BENEFICIAL USE OF DREDGED MATERIAL DISPOSAL HISTORY ALONG SELECT NAVIGATIONAL CHANNELS IN LOUISIANA

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INTRODUCTION

Beginning in the late 1970's, the U.S. Army Corps of Engineers (USACE) began placing dredged material in an effort to create and restore coastal habitats. In 1994, the Beneficial Use Monitoring Program (BUMP) was instituted to quantify the amount of new habitat created and to improve dredge disposal placement in order to maximize the beneficial use. As part of BUMP, the University of New Orleans- Coastal Research Laboratory (UNO-CRL) performed a cumulative landscape history of the BUMP monitored sites between 1985 and 2000 to determine the net amount of sub-aerial land created by the USACE. The study will be continued on a yearly basis to determine the net land created between the current year and base year of 1985.

DATA

The base year color infrared (CIR) photography used in the study was flown in December 1985 by the NASA- Ames Research Center. The photography was captured using a Wild RC10 camera at an altitude of 65,000 feet (1:65,000 scale).

For comparison, the current fiscal year (FY) CIR photography was used. The FY 2000 photography was flown by Aerial View Point in December of 2000 and January 2001. The photography was captured with a Wild RC30 camera at an altitude of 12,000 feet (1:24,000 scale).

METHODS

The CIR photography was first scanned at a resolution of 600 dpi, and then imported into Erdas Imagine file format. The photography was then geo-referenced and a CIR photo-mosaic was created. For the land water classification, an ISODATA algorithm was performed on the CIR photo-mosaic to separate the imagery into 85 unique spectral classes. These 85 classes were then examined for spectral homogeneity and assigned either a final class of land or water. The image was then recoded to produce a land-water image. This procedure was followed for both the 1985 and FY 2000 CIR mosaics.

Once a land-water image was finalized for a study site, a change detection matrix was computed and a change detection image created. From this image, the areas of direct land created due to dredged material disposal was delineated using information from the disposal history of each study site.

RESULTS

The goal of the study was to determine the amount of sub-aerial land created by the USACE. Since this study was a comparison of two time periods, the polygon delineations and acreage of BUMP created land represents a net change in the landscape based on current conditions. However, it was beyond the scope of the study to determine the amount of new land created by "BUMP assistance." The natural processes of re-working sediment placed into a system are numerous; making the determination of

BUMP assisted land creation difficult. Table 1 summarizes the results of the study and is followed by figures presenting the cumulative landscape change for each study site.

Table 1 Summary of BUMP created land by study site.

BUMP Study Site	BUMP Created (Acres)	BUMP Created (Hectares)	Figure Number
Atchafalaya- Avoca Island	1,066	432	1
Atchfalaya- Delta	2,924	1,184	2
Atchfalaya- Horseshoe Bend	1,256	508	3
Baptiste Collette	6,239	2,527	4
Barataria- Inland	141	57	5
Barataria- Bay	60	24	6
Barataria- Grand Terre	121	49	7
Calcasieu- Brown Lake	195	79	8
Calcasieu- Sabine	745	302	9
Freshwater Bayou	21	8	10
Houma- Navigation Canal	13	5	11
Houma- Wine Inland	48	19	12
Mermentau River	63	25	13
MRGO- Inland	289	117	14
MRGO- Jetties	319	129	15
MRGO- Breton Island	29	12	16
South Pass	396	161	17
Southwest Pass	3,096	1,254	18
Tiger Pass	347	140	19
Total	**17,367**	**7,034**	

NAVIGATION, DREDGING, AND
BENEFICIAL USE OF DREDGED MATERIAL DISPOSAL HISTORY
MISSISSIPPI RIVER, BATON ROUGE TO THE GULF OF MEXICO, LA
SOUTHWEST PASS
Through FY 2000

The natural distributaries of the Mississippi River have been used as navigational channels by Europeans since 1682 when La Salle explored the mouth of the river. The site of New Orleans was selected in the early 1700s, and levee construction began as early as 1717 at New Orleans to control flooding. By 1726 a levee 5400 feet long, 18 feet wide and 3 feet high had been constructed. By 1735, levees extended on both sides of the river from 30 miles above New Orleans to 12 miles below, and by 1858 extended to the Ohio River. The effect of the levee system was largely to contain floodwaters within the river channel. Although the levees decreased the number of crevasses that occurred during flood stage of the river, they increased the intensity of the crevasses which did occur, and the modern delta experienced an overall growth in area between 1890s to the mid 1920s.

