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## Louisiana Barrier Island Comprehensive Monitoring Program (BICM) Volume 5: Chenier Plain, South-Central Louisiana, and Chandeleur Islands, Habitat Mapping and Change Analysis 1996 to 2005 Part 4: Results

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**Louisiana Barrier Island Comprehensive Monitoring Program (BICM)  
Volume 5: Chenier Plain, South-Central Louisiana, and Chandeleur Islands,  
Habitat Mapping and Change Analysis 1996 to 2005  
Part 4: Results and Interpretations of the Habitat Mapping and Change Analysis  
1996 to 2005**

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**US Army Corps  
of Engineers®**

## INTRODUCTION

As part of the larger Barrier Island Comprehensive Monitoring (BICM) program, the goal of the Habitat Analysis was to classify land from the five delta shorelines in the Louisiana Coastal Zone (Fig. 1) for four different time periods and make comparisons of habitat change between the time periods. The approach presented herein follows according to the classification by Penland *et al.* (2004). This is Part 4 of four parts in this Volume 5 of the BICM Final Report. Part 1 describes all methods used in the analysis, all maps included with the deliverables are presented in Part 2, and all data tables and statistical information are presented in Part 3. The objective of this Volume 5, Part 4 is to summarize in detail the results of the habitat analysis and provide limited interpretation of the results.

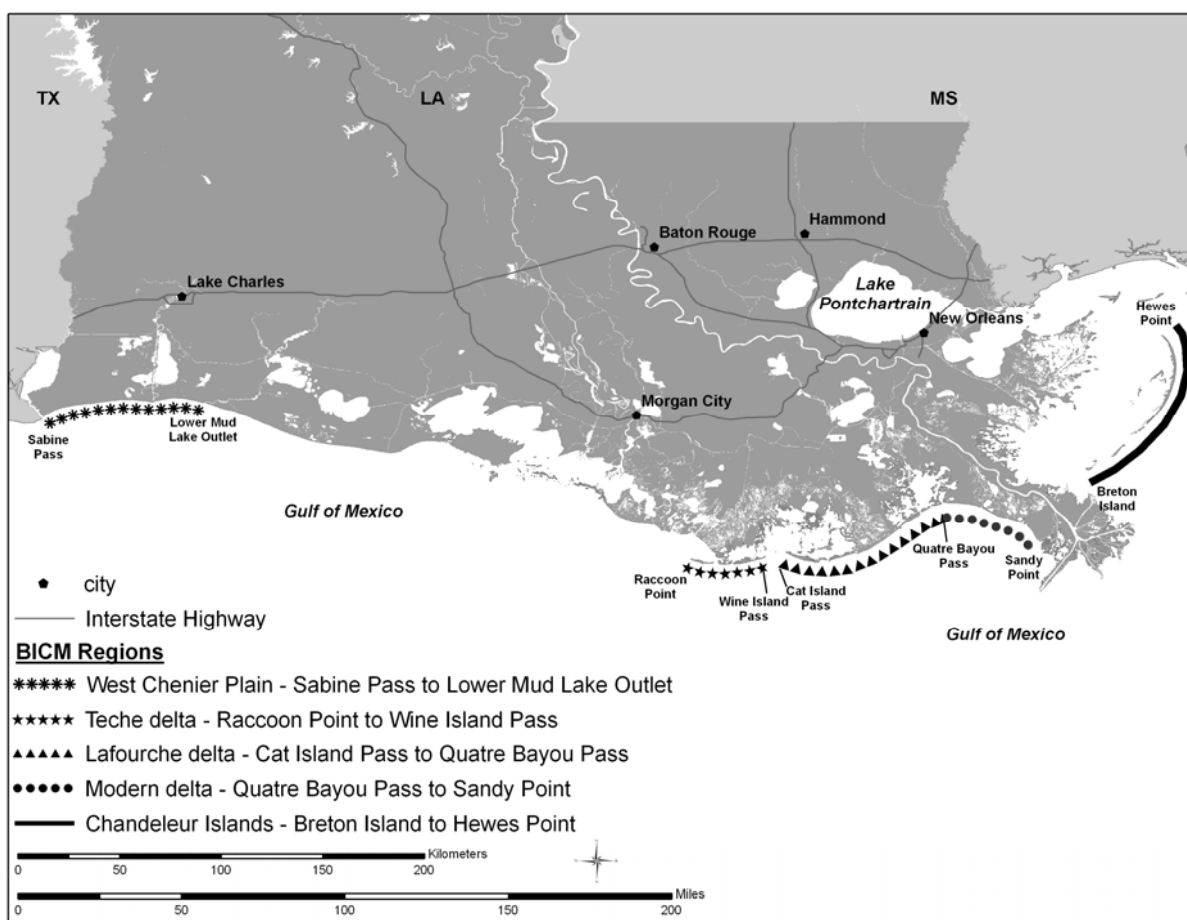


Figure 1. The five sections of shoreline used in the BICM Habitat Analysis include 1) Western Chenier Plain, which extends from the Texas/Louisiana border at Sabine Pass to the Lower Mud Lake Outlet; 2) Teche delta from Raccoon Pass to Wine Island Pass; 3) Lafourche delta from Cat Island Pass to Quatre Bayou Pass, 4) Modern delta continues from Quatre Bayou Pass to Sandy Point; and 5) Chandeleur Islands from Breton Island north to Hewes Point.

<b>Barrier Shoreline</b>		<b>1996/1998</b>	<b>2001/2002</b>	<b>2004</b>	<b>2005</b>
West Chenier Plain	Johnson's Bayou/Holly Beach	DOQQ(1998)*	CIR (2001)*	DOQQ(2004)*	DOQQ(2005)*
	Cameron/Hackberry Beach	DOQQ(1998)*	CIR (2001)*	DOQQ(2004)*	DOQQ(2005)*
Teche	Raccoon Island	CIR (1996)**	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Whiskey Island	CIR (1996)**	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Trinity Island	CIR (1996)**	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	East Island	CIR (1996)**	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
Lafourche	Timbalier Island	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	East Timbalier Island	CIR (1996)**	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Caminada Headland	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Grand Isle	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Grand Terre	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
Modern Delta	Chaland Headland	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Bay Jo Wise	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Shell Island	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Scofield	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Sandy Point	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
Chandeleur Islands	Breton Island	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	Curlew/Gossier	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*
	North Chandeleur Island	DOQQ(1998)*	QuickBird <sup>+</sup>	DOQQ(2004)*	DOQQ(2005)*

\*U.S. Geological Survey

\*\*University of New Orleans-Pontchartrain Institute for Environmental Sciences (UNO-PIES)

<sup>+</sup>Digital Globe acquired by UNO-PIES

Table 1. List of shorelines included and the source of the original imagery, which was classified into different habitat types based on the classification developed by Penland *et al*, (2004). CIR indicates the source of the imagery was color infrared imagery, Quickbird indicates the source was Digital Globe QuickBird satellite imagery, and DOQQ indicates the imagery originated as U.S. Geological Survey (USGS) digital orthophoto quarter quads.

## Water Levels

To determine the mean water level in each barrier shoreline at each of the analysis dates, six tide gauge stations that are maintained by the U.S. Army Corps of Engineers (USACE) were used (Table 2). Daily USACE water level measurements made at 08:00 hours were downloaded from the website <http://www.mvn.usace.army.mil/eng/edhd/watercon.asp> and averaged into monthly means. The monthly means were adjusted to National Geodetic Vertical Datum (NGVD) and then adjusted again to account for any elevation changes to the gauge caused by maintenance performed by the USACE. The adjusted monthly means were averaged to determine annual means for the analysis time periods (1996/98, 2001/02, 2004, and 2005).

Barrier Shoreline		Tide Gauge	Water Level (cm); gage zero is NGVD 1988			
			1996/ 1998	2002	2004	2005
Chenier Plain	Johnson's Bayou/ Holly Beach	Calcasieu River and Pass near Cameron	28.78	24.46	18.81	14.26
	Cameron/ Hackberry Beach	Mermentau River at Catfish Point (South)	45.98	44.27	50.8	39.63
	Teche	Intracoastal Waterway at Houma	53.7	67.24	62.23	64.16
	Lafourche	Bayou Lafourche at Golden meadow Floodgates (South)	30.22	65.25	68.19	69
	Modern Delta	Mississippi River at Venice	17.54	15.02	22.38	8.3
	Chandeleur Islands	Mississippi River Gulf Outlet at Shell Beach	-1.48	7.67	-10.12	-4.4

Table 2. Average Annual Water Levels in centimeters above gage zero (NGVD 1988) in each of the barrier shorelines at each of the analysis time periods.

## Flight Paths

Color Infrared (CIR) imagery that was collected during aerial overflights was used for the entire Teche segment in 1996 and also for East Timbalier Island in 1996. The Isles Dernieres island chain was captured in two flight lines and East Timbalier Island was captured in one flight line. Provided here are maps of the flight lines from which the imagery was obtained (Figs. 2 and 3).

