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"State-of-the-beaches" of Alabama: 2000

by

Scott L. Douglass and Bradley H. Pickel
Civil Engineering Department
University of South Alabama
Mobile, AL 36688

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To
Coastal Programs Office
Alabama Department of Economic and Community Affairs

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"The Gulf of Mexico beaches are one of the top economic and environmental assets in coastal Alabama."

Preface

This report was written for citizens interested in the scientific understanding of Alabama's Gulf beach erosion that has been developed through research at the Coastal Engineering and Science Research program at the University of South Alabama. The report attempts to explain the analysis tools and results in a format for laymen. Some suggestions for future management decisions also are included at the end of the report.

The authors of the report are Dr. Scott L. Douglass, Professor of Civil Engineering, and Bradley H. Pickel, Research Assistant. They can be reached through the Department of Civil Engineering by telephone at 334-460-6174 and by email at sdouglas@jaguar1.usouthal.edu or bpickel@jaguar1.usouthal.edu, respectively.

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Summary

The Gulf of Mexico beaches are one of the top economic and environmental assets in coastal Alabama. The beaches are some of the prettiest in the world and their use by citizens is at an all-time high level. Unfortunately, the health of some of the beaches is worse than at any time in the state's history and the prognosis for the future is unclear. Alabama citizens are faced with a clear choice as we enter the 21st century. If we better manage our beach and inlet sands, we can preserve our beautiful beaches for our own enjoyment and for the enjoyment of future generations. If, however, we ignore sound coastal engineering and management principles, we will continue to see the beaches gradually decay.

We are responsible for much of the damage to the beaches. Some of the damage is a result of trapping and removing sand by engineering and dredging at the inlets and some is a result of building too close to the water. There are clear, sound coastal engineering and management solutions to the inlet problems but they need to be properly designed to maximize their benefits and minimize their costs.

All of the Gulf of Mexico beaches of Alabama naturally fluctuate in width in response to the variable wave climate. The dry portion of the beach often builds wider when the waves are milder and gets narrower when the seas are stormier. Identifying the long-term trends in the midst of these fluctuations is important. About half (18 of the 38 miles measured) of Alabama's Gulf beaches have gotten narrower in the past three decades. Half of the beaches, while they fluctuated in width, did not have a trend in either direction. A few miles of beaches widened in response to engineering. Figure 1 (also on the cover) shows the general locations of these shoreline change trends. A more detailed breakdown of specific locations and rates of change is shown in the report (Figure 2).

The behavior of the beaches in 1999 generally was consistent with the trends of the past decades. One year after Hurricane Georges, the beaches had apparently only partially achieved their natural post-storm recovery. Recovery has been much less complete on the west end of Dauphin Island where the beaches are stressed by the lack of historic sand bypassing at Mobile Pass.

Suggestions for the future management of Alabama's beaches include improved sand bypassing at inlets, sound beach nourishment engineering, significant changes in the role of government in beach and inlet management, and future research focused on addressing the critical engineering and management issues.

The formation of an Alabama chapter of the premier national association for the preservation of the beaches and shorelines of the state is recommended. An Alabama chapter of the American Shore and Beach Preservation Association could serve to bring together for cooperation the many individuals, interests, and agencies concerned with the protection and proper utilization of the shores and beaches of the state. This could foster sound, far-sighted, economical development and preservation of the beaches.

Introduction

This report presents data, analysis and recommendations for managing the health of the narrow strip of beach sand between the buildings and the water. This is the second "state-of-the-beaches" report. The first was released one year earlier in January 1999. The next section of this report (page 6) outlines the differences between this report and the previous report.

Specific emphasis in this report is placed on determining any trends in beach width and, where possible, explaining those trends in terms of the physical, coastal processes that are causing the changes. Notes are also made as to how well the trends and their causes are understood and where further research is warranted to improve our understanding of the "state-of-the-beaches."

Individual reaches, or stretches, of beach are discussed in the "Beach by Beach" section of this report. The reaches are selected because these stretches of beaches, from 1 to 13 miles long, are generally behaving similarly. The extensive beach systems of the bays, sounds, and bayous of Alabama are not discussed in this report.

"Golden is the sand"

The Robert Louis Stevenson poem with the line "golden is the sand" was not written with the Alabama beaches in mind - but it could have been! Alabama's Gulf of Mexico beaches are one of the greatest economic and environmental assets of the state. The tourist economy in south Baldwin County provides over 40,000 jobs and over $1 billion in revenue annually. All of this business ultimately rests on the thin strip of beach sand, the strand, along the Gulf of Mexico.