In 1720, only South Pass of the Mississippi River was utilized for navigation. However, since most commerce came from an easterly direction, a pilot station known as *Balize* was established on an island off of Balize Bayou which was a distributary of Northeast Pass. The Balize settlement was destroyed before 1767 by a flood and the pilot station was moved to the north shore of Northeast Pass. By the late 1700s, Northeast Pass was being surpassed by Pass a Loutre as a main navigational channel, and South Pass had shoaled considerably. Southwest Pass had the greatest water depth over the distributary mouth bar, and by 1813, had become the major channel. Between 1852 and 1869, attempts to increase the depth of the channel at Southwest Pass and Pass a Loutre included jettying, dredging the channel mouth bar, blasting mudlumps, agitation of the bottom with steam-driven propellers, and dragging iron harrows across the bar. None of these techniques were successful and bar deposits soon reformed when attempts ceased. The building of jetties at Southwest Pass commenced in 1902 and was largely completed in 1908, although work on the project continued for nearly another decade, including damming of upstream subsidiary channels (Morgan 1977).

During the first half of the 1900's, the Mississippi River's Southwest Pass (SWP) navigational channel was maintained to a 35-foot depth. The Rivers & Harbors Act of 1945 authorized a 40-foot deep by 800-foot wide navigational channel, and in 1961 the SWP navigational channel was enlarged to achieve a 40-foot depth. The Rivers & Harbors Act of 1985 authorized a 55-foot deep channel. The SWP navigational channel is currently maintained by the USACE-NOD at a 45-foot depth and 750-foot width between Mile 4.0 Above Head of Passes (AHP) to Mile 17.5 Below Head of Passes (BHP). Between Mile 17.5 BHP and Mile 22.0 BHP the navigational channel is maintained to a 45-foot depth and 600-foot width. Construction to enlarge the channel dimensions to the current 45-foot maintained depth began in 1987. The 45-foot channel was completed from SWP to Mile 181 in 1988. Construction of the 45-foot channel from Mile 181 to Baton Rouge (Mile 232.4) was initiated in 1994 and completed in the same year.

Although dredging records prior to 1956 are sketchy, records indicate that SWP has been dredged

annually in discontinuous reaches since at least 1945. Currently, SWP is dredged annually in discontinuous reaches from Mile 4.0 AHP to Mile 22.0 BHP. Both hopper and hydraulic cutterhead dredges are used to maintain the upper Mile 4.0 AHP to Mile 18.8 BHP reach, and hopper dredges are used to maintain the lower Mile 18.8 BHP to Mile 22.0 BHP reach. Hopper dredged material from the lower part of the reach including the lower jetty and bar channel reach of the river is either agitation dredged or deposited in a designated ocean dredged material disposal site. Hopper dredged material from the upper part of the reach is deposited in an open water disposal area, the Hopper Dredge Disposal Area (HDDA), at the entrances to Pass a Loutre and South Pass. Historically, this disposal area has been dispersive and shoal material has been scoured from the site during high river flows. Hydraulically dredged Southwest Pass shoal material historically has been placed into one of three different categories of disposal areas: 1) unconfined into the open waters located on either side of Southwest Pass (including East Bay and West Bay), 2) behind existing foreshore dikes for bank stabilization purposes, and 3) shallow open water areas for wetland creation.

Since 1975, material hydraulically dredged from Southwest Pass has been utilized to create marsh. The 1976 Mississippi River, Baton Rouge to the Gulf of Mexico Final Environmental Impact Statement (FEIS) Supplement, and the 1982 Deep-Draft Access to the Ports of New Orleans and Baton Rouge, Louisiana FEIS, both outlined placement of dredged material in open water habitats for marsh creation purposes. In 1975, a marsh creation experiment was conducted at East Bay. In coordination with the Louisiana Department of Wildlife and Fisheries, the NOD developed a plan in which approximately 4,000,000 cubic yards (CY) of dredged material was placed into the open water of East Bay to create marsh.