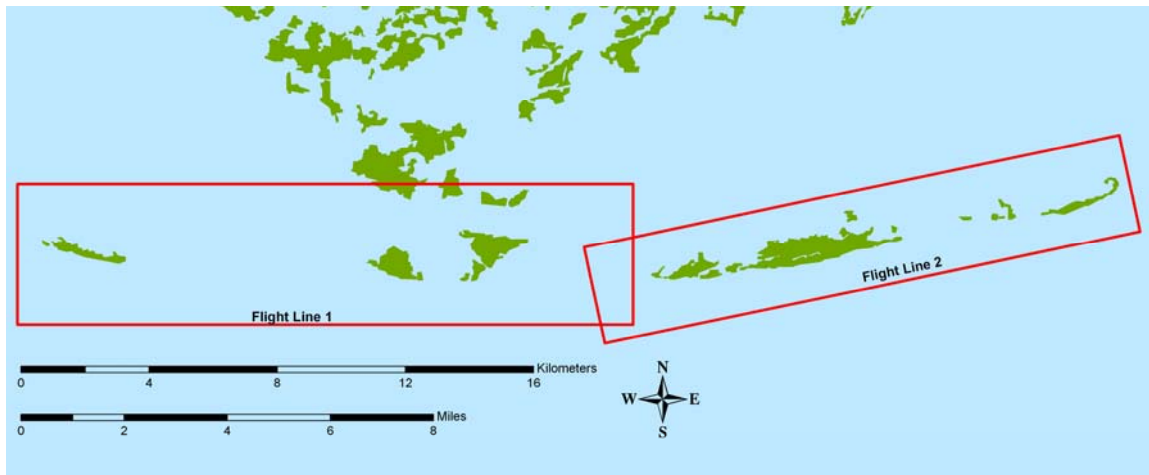


Figure 2. Flight lines for the capture of the aerial photographs that were used for the habitat analysis of the Isles Dernieres within the Teche segment for the time period 1996.



Figure 3. Flight lines for the capture of the aerial photographs that were used for the habitat analysis of East Timbalier Island within the Lafourche segment for the time period 1996.

## **RESULTS AND INTERPRETATIONS**

### **Chenier Plain (Sabine Pass to Lower Mud Lake Outlet)**

The Chenier Plain area of analysis extends from Sabine Pass at the Louisiana/Texas state line east to the Lower Mud Lake Outlet in Cameron Parish. This area includes the following Gulf of Mexico beaches: Ocean View, Holly, and Hackberry Beaches. The only restoration project completed in the Chenier Plain analysis area during the period of analysis was the Holly Beach Sand Management (CS-31) project. This project was completed in 2003 and created approximately 300 acres of beach, dune, and coastal Chenier habitat along the Gulf of Mexico shoreline extending between Holly and Constance Beaches. The project placed 1.7 million cubic yards of high quality sand on the beach to reestablish a more historical shoreline and simultaneously protect approximately 8,000 acres of existing, low energy intermediate and brackish marsh wetlands to the north of the beach (Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTF), 2004a). The positive benefit of this project is apparent by the increase in beach and marsh acreage from 2001 to 2004 and 2005.

Marsh habitat in the western Chenier Plain remains relatively constant throughout the entire period of analysis (1998 through 2005; Figs 4, 5, 6, 7, and 8). The amount of intertidal flat present in 2001 is significantly less than what is present in 1998 and 2004 and is the result of high water at the time that the 2001 imagery was obtained. Scouring and flooding of low lying areas near the coastline as a result of Hurricane Rita result in lower acreages of marsh and beach habitat in 2005 compared to the other years.

The acreages of different habitat types are more variable in the West of Hackberry Beach and Hackberry Beach analyses areas (Figs 7 and 8). Low-lying areas south of LA Hwy 82 fill in and develop into marsh habitat during the years 1998 to 2001 to 2004. These low-lying areas were inundated with water and scoured out as a result of flooding and high winds associated with the passage of Hurricane Rita in 2005 reducing the acreage of marsh habitat present on the 2005 analysis year. An increase in beach habitat along the coastline is also apparent after the passage of Hurricane Rita as a result of sediment being moved inland with the storm surge. The acreage of structures through out the area is also significantly reduced as a result of Hurricane Rita.



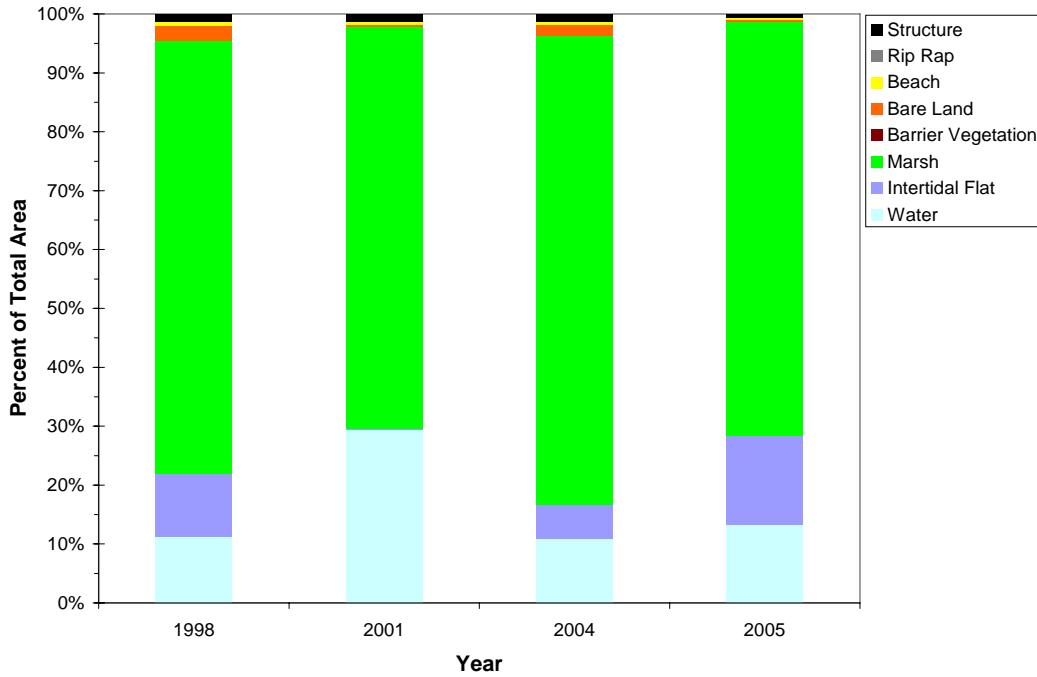


Figure 4. The percentage of different habitats in Johnson's Bayou of the western Chenier Plain analysis area during the four analyses time periods. The entire analysis area is 41,345 acres in size.

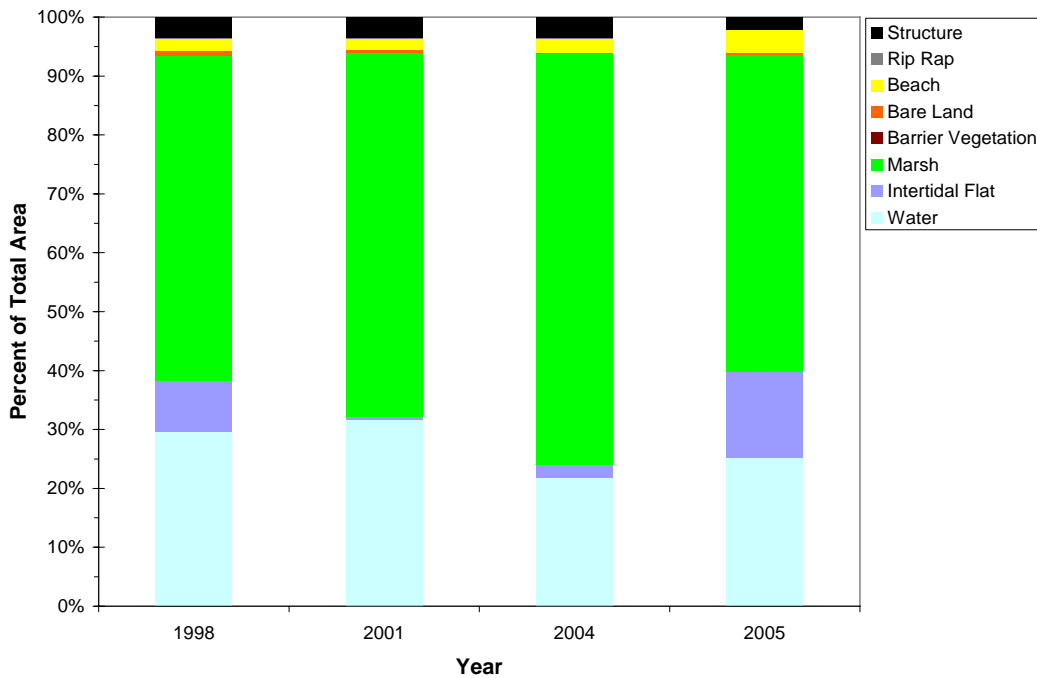


Figure 5. The percentage of different habitats in Ocean View Beach of the western Chenier Plain analysis area during the four analyses time periods. The entire analysis area is 10,367 acres in size.

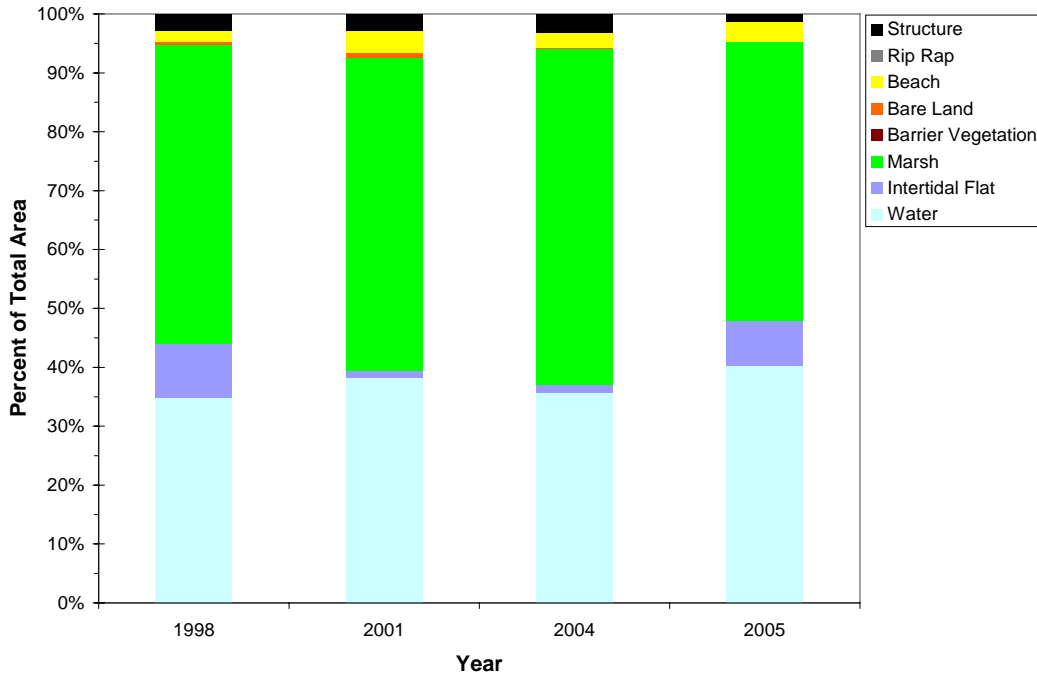


Figure 6. The percentage of different habitats in Holly Beach of the western Chenier Plain analysis area during the four analyses time periods. The entire analysis area is 5,734 acres in size.

