltwater intrusion on municipal water supplies.

The project was authorized by Title IV of the Second Supplemental Appropriations Act of FY 85 (PL 99-88). The Water Resources Development Act of 1986 (PL 99-662), which provided additional authorization by formalizing the cost-sharing provisions of the project, permits the local sponsor (Louisiana Department of Transportation and Development) to enact user fees to defray their portion of the project costs, and implements



Dredge constructing underwater saltwater barrier during the drought of 1988

harbor maintenance fees to help pay the Federal cost of the project. In terms of channel depths up to 45 feet, the cost-sharing requirements are 75 percent Federal and 25 percent non-Federal for construction and 100 percent Federal for maintenance. For channels deeper than 45 feet, the cost-sharing requirements are 50 percent Federal and 50 percent non-Federal for both construction and maintenance.

At the request of the local sponsor, the first increment of work on the project provides a 45-foot channel from the Gulf to mile 181 above Head of Passes, near Donaldsonville. A Local Cooperation Agreement (LCA) was signed by the State of Louisiana and the Federal government on June 30, 1986, for this first increment. Two supplemental LCA's have been completed as a result of PL 99-662 and PL 100-676. The total cost of the first increment is \$44,052,000, shared \$27,056,000 Federal and \$16,996,000 non-Federal.

Construction began in July 1987. A 45-foot channel to New Orleans was completed in December 1987. Dredging of the 45-foot channel to mile 181 was completed in 1988.

The second phase of the project provided for the construction of the 45-foot channel from mile 181 to Baton Rouge (mile 232.4). A Project Cooperation Agreement for this work was executed on September 3, 1993. Construction of the deeper channel began on

July 31, 1994 and was completed on December 9, 1994. The total cost of this increment is \$6,902,000, shared \$4,660,000 Federal and \$2,242,000 non-Federal. Design studies on the remaining authorized features of the project have been initiated. These studies are expected to be completed in 1998.

As a result of the severe drought conditions in the Midwest during the summer of 1988, saltwater intrusion mitigation measures for the 45-foot channel were implemented on July 14, 1988 and construction of an underwater dredged material sill in the Mississippi River at mile 63.7 above Head of Passes was initiated on June 30, 1988 and completed to an elevation of -45.0 feet NGVD on August 1, 1988.

Before the sill was built, the saltwater wedge was advancing upstream at a rate of about 2 miles per day. It was anticipated that, without the sill and with continuing low river flows, the toe of the wedge would advance to at least mile 116 above Head of Passes. Shortly after the sill was begun, the upstream movement of the wedge slowed and on July 11, 1988 the advance of the wedge stopped near mile 104 above Head of Passes, just below the Carrollton water intake for the city of New Orleans. Assisted by increasing flows in late July and early August, the sill initiated a retreat of the wedge. By August 11, the wedge had become discontinuous upstream of the sill, and surface salinities upstream of it

had returned to near background levels.

An interim mitigation plan was implemented to barge fresh water to the municipal water treatment plants at Boothville and West Pointe a la Hache, Louisiana, downstream of the sill. Barging was initiated on July 14, 1988 and by December 2, approximately 101 million gallons of water had been barged. We have executed a supplemental LCA with the local sponsor for a permanent saltwater intrusion mitigation plan. The permanent plan provides for modifications to the water treatment plant in Belle Chasse, LA to permit the supply of potable water to lower Plaquemines Parish during times of saltwater intrusion. The plan also includes improvements to the water distribution system to facilitate the supply of water to the lower part of the parish. The construction of the mitigation plan is underway with a total of 9 contracts to be completed by fiscal year 2000.

Dredged material from construction and maintenance of this project will be used for bank nourishment and to build up to 34,000 acres of marsh (entire 55-foot project).



Bird islands created with dredged material from Baptiste Collette

### **Mississippi River Outlets, Venice**

These outlets were provided by enlarging the existing channels of Baptiste Collette Bayou and Grand-Tigre passes. Channel dimensions are 14 feet deep over a bottom width of 150 feet, except for entrance channels which are 16 to 250 feet wide. Jetties to reduce the cost of maintenance dredging are constructed to the -6 foot contour.

The state's extensive offshore oil operations, most of which are based in Venice, are realizing considerable savings in transportation costs using these channels rather than South or Southwest Pass of the Mississippi River. Commercial and sport fishermen and hunters derive similar time and distance benefits.

The project was authorized by the Rivers and Harbors Act of 1968. Estimated Federal cost (1977) is \$5.6 million for construction, plus \$60,000 for the U.S. Coast Guard for aids to navigation. Estimated non-Federal cost is \$1.5 million. Channel construction was completed in the fall of 1978. The jetty construction was completed in 1979 at a cost of approximately \$2.2 million.

Dredged material from the channel maintenance of these outlets is used beneficially to create wetlands. The location and frequent dredging of Baptiste Collette at the northeastern outlet of the Mississippi River provides an excellent opportunity to manage dredged material disposal islands and wetland creation sites for seabirds and waterfowl. The area's location in the delta of the Mississippi River is fortuitously placed for migrant and wintering waterfowl, shorebirds, and passerines. Many of these birds are trans-Gulf migrants. The disposal sites at Baptiste Collette often represent the first or last suitable habitat such migrants utilize in their hazardous trip across the Gulf of Mexico. By providing a variety of habitats, the Corps islands provide a large patch of landscape heterogeneity in a region where landscapes tend towards rather homogeneous marshes.

These islands and wetland creation sites provide landscapes that range from willow thickets and intermediate marshes to dunes,

salt flats, tidal pools, and sand and mud spits. There is also beach, low dunes, weed patches, and non-tidal ponded areas. Such diversity of habitats attracts a wide range of birdlife, with 10 species of herons and ibis, 26 species of shorebirds (including the endangered piping plover), and 12 species of gulls and terns, so far identified at the site. Rather than focus on managing for a single rare species or just creating wetlands for waterfowl or dredged disposal islands for breeding terns, the New Orleans District has concentrated its efforts on providing different designs of islands as breeding and roosting habitat for different groups of birds. The management is dynamic and adaptive as amounts of available material, the need to dredge on fairly short notice, and the sculpturing aspects of storm tides, tidal currents, and cold fronts and tropical storms or hurricanes dictate.

***Baptiste Collette and South Pass*** These two studies are being conducted under the authority of Section 1135 of the Water Resources Development Act of 1992. The purpose of these studies are to investigate the feasibility of creating wetlands in the Mississippi River Delta region. The projects consist of the construction of two crevasses stemming from South Pass and Baptiste Collette into the adjacent eroding marshlands of the Delta. Construction of these projects would emulate natural alluvial marsh building processes. These projects are scheduled for implementation in the spring of 1998.



Brown and white pelicans and gulls at the Baptiste Collette bird islands

***Mississippi River Ship Channel Improvements, Louisiana.*** The purpose of this study is to determine the feasibility of providing long-term improvements needed for navigation on the Mississippi River and its outlets between Baton Rouge and the Gulf of Mexico. Improvements will be considered for potential reductions in annual maintenance costs, environmental restoration, improved channel efficiency, and reduced hazards to navigation. Several alternatives are being evaluated which have merit, including (1) the concept of a new channel with a gated navigation structure to reduce sediment thereby (in theory) reducing dredging costs. (2) A sediment trap above the Head of Passes, and (3) A risk based analysis to evaluate maintaining a narrower channel in Southwest Pass. (Reducing the channel from 750 feet wide to 500 feet wide.) The study is scheduled to be completed in 1999.



Mississippi River jetties at the mouth of Southwest Pass