The 1985 Mississippi River, Baton Rouge to the Gulf of Mexico FEIS Supplement 2 discussed the utilization of material dredged from Mile 11.6 AHP to Mile 20.1 BHP for bank nourishment and marsh creation. Placement of dredged material behind foreshore dikes for bank nourishment between Mile 11.6 AHP to Mile 0.0 would be to a maximum initial height of +8.3 feet Mean Low Gulf (MLG) (+7.5 feet National Geodetic Vertical Datum (NGVD)) to achieve a maximum final height of +5.3 feet MLG (+4.5 feet NGVD). Between Mile 0.0 and Mile 20.1 BHP, dredged material placed for bank nourishment would be discharged to a maximum initial height of +7.8 feet MLG (+7.0 feet NGVD) to achieve a final height of +4.8 feet MLG (+4.0 feet NGVD). This maximum initial height restriction of dredged material was changed to +6.0 feet MLG (+5.2 feet NGVD) in 1987. Material excavated during maintenance dredging that was not used for bank nourishment would be discharged unconfined into open water habitats for marsh creation.

Since 1975, and probably earlier, open water placement of dredged material into East Bay was restricted to a maximum initial discharge height of +10.0 feet MLG (+9.2 feet NGVD) to offset the erosive effects of the high energy wave environments. Placement of dredged material into other open water habitats was restricted to a maximum initial height of +6.0 feet MLG (+5.2 feet NGVD). Subsequent consultation with the U.S. Fish and Wildlife Service led to the determination that dredged material placed at these heights did not result in the formation of intertidal marshland. In 1988, the maximum height restriction was changed to +6.0 feet MLG (+5.2 feet NGVD) for East Bay disposal and to +4.5 feet MLG (+3.7 feet NGVD) with an expected final height of +3.0 feet MLG (+2.2 feet NGVD) for other open water disposal areas to facilitate intertidal marsh formation. Further consultation with various state and Federal resource agencies resulted in another

modification of the initial height restriction for material placed in these other open water areas to +4.0 feet MLG (+3.2 feet NGVD) in 1996.

Open water disposal areas dedicated to wetland creation were established in 1992 at specific locations in the West Bay (West Bay Mandatory Disposal Area (WBMDA) at Mile 14.5 BHP) and in the East Bay (East Bay Mandatory Disposal Area (EBMDA) at Mile 9.5 BHP) of Southwest Pass. Initial plans for the WBMDA called for a crescent-shaped design to extend into West Bay in order to help retain dredged material from subsequent placements. Prior to 1996, a maximum discharge height for dredged material placed at the West Bay site was +6.0 feet MLG (+5.2 feet NGVD) with an expectation that, following dewatering and compaction, a final height of +3.0 feet MLG (+2.2 feet NGVD) would be achieved. This maximum elevation height restriction was chosen to offset the erosive effects of the high energy wave environment present in West Bay. The WBMDA design plan was altered in 1996 to create a continuous spit to be angled away from the existing shoreline. The maximum initial height of dredged material placed at this site was also changed to +4.5 feet MLG (+3.7 feet NGVD) with an expected final height of +3.0 feet MLG (+2.2 feet NGVD). Approximately 2,291,200 cy of dredged material have been placed at the WBMDA since 1992, including 274,200 cy in FY 99.

The EBMDA was authorized under Section 150 of the Water Resources Development Act of 1976. Prior to 1996, material placed at the EBMDA was not to exceed a maximum initial height of +4.5 feet MLG (+3.7 feet NGVD). This maximum height restriction was changed to +4.0 feet MLG (+3.2 feet NGVD) in 1996. Approximately 827,000 cy of dredged material have been placed at this site since 1992. Once this site had been filled to capacity, plans called for placing material into the open water of East Bay. The EBMDA was determined to be filled to capacity in 1996.

During FY 2000, no cutterhead dredging was performed in Southwest Pass due to the low water conditions experienced in the Mississippi River.

Figure 16A illustrates the dredged material disposal history for the Southwest Pass study area in detail between FY 1985 and FY 1995. Figure 16B illustrates the more recent dredged material disposal history up to FY 2000, showing FY 1996 through FY 2000 disposal in detail.

Approximately 7,000,000 cubic yards of material are discharged annually into the HDDA at the Head of Pass a Loutre and South Pass. The disposal material in the HDDA usually is scoured from the site during high river flows. However, on occasion, extensive shoaling in Southwest Pass results in the rapid temporary filling of this disposal area. In FY 1998, the New Orleans District implemented a management plan for the HDDA in order to insure continuous availability of the site for hopper dredge disposal. The management plan included dredging within the existing HDDA and placement of the dredged material into a 298-acre, shallow, open water area, the Pass a Loutre Disposal Area (PALDA) (Figure 16C), on the east side of the Mississippi River north of Pass a Loutre within the Delta National Wildlife Refuge in a manner conducive to wetlands development.