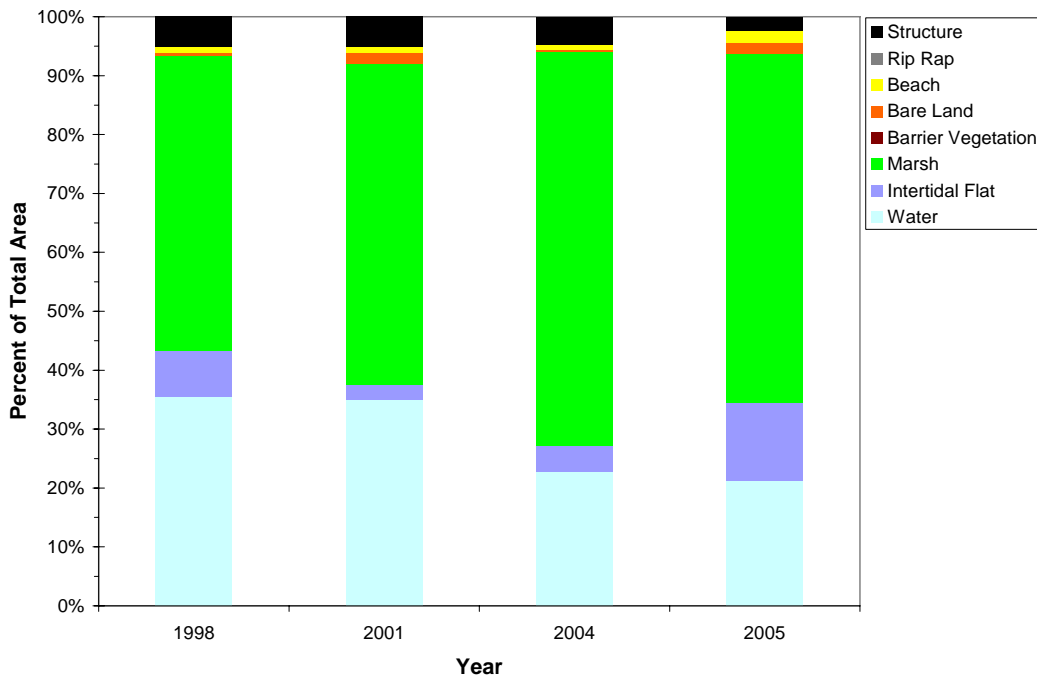


Figure 7. The percentage of different habitats in West of Hackberry Beach of the western Chenier Plain analysis area during the four analyses time periods. The entire analysis area is 18,917 acres in size.

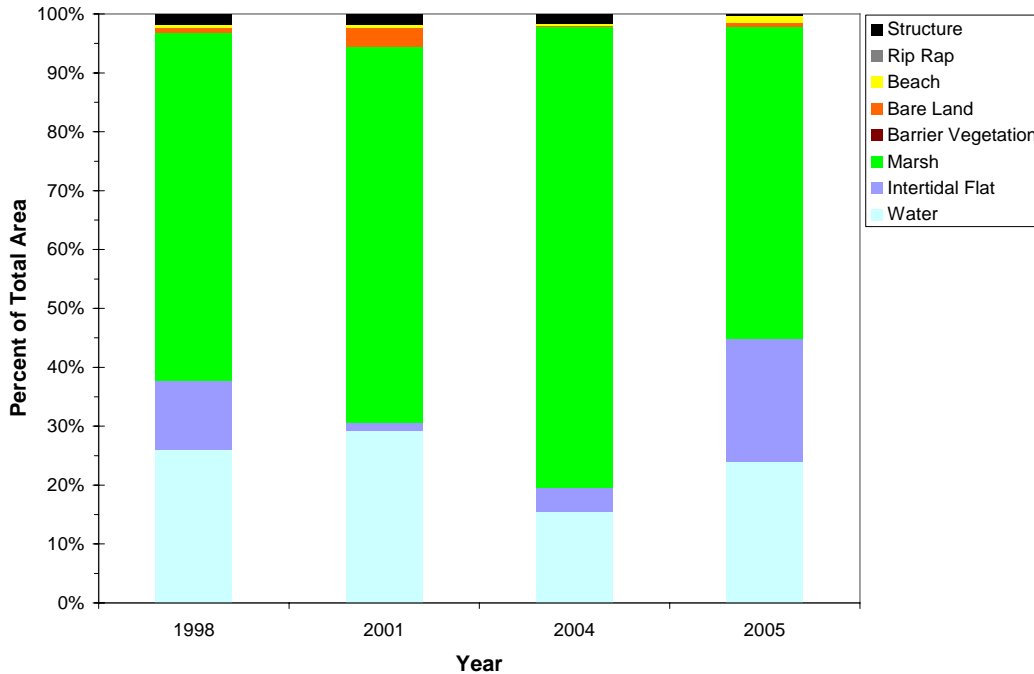


Figure 8. The percentage of different habitats in Hackberry Beach of the western Chenier Plain analysis area during the four analyses time periods. The entire analysis area is 21,985 acres in size.

### Teche (Raccoon Point to Wine Island Pass)

For the purposes of this analysis, the Teche segment of the Louisiana coast includes the Isles Dernieres island chain from Raccoon Point to Wine Island Pass. This segment includes Raccoon Island, Whiskey Island, Trinity Island, and East Island.

The most recent restoration project in this area was the Isles Dernieres Stabilization Project, which was implemented in 1998. This restoration project pumped material dredges from the bayside of East (TE-20), Trinity (TE-24), and Whiskey (TE-27) Islands onto the islands in order to construct and enhance the dunes and backbarrier marshes (LCWCRTF, 2002a). The impact of this restoration is apparent in the large increase in acreages of bare land and intertidal flat habitats between 1996 and 2002 (Figs 10, 11, and 12).

Prior to the 1998 restoration, two smaller restoration projects were implemented on East Island. The Terrebonne Parish Barrier Island Restoration Project rebuilt part of the dune on the eastern section of East Island in 1985 (Jones, 1987). The FEMA Restoration Project further enhanced the eastern dune on East Island using dredge material from the bay side of the island in 1996 (Department of Natural Resources (DNR), 1996). The New Cut dune and marsh

restoration project (TE-37) was completed in 2007, closing the area between East and Trinity Islands known as New Cut, with 850,000 cubic yards of dredge material followed by sand fencing construction and vegetative plantings (LCWCRTF, 2007). Raccoon Island was not part of the Isles Dernieres Stabilization Project. In 1997, TE-29 was implemented, which installed eight concrete breakwaters along the eastern end of Raccoon Island (LCWCRTF, 2002b).

### Raccoon Island

The affects of the TE-29 breakwaters at Raccoon Island are apparent in the increase in acreages of intertidal flat habitat from 1996 to 2001 (Figure 9). The increase is a result of sediment accumulating behind the breakwaters. The 2004 data indicates the presence of marsh plants that colonized the newly accumulated intertidal flats, increasing the acreages of marsh habitat in this time period. Hurricanes Katrina and Rita caused significant overwash deposition on this island, increasing the acreages of beach and intertidal flat habitat and decreasing the acreages of marsh habitat for the 2005 analysis period.

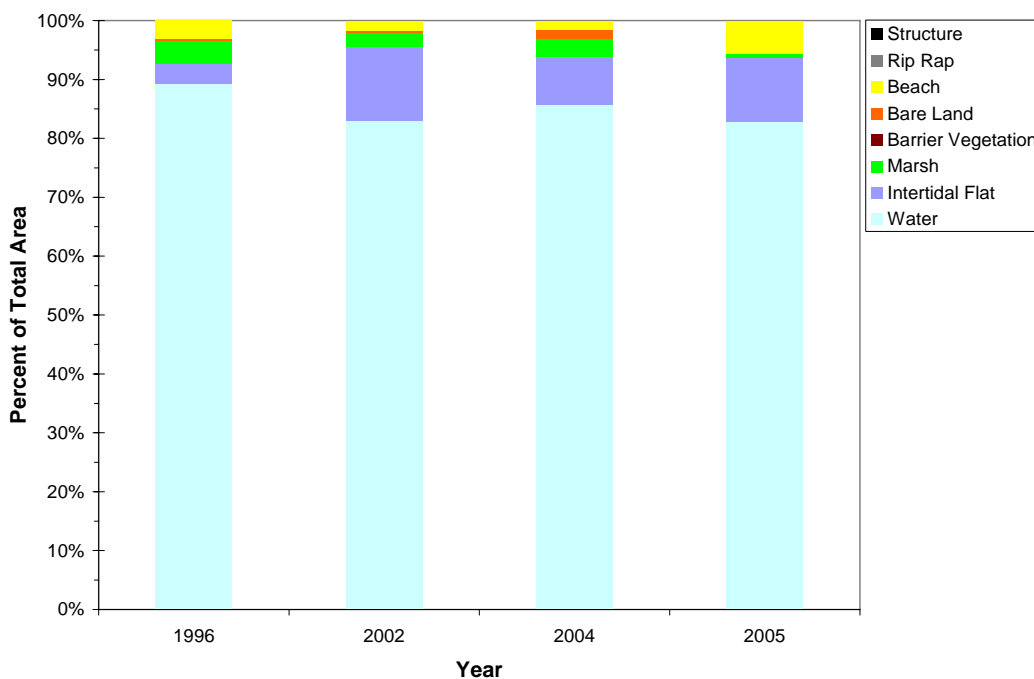


Figure 9. The percentage of different habitats in Raccoon Island in the Teche delta analysis area during the four analyses time periods. The entire analysis area is 1,725 acres in size.