In FY 1998 (November 21, 1997 - February 21, 1998), approximately 1,051,661 CY of material were hydraulically dredged from the HDDA and placed unconfined in shallow open water in the northern one-third of the designated PALDA (Figure 16C). The specified maximum initial height

of the dredged material was +3.0 feet MLG (+2.2 NGVD); however, during construction, the material was stacked too high and had to be washed down. At the project's completion, the elevation of most of the dredged material placed in the PALDA was +3.0 feet MLG (+2.2 feet NGVD) or less. Following compaction and de-watering, final elevations of +1.0 to +0.5 feet MLG (+0.2 feet NGVD) are expected.

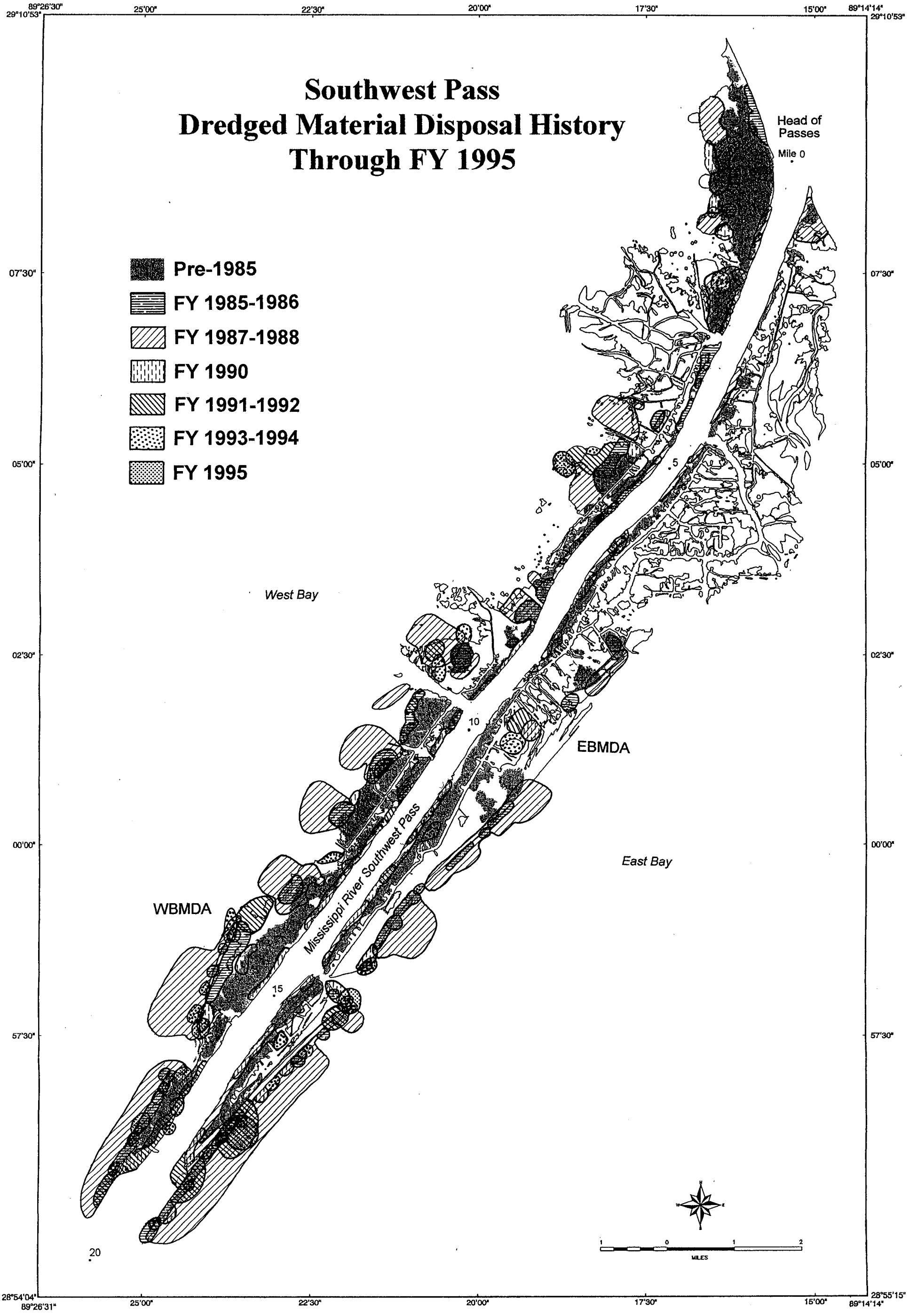

Figure 16A. The dredged material disposal history for the Mississippi River - Southwest Pass BUMP study area, showing FY 1985 through FY 1995 disposal in detail.

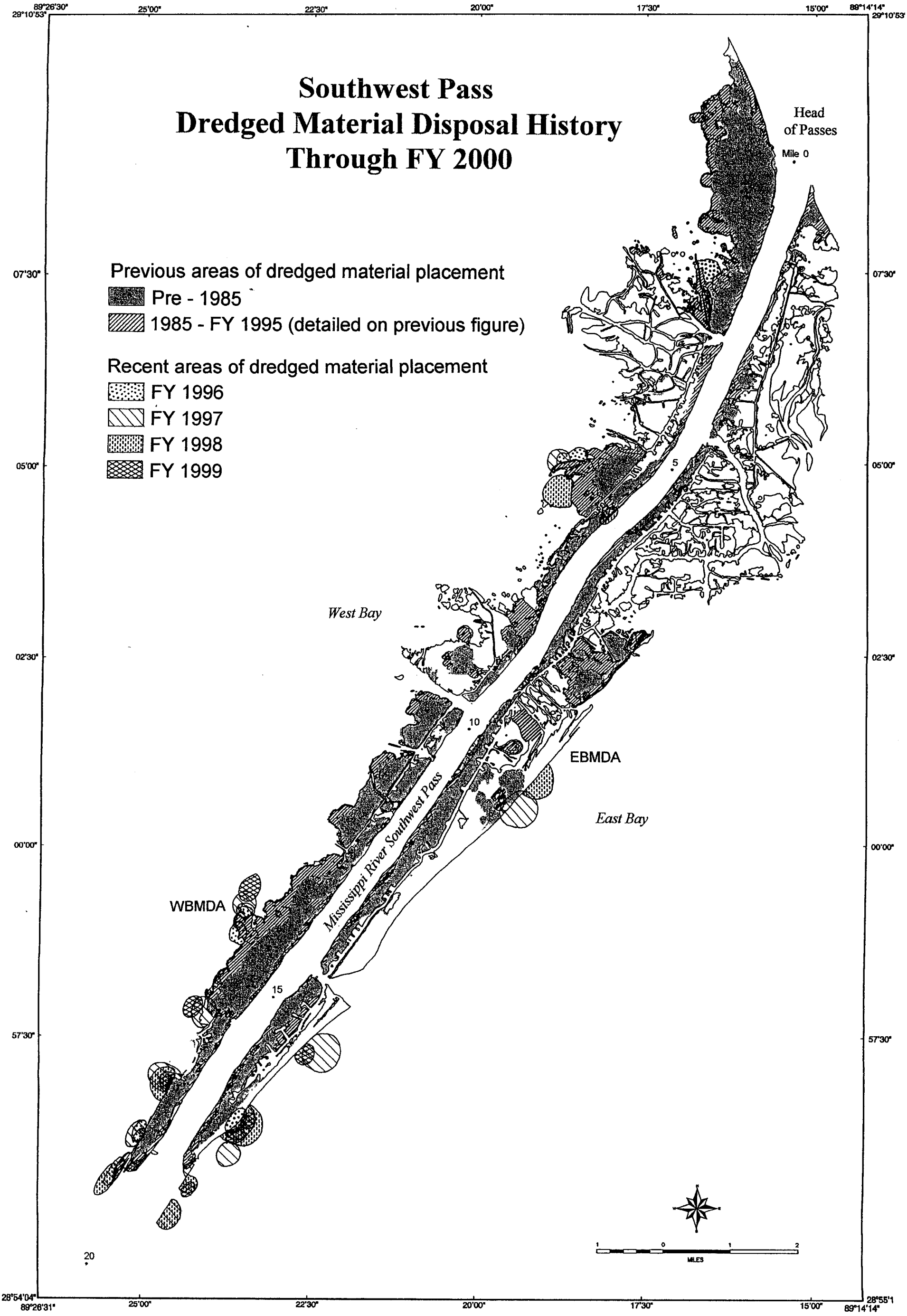

Figure 16B. The dredged material disposal history for the Mississippi River - Southwest Pass BUMP study area, showing the FY 1996 through FY 2000 disposal in detail. There was no cutterhead dredging, and therefore no beneficial use disposal, in FY 2000.