## Whiskey Island

The affects of the TE-27 restoration of Whiskey Island in 1998 are clearly apparent in Figure 10. In the time period after the restoration of the island (2002), the acreages of bare land and intertidal flat habitats drastically increase as a result of the placement of the dredge material and there is a slight decrease in the acreages of marsh habitat as a result of burial. In the next time period (2004), plants have begun to colonize the placed material and the acreages of barrier vegetation increases as the acreages of bare land decrease. The acreages of marsh habitat remain relatively constant through out the entire period of analysis indicating that the placed material was colonized by dune and other non-wetland species rather than marsh grass, which is a result of the elevation of the placed material. As a result of the passage of Hurricanes Katrina and Rita, significant washover occurred on Whiskey Island, increasing the acreages of beach and intertidal flat habitat. The marsh habitat on this island proved to be resilient to the washover effects from the hurricanes and remained intact and at similar acreages to what was present before the hurricanes.

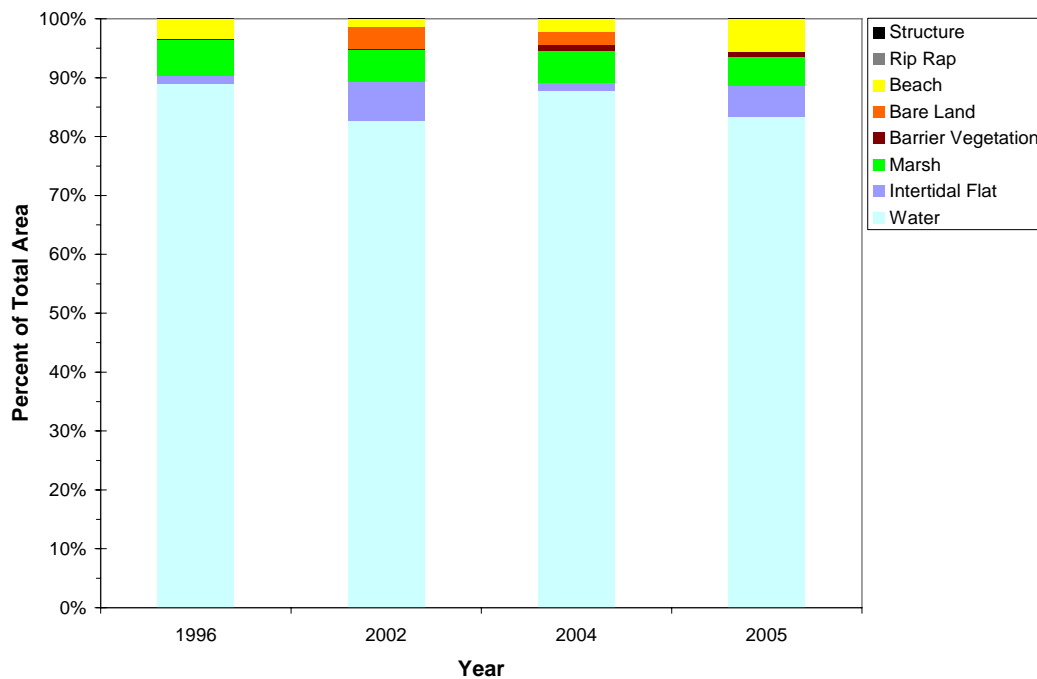


Figure 10. The percentage of different habitats in the Whiskey Island analysis area during the four analyses time periods. The entire analysis area is 4,936 acres in size.

## Trinity Island

The TE-24 restoration of Trinity Island in 1998 increased the acreages of bare land and intertidal flat habitats drastically as a result of the placement of the dredge material and decreased the acreages of marsh habitat as a result of burial (Figure 11). In the next time period (2004), plants have begun to colonize the placed material and the acreages of barrier vegetation increases as the acreages of bare land decrease. The acreages of marsh habitat remain relatively constant through out the entire period of analysis indicating that the placed material was colonized by dune and other non-wetland species rather than marsh grass, which is a probable result of the elevation of the placed material. Washover occurred on Trinity Island during the passage of Hurricanes Katrina and Rita, increasing the acreages of beach and intertidal flat habitat. Similarly to Whiskey Island, the marsh habitat on this island proved to be resilient to the washover effects from the hurricanes and remained intact and at similar acreages to what was present before the hurricanes.

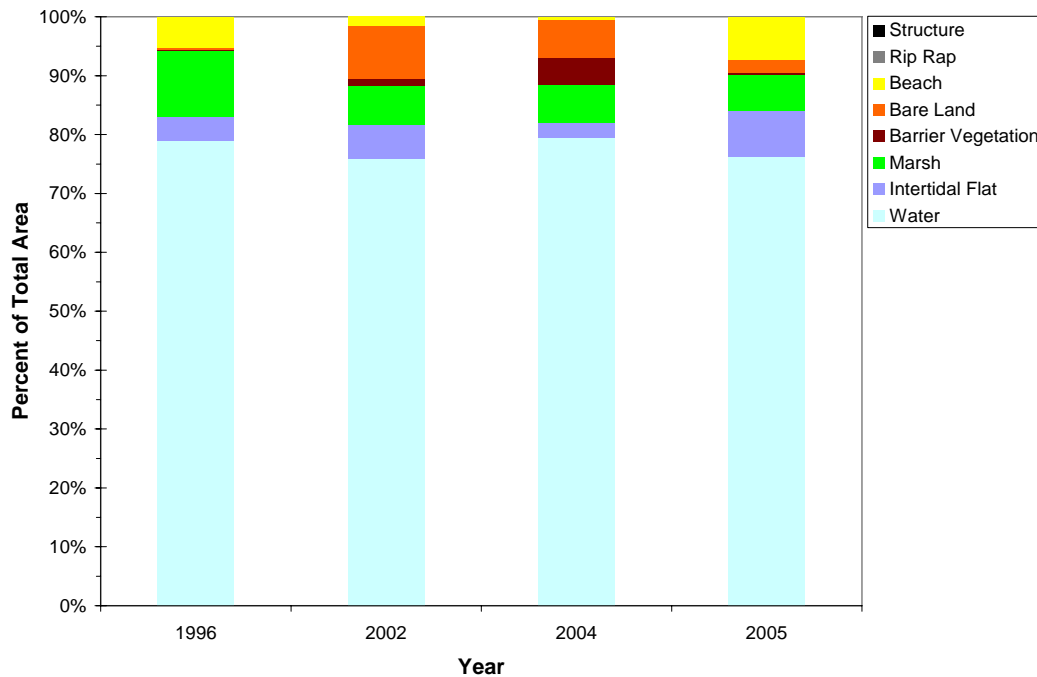


Figure 11. The percentage of different habitats in the Trinity Island analysis area during the four analyses time periods. The entire analysis area is 3,626 acres in size.

## East Island

The restoration of East Island (TE-20) resulted in placement of the largest amount of material of all the islands in the Isles Dernieres. Over 90% of the island was covered with dredge material resulting in the drastic increase in bare land habitat in the 2002 analysis year (Figure 12). Between analysis years 2002 and 2004, much of the placed material was reworked and colonized by both marsh and non-wetland vegetation, resulting in an increase in the acreages of marsh and barrier vegetation habitats in 2004 compared to 2002. Significant washover as a result of the passage of Hurricanes Katrina and Rita resulted in an increase in the acreages of beach habitat present in the 2005 analysis year.

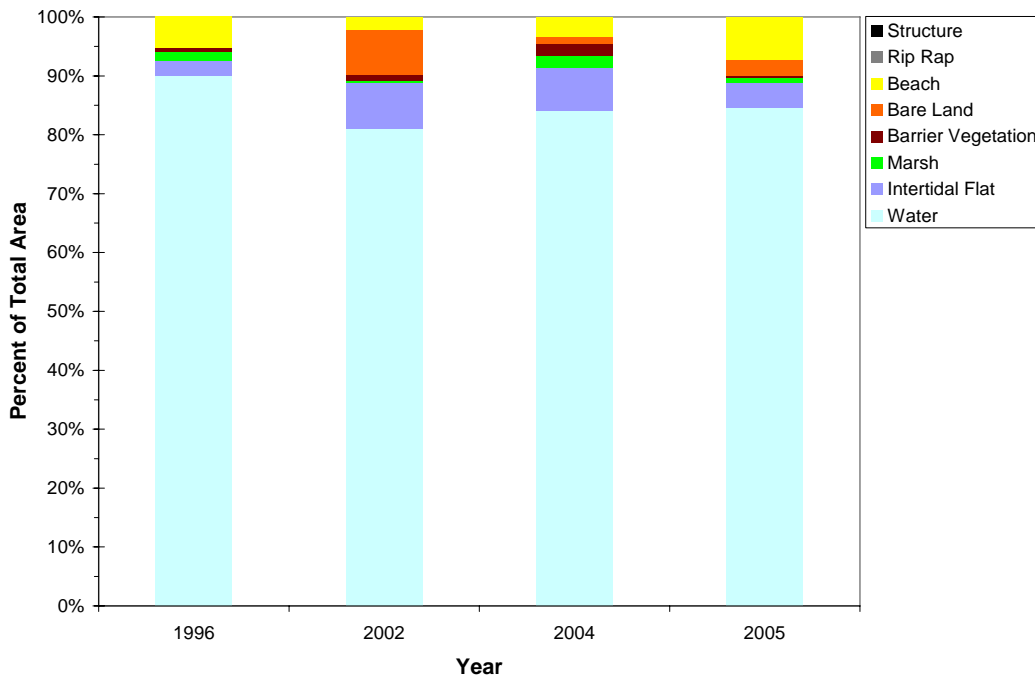


Figure 12. The percentage of different habitats in the East Island analysis area during the four analyses time periods. The entire analysis area is 2,600 acres in size.

### **Lafourche (Cat Island Pass to Quatre Bayou Pass)**

The Lafourche analysis area is located in the central part of the Louisiana delta plain and includes the following islands and headland: Timbalier Island, East Timbalier Island, the Caminada Headland, Grand Isle, Grand Terre Island, and East Grand Terre Island. Several restoration projects have been implemented along this shoreline in the recent past.

Restoration of Timbalier Island began in 1996 with a planting demonstration project (TE-18) that placed more than 7,000 linear feet of sand fencing and planted Spartina patens and Panicum armanum the following year on created dunes (LCWCRTF, 2002c). Completed in 2004, the Timbalier Island dune and marsh creation project (TE-40) innovatively placed 4.6 million cubic yards of dredge material on the island in a terraced formation that created both dune and marsh habitat. Placement of dredge material was followed by construction of sand fencing and vegetative plantings (LCWCRTF, 2008a). The shoreline of East Timbalier Island was restored in 2000 (TE-25 and 30) using dredge material to construct a 200 foot wide dune and 600 foot wide backbarrier marsh along the entire length of the island (LCWCRTF, 2002d, 2002e).

Dredge material was placed in the western portion of the Caminada Headland, known as West Belle Pass in 1998 (TE-23). This project placed 240,000 cubic yards of material on the shoreline for beach nourishment and also created an additional 184 acres of marsh behind the shoreline (2002f). Grand Isles as a community has implemented several shoreline restoration projects including the construction of breakwaters in 1995 and breakwater extension in 1999 as well as numerous placements of sand for beach nourishment during the past three decades. In 2001, dredge material disposal and vegetative plantings were implemented on Grand Terre (BA-28), benefiting 127 acres of land in the eastern portion of the island (LCWCRTF, 2008b). The affects of the various restoration projects completed in this analysis area are apparent in the changing acreages of the habitat types during the periods of analysis.



## Timbalier Island

The western portion of Timbalier Island is more stable than the eastern portion as a result of the wider and continuous marsh platform. The 2004 restoration (TE-40) is apparent in Figure 13 as an increase in the acreages of bare land habitat in 2004 compared to 2002 and 1996. Overwash as a result of the passage of Hurricanes Katrina and Rita resulted in an increase in the acreages of beach habitat in 2005 compared to the other analysis years. Marsh and intertidal flat habitats remain relatively stable throughout all periods of analysis.

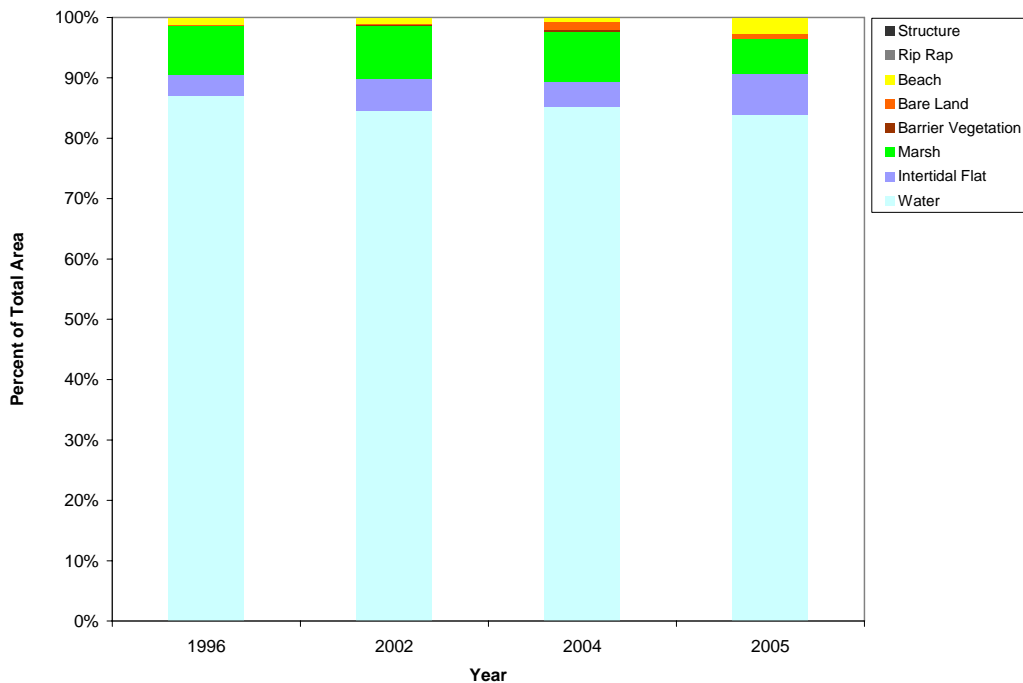


Figure 13. The percentage of different habitats in the Timbalier Island analysis area during the four analyses time periods. The entire analysis area is 9,522 acres in size.

## East Timbalier

The restoration of East Timbalier Island in 2000 (TE-25 and 30) resulted in an increase in the acreages of bare land habitat in the analysis year 2002 (Figure 14). On the basis of the vegetation colonization rates on placed material on other islands in south east Louisiana such as Whiskey, Trinity, and Timbalier Islands, colonization of the material placed on East Timbalier would have been expected by the analysis year 2004. Colonization would result in a decrease in the acreages of bare land and an increase in the acreages of marsh and barrier vegetation habitats. This is not the case on East Timbalier Island. The acreages of bare land in 2004 are similar to

the acreages in 2002, indicating that little colonization occurred during that time period. The locations of the bare land habitat remain unchanged between the two time periods indicating that the placed material is not being redistributed around the island but remaining in place. It is not until analysis year 2005 as a result of the overwash from Hurricanes Katrina and Rita that the placed material is redistributed as beach habitat and the acreages of bare land all but disappear.

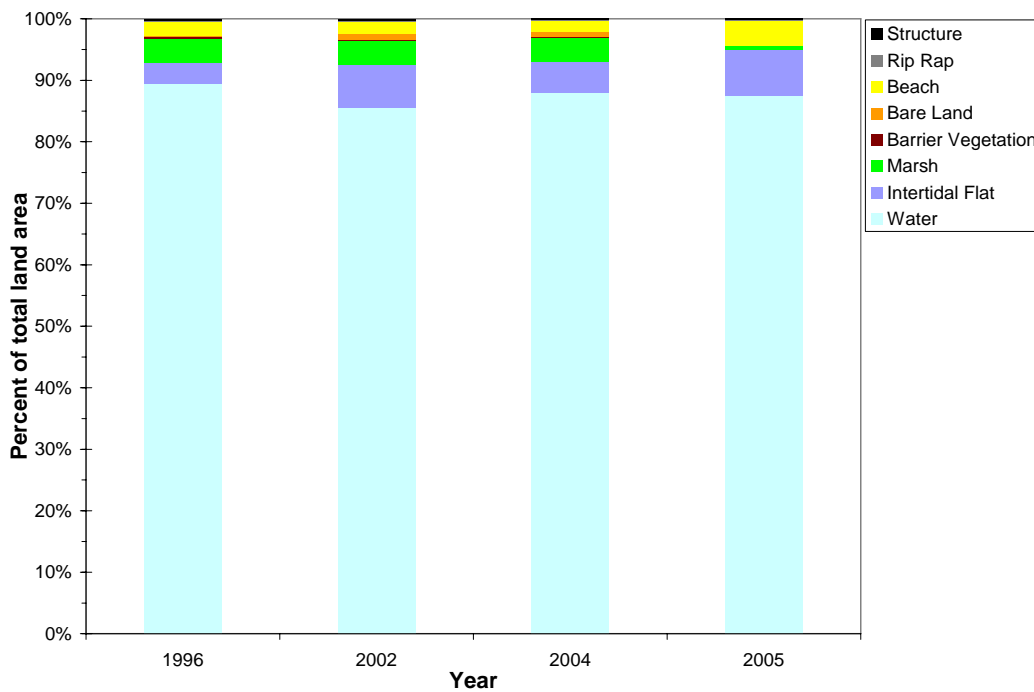


Figure 14. The percentage of different habitats in the East Timbalier Island analysis area during the four analyses time periods. The entire analysis area is 3,332 acres in size.

### **Caminada Headland**

The acreages of different habitat types in the Caminada Headland remained relatively constant during the entire period of analysis (Figure 15). The increase in acreages of intertidal flat habitat from 1996 to 2002 is a result of the redistribution of material placed on the shoreline and in the marsh of the West Belle Pass Headland on the western portion of the Caminada Headland. By 2004, less material is present as intertidal flat habitat. Acreages of intertidal flat and beach habitat increase in 2005 as a result of the overwash affects from Hurricanes Katrina and Rita.