1985 Land-Water Classification

2000 Land-Water Classification

Change Detection: 1985-2000

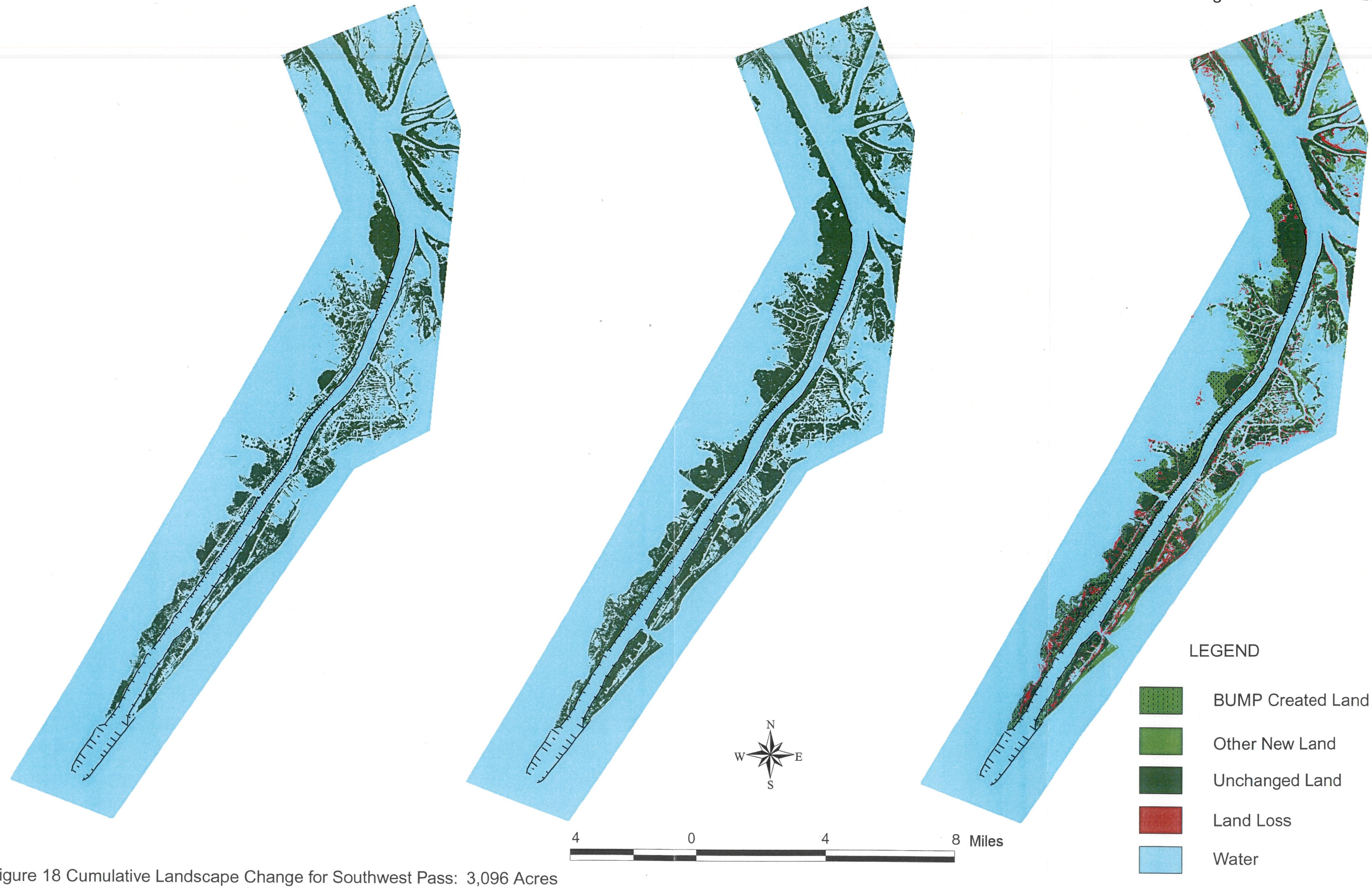

Figure 18 Cumulative Landscape Change for Southwest Pass: 3,096 Acres