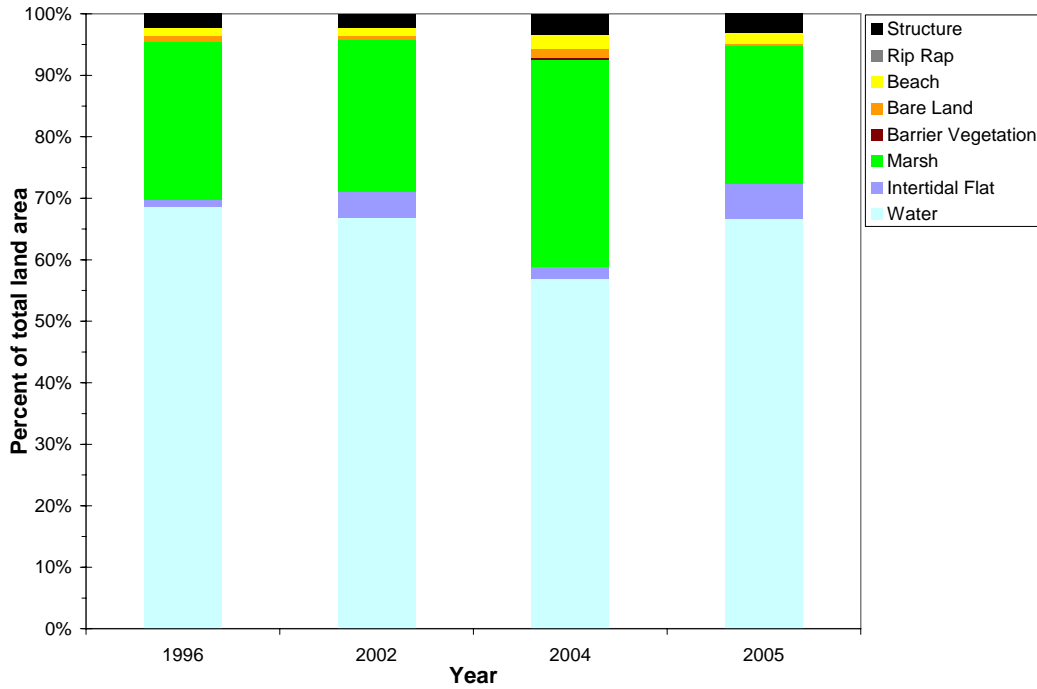


Figure 15. The percentage of different habitats in the Caminada Headland analysis area during the four analyses time periods. The entire analysis area is 30,401 acres in size.

## Grand Isle

The restoration projects that have been implemented in Grand Isle have been focused on nourishing and protecting the beach side of the island. The bay side of the island, where most of the marsh and structure habitats are located, remain stable through-out the entire analysis period (Figure 16). There is an increase in the acreages of bare land habitat on 2004 compared to the other years that is likely the result of construction activities on this human inhabited barrier island. The implementation of the breakwaters on the gulf side of the island has had little effect on the acreage distribution of habitat types.

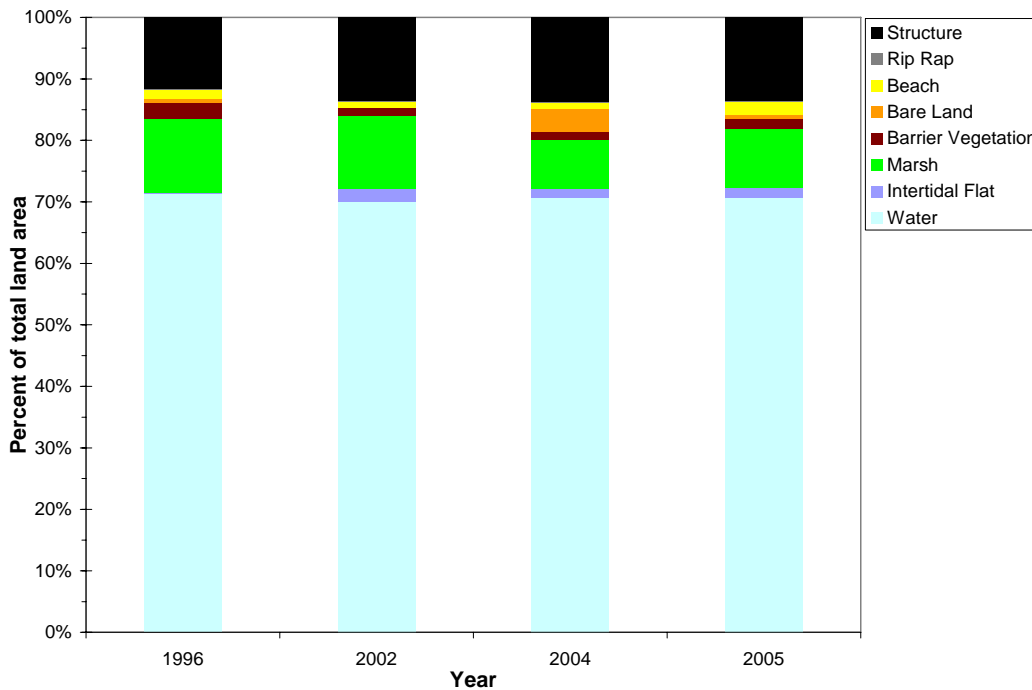


Figure 16. The percentage of different habitats in the Grand Isle analysis area during the four analyses time periods. The entire analysis area is 8,023 acres in size.

## Grand Terre

The affects of the dredge material placement and vegetative plantings on West Grand Terre in 2001 (BA-28) are not initially apparent in the acreages of habitat types in 1998 and 2002 (Figure 17) because of the inclusion of East Grand Terre habitats, which remain stable through-out the analysis period. By 2004, vegetation planted in 2001 and vegetation from natural colonization of the dredge material becomes apparent. The increase in acreages of barrier vegetation in 2004 is a direct result of the 2001 restoration. By 2005, the restored area further

develops into marsh habitat increasing the acreages of this habitat type and reducing the acreages of barrier vegetation. Grand Terre Islands experienced very little overwash during the passages of Hurricanes Katrina and Rita, likely because of they are on the west side of where Hurricane Katrina made landfall and far from the Louisiana/Texas border where Hurricane Rita made landfall.

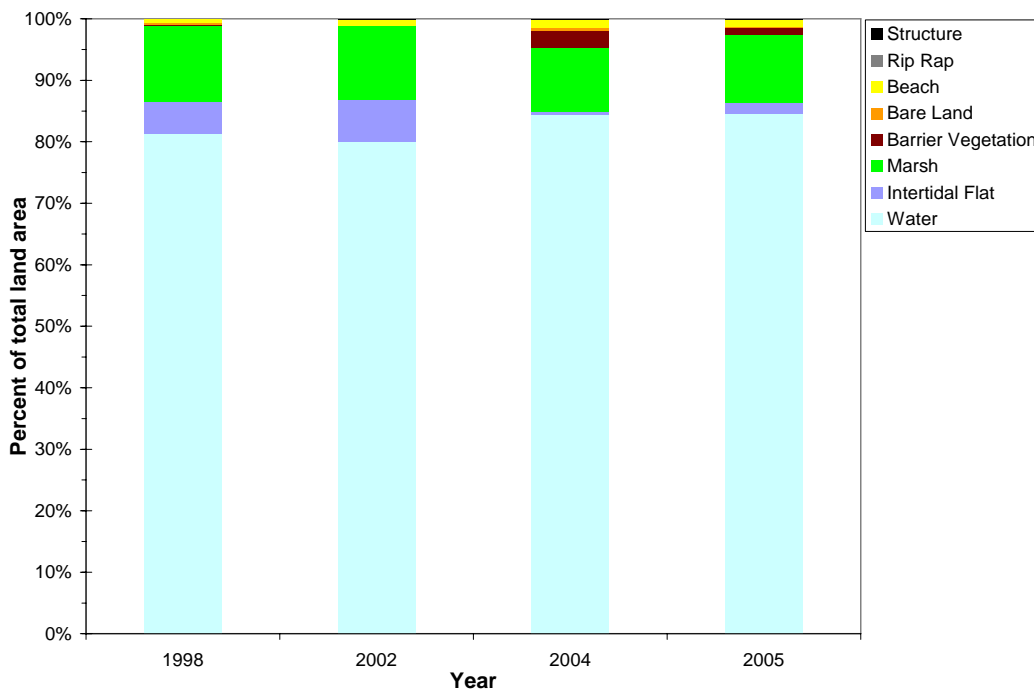


Figure 17. The percentage of different habitats in the Grand Terre analysis area during the four analyses time periods. The entire analysis area is 6,842 acres in size.

### Modern Delta (Quatre Bayou Pass to Sandy Point)

The Modern Delta analysis area is entirely contained within the parish of Plaquemines and extends from Quatre Bayou Pass east to Sandy Point. The analysis area includes the Chaland Headland, Bay Joe Wise, Shell Island, Scofield and Sandy Point. The Barataria Barrier Island Complex project (BA-38) restored portions of the Chaland Headland shoreline (LCWCRTF, 2008c) and the Pass Chaland to Grand Bayou Pass Barrier Shoreline Restoration project (BA-35) restored the shoreline of Bay Joe Wise (LCWCRTF, 2008d). However, both of these restoration projects were completed in 2006 and therefore the affects of the restoration are not apparent in this analysis.

## Modern Delta

The habitat types in the entire Modern delta analysis area remain relatively constant through out all analysis time periods (Figures 18 through 22). Even in response to Hurricane Katrina, the relative acreages of habitat types through out the Modern delta remains constant. There are minor fluctuations in the acreages of intertidal flat habitat from analysis year to year; however this is likely the result of changing water level conditions between analysis years.