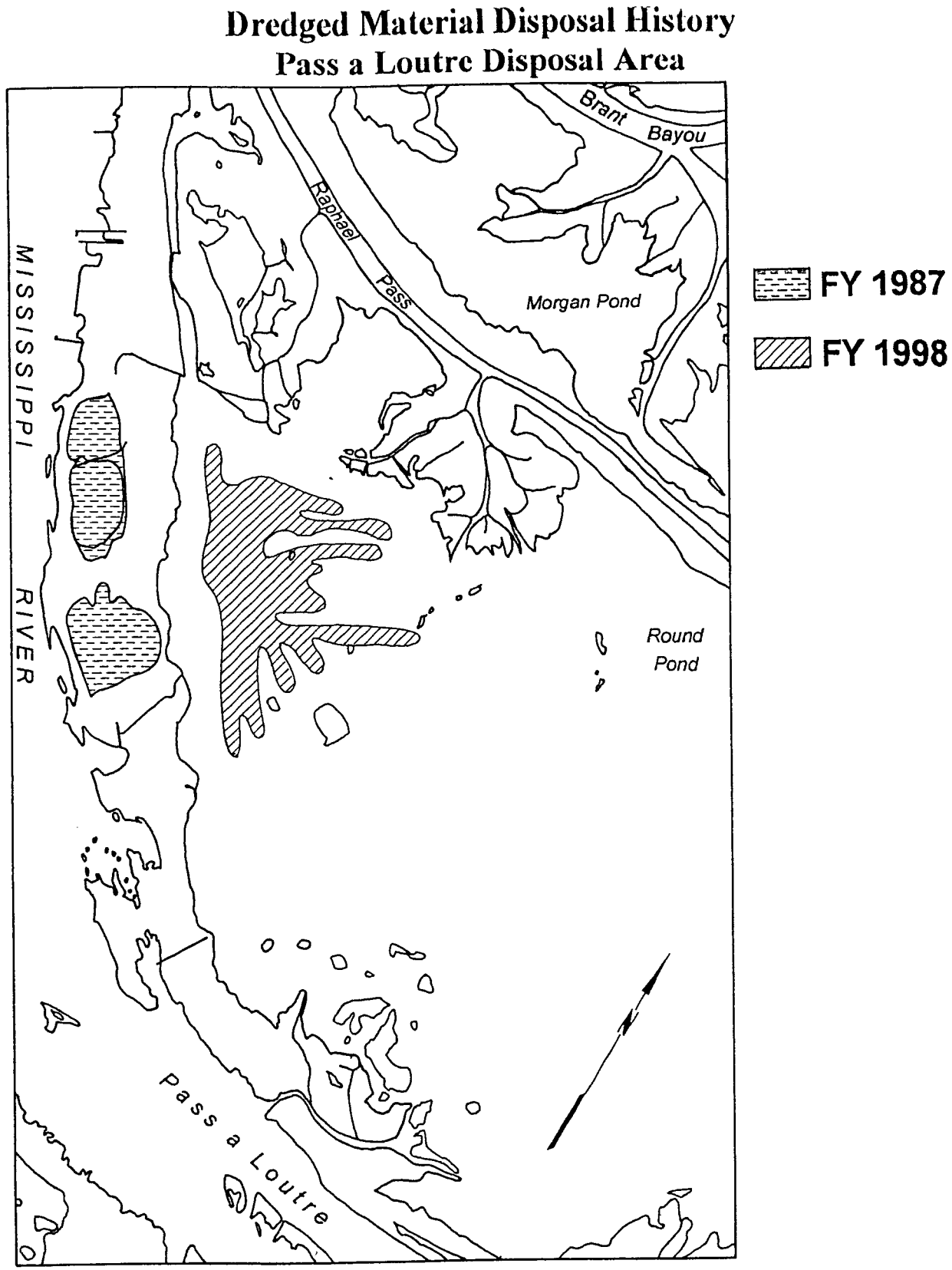

Figure 16C. The dredged material disposal history for the Pass a Loutre BUMP study area, showing disposal through FY 2000. The last disposal in this area was FY 1998.