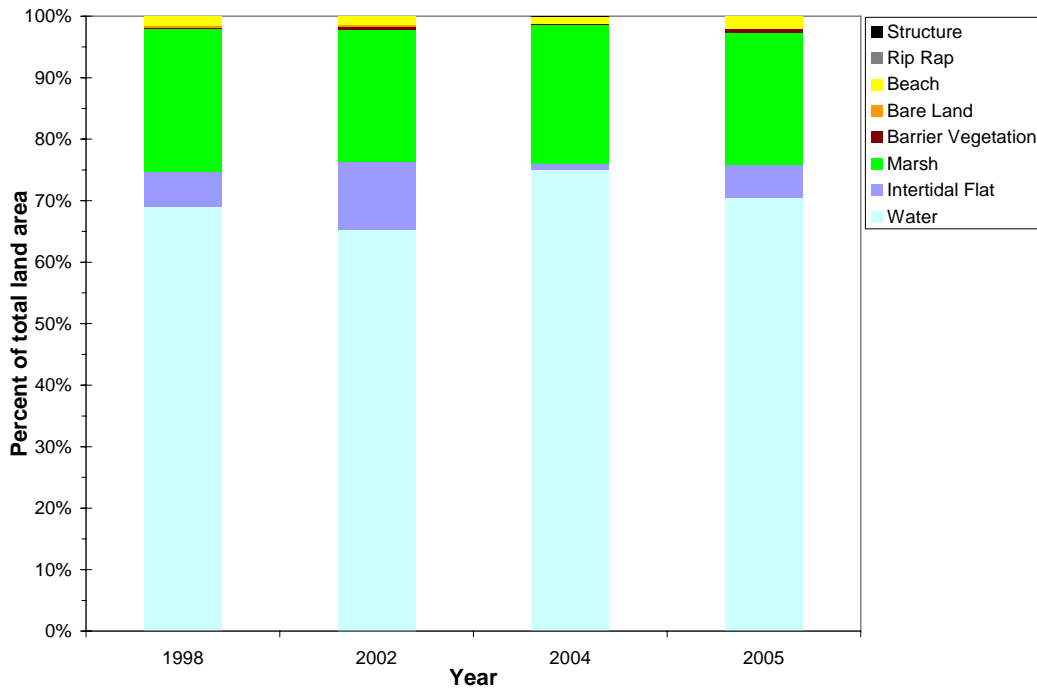


Figure 18. The percentage of different habitats in the Chaland Headland analysis area during the four analyses time periods. The entire analysis area is 6,934 acres in size.

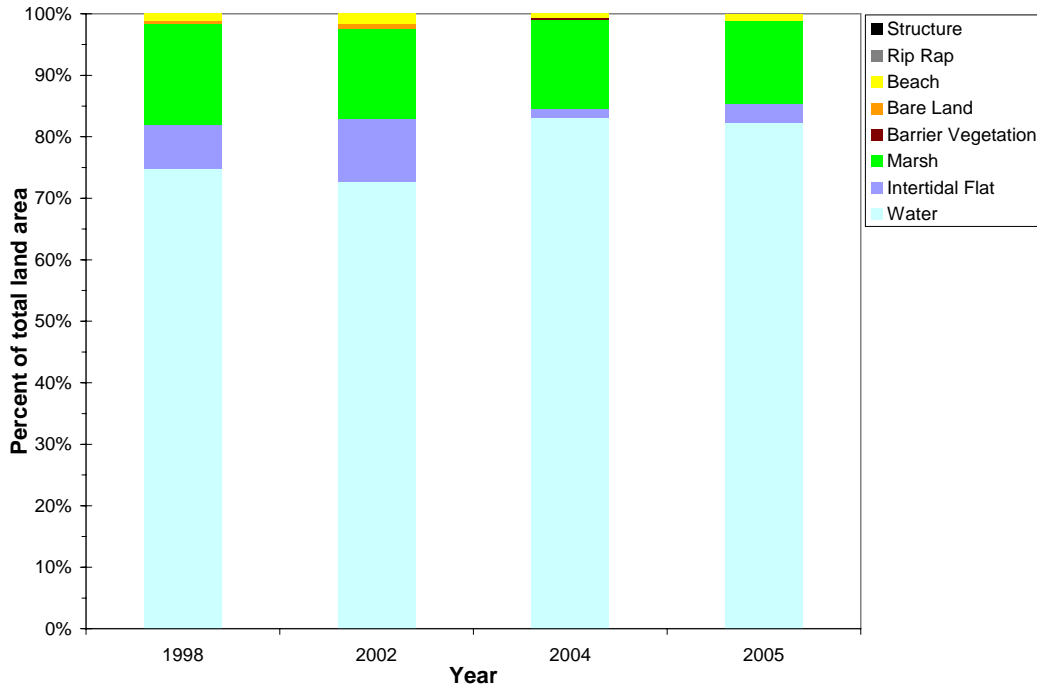


Figure 19. The percentage of different habitats in the Bay Joe Wise analysis area during the four analyses time periods. The entire analysis area is 2,315 acres in size.

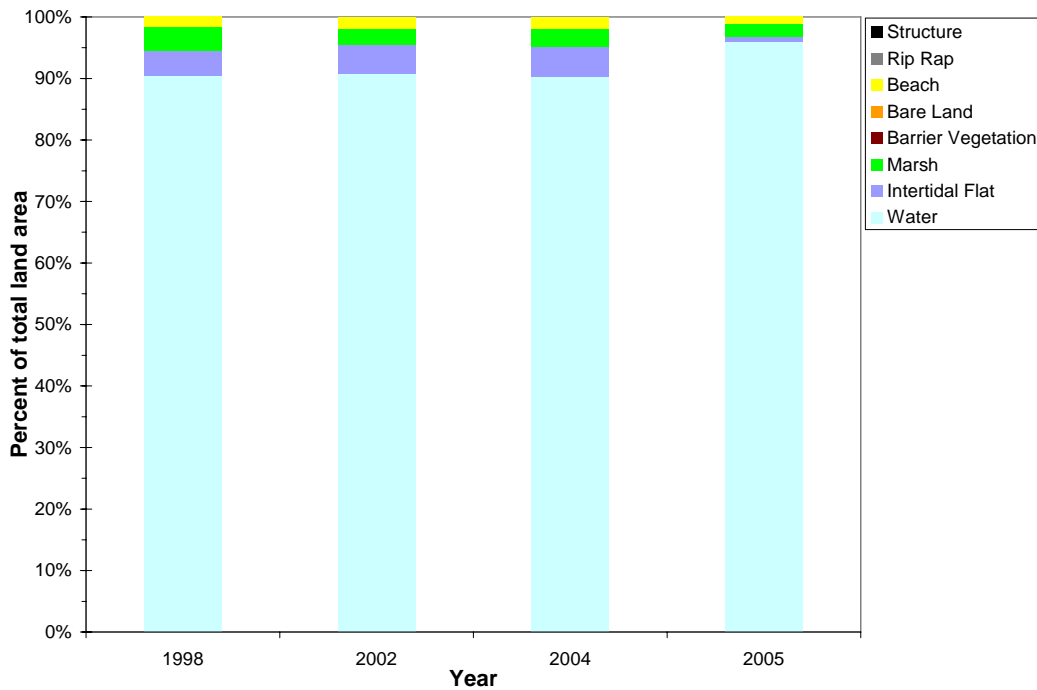


Figure 20. The percentage of different habitats in the Shell Island analysis area during the four analyses time periods. The entire analysis area is 2,549 acres in size.

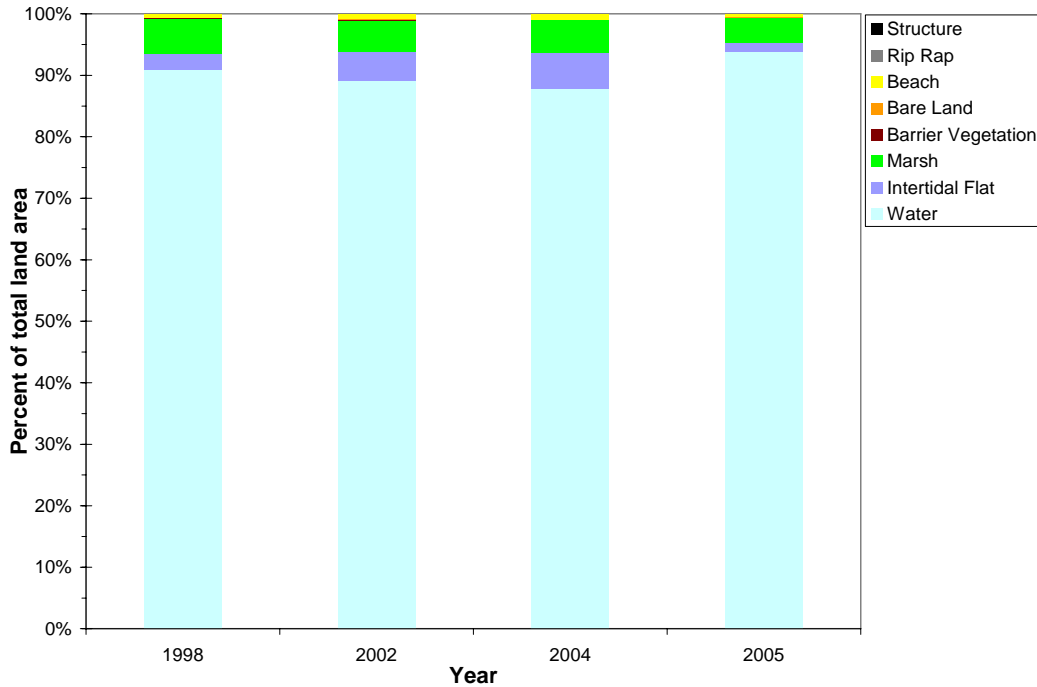


Figure 21. The percentage of different habitats in the Scofield analysis area during the four analyses time periods. The entire analysis area is 8,066 acres in size.

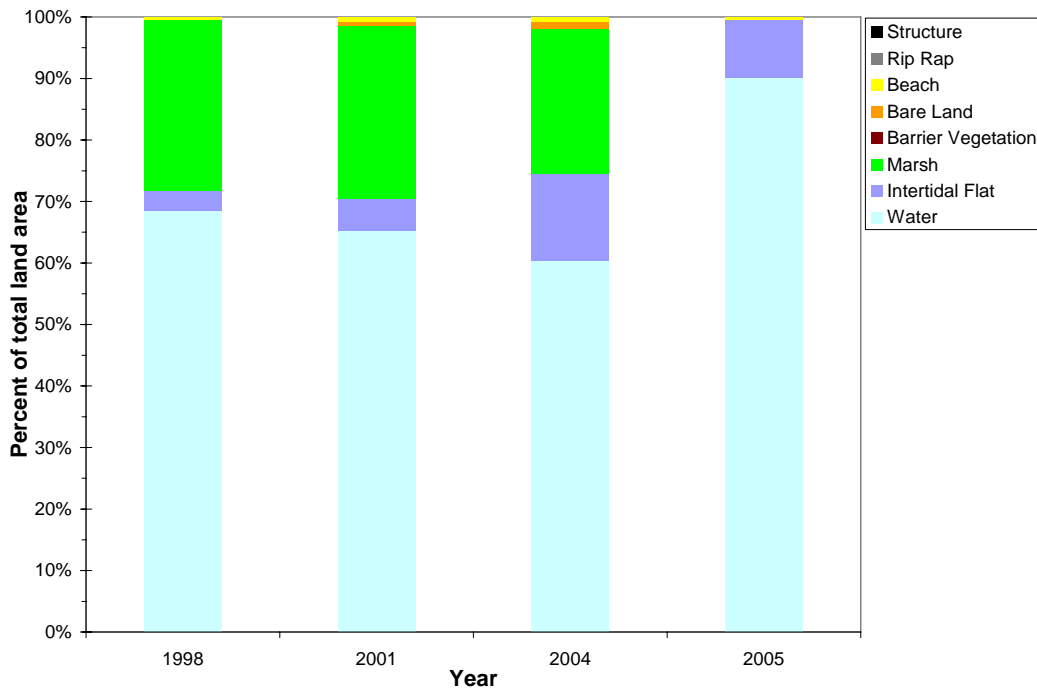


Figure 22. The percentage of different habitats in the Sandy Point analysis area during the four analyses time periods. The entire analysis area is 5,372 acres in size.



## Chandeleur Islands (Breton Island to Hewes Point)

The Chandeleur Islands analysis area includes both the south islands (Breton, Grand Gossier, and Curlew) and the entire North Island to Hewes Point. Restoration along this shoreline is limited to the Chandeleur Islands Marsh Restoration project (PO-27), which was completed in 2001. This project planted *Spartina alterniflora* on 22 overwash fans, stabilizing approximately 364 acres of land (LCWCRTF, 2004b).

### South Chandeleur Islands

The most drastic change in habitat types on the south Chandeleur islands occurred after the passage of Hurricane Katrina (Figures 23 and 24). All habitat types on Breton, Grand Gossier, and Curlew islands were converted to open water in analysis year 2005. Prior to the impact of Hurricane Katrina, Breton Island remained relatively stable during the other analysis years. Grand Gossier and Curlew were almost destroyed in the 2002 analysis year after the impacts of Hurricanes Isidore and Lili, however the islands recovered slightly by analysis year 2004.



Figure 23. The percentage of different habitats in the Breton Island analysis area during the four analyses time periods. The entire analysis area is 2,354 acres in size.

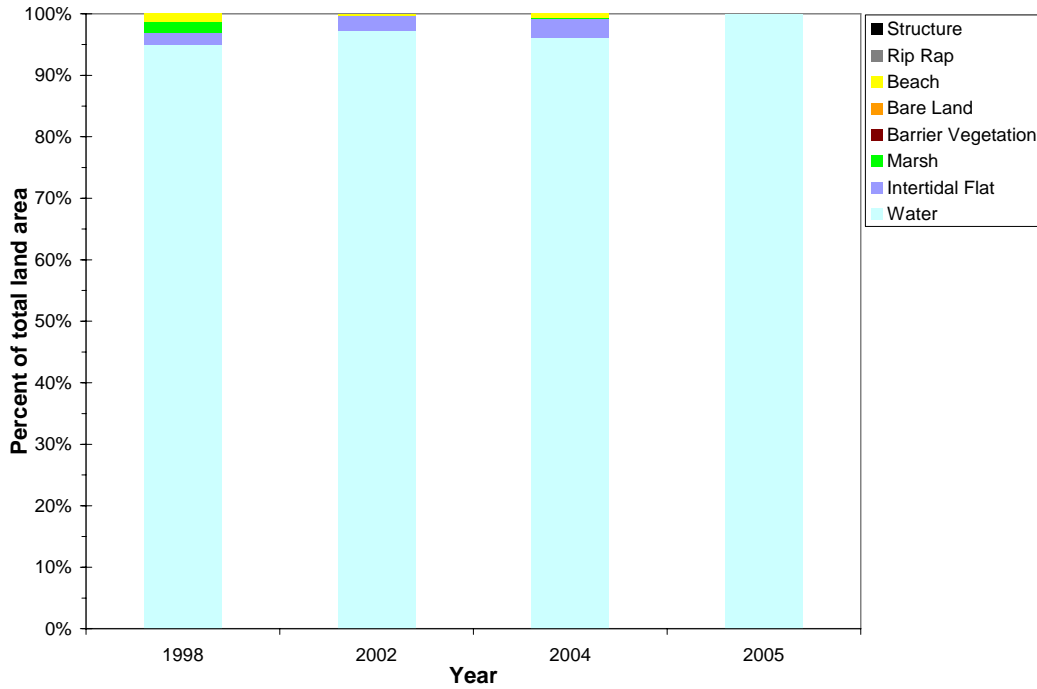


Figure 24. The percentage of different habitats in the Curlew and Grand Gossier Islands analysis area during the four analyses time periods. The entire analysis area is 11,089 acres in size.

## North Chandeleur Island

The acreages of habitat types on the North Chandeleur Island remains relatively stable through out the first three analysis years but similar to the south islands the northern Chandeleurs were decimated by the impact of Hurricane Katrina (Figure 25). During analysis year 2005 the only remaining habitat on the island is marsh. All other habitat types were destroyed. Little change in the acreage of marsh habitat is apparent from the restoration done in 2001 (PO-27).

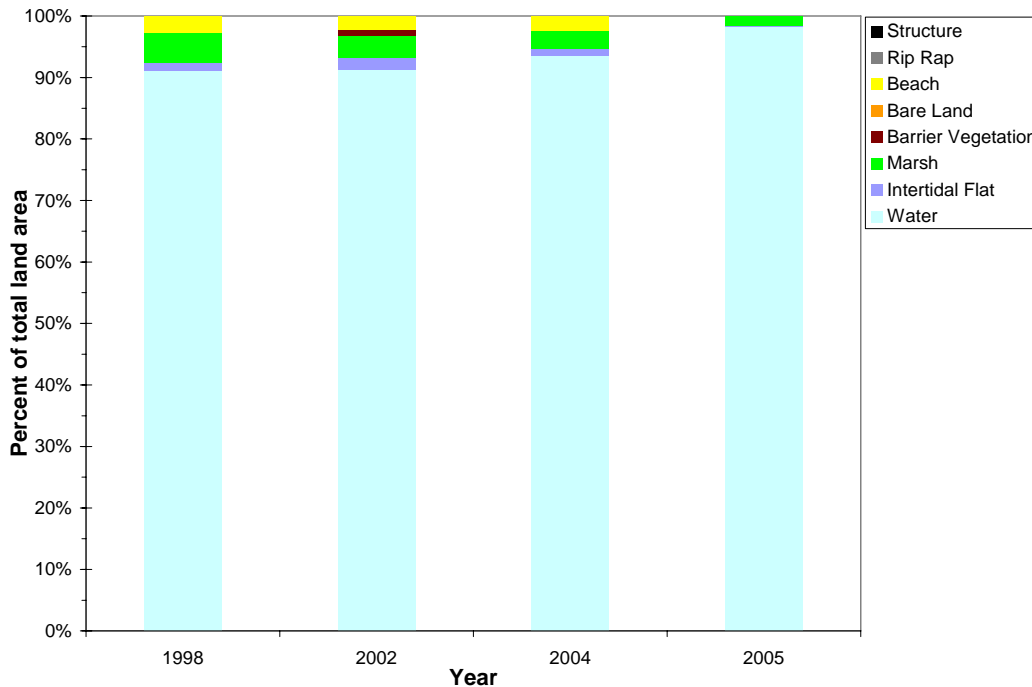


Figure 25. The percentage of different habitats in the North Chandeleur Island analysis area during the four analyses time periods. The entire analysis area is 50,748 acres in size.

## Island Area and Land Loss Measurements

Measurements of the total island area in each analysis time period can be made by summing together the acreages of different habitat types on each island to determine a total land area. Total land acreages have been made for the Teche and Chandeleur Islands barrier shorelines in the shoreline change task final report and will not be repeated here. Total land acreages for the Chenier, Lafourche, and Modern Delta barrier shorelines are included in Table 3.

<b>Barrier Shoreline</b>		<b>1996/1998</b>	<b>2001/2002</b>	<b>2004</b>	<b>2005</b>
Chenier Plain	Johnson's Bayou/ Holly Beach	47647.46	39708.79	48544.17	46911.44
	Cameron/ Hackberry Beach	28280.06	27671.34	32980.55	31434.48
Lafourche	Timbalier Island	1308.50	1478.84	1409.83	1536.56
	East Timbalier Island	355.78	481.54	399.02	408.81
	Caminada Headland	9585.51	10098.11	8382.69	10141.97
	Grand Isle	2318.56	2436.34	2378.13	2378.85
	Grand Terre	1273.52	1366.61	1067.27	1053.83
Modern Delta	Chaland Headland	2153.19	2409.06	1729.99	2050.86
	Bay Jo Wise	581.73	630.90	392.69	408.44
	Shell Island	241.45	235.95	249.26	100.26
	Scofield	730.58	883.30	979.98	497.03
	Sandy Point	1686.89	1863.01	2307.95	1611.34

Table 3. Total acreages of land in each analysis time period for the Chenier Plain, Lafourche, and Modern Delta barrier shorelines.

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