Alabama citizens throughout the state consider the Gulf beaches to be one of the state's prettiest areas. Indeed, people from throughout the nation and the world acknowledge that the beauty of the white sand and gentle surf makes for some of the prettiest beaches in the world.

Like sugar attracts ants, the sugar-white sands of Alabama attract people. The Alabama Gulf front properties have experienced tremendous development in the past few decades. The percentage of Gulf front lots with condominiums or hotels rose from 3% to 22% between 1970 and 1996. The percentage of condominiums will continue to increase as more single-family houses are replaced with condominiums. The density of the housing of the beachfront properties is extremely high. During peak summer weekends these densities approach only several inches of coastline per person! There is only ½ inch of Gulf of Mexico beach per Alabama citizen.

Terminology

The terms, "recession" and "accretion" are used in this report to describe the direction of shoreline movement. A "receding" or "recessional" shoreline is one where the beach is eroding and getting narrower. In other words, since this report only considers the Alabama Gulf of Mexico, a receding shoreline is moving north. An "accreting" or "accretional" shoreline is one where the beach is gaining sand and getting wider. In other words, an accreting shoreline is moving south.

The relationship between inlets and beaches

Most of the dramatic shoreline change in Alabama is near the tidal passes or inlets. Some of this shoreline change is probably in response to natural inlet fluctuations. And, man's engineering has influenced much of it. Alabama has three tidal inlets through the Gulf barrier island system: Perdido Pass, Little Lagoon Pass and Mobile Pass (not counting Petit Boit Pass at the western end of Dauphin Island that straddles the Mississippi-Alabama border). Each of the three passes in the state has a significant impact on the beaches in the vicinity of the pass. Each of the passes has engineered jetty or seawall structures and regular dredging to maintain adequate water depths.

The sand that is dredged from these passes is sand that came off the adjacent beaches. It is also sand that was on its way back to the beaches before it was removed by dredging operations. That sand is part of the same littoral system as the sand on the beaches. The details of our understanding of the relationship between the beaches and passes are discussed throughout this report.

Littoral drift

Along the Alabama Gulf beaches, the dominant direction of longshore sand transport, or littoral drift, is from east to west. However, often and for sustained periods of time, significant amounts of sand move

toward the east. The dominant process, or mechanism, for moving sand in the littoral system is longshore sand transport. Longshore sand transport is the wave-driven movement of sand along the coast. As waves approach a beach at an angle, they break and move sand in that direction. Thus, when waves approach the beach from the other direction, the longshore sand transport direction reverses. Winds and tidal currents, while important in some situations, are clearly secondary processes in terms of sand movement along the coast. Many of the long-term shoreline change trends in Alabama can be explained in terms of changes in longshore sand transport.

Changes from last year's "state-of-the-beaches" report

While much of this report is similar to last year's report, there have been several important findings about the beach behavior and several important management initiatives. This year's recommendations are updated forms of last year's recommendations with one addition. The formation of a new Alabama chapter of an organization dedicated to preserving the beaches and shorelines of the state is recommended.

Beach changes this past year

The overall summary figure of the trends in beach width (Figure 1 and cover of report) has not changed because the results didn't significantly change with the addition of 1997 and 1999 shoreline position data. The numerical values of shoreline change rate for each location (Figure 2) changed slightly at all locations but the big picture did not. This is to be expected since the methodology is not sensitive to short-term (year-to-year) changes but is alongshore on understanding the long-term (several decades) trends underlying the day-to-day fluctuations.

The implication from the air photo data and the beach profile data is that the natural post-storm recovery from Hurricane Georges is underway but not complete. Because of the way the data are collected, outlined below, too much significance should not be attributed to any single beach width measurement in the air photo analysis - even the most recent measurement. Nonetheless, it is notable that the beach width measured in 1999 was wider than the beach width measured in 1997 at many locations throughout the state. In other words, the dry beach was wider one year after Hurricane Georges than it was one year before Hurricane Georges at many locations. An example is shown in Figure 6. However, most of the beach profile data indicate that the primary sand bar is farther offshore and at a deeper elevation than at any other time in the data set. An example is shown in Figure 5. The implication of these two facts, dry beach recovery without sand bar recovery, is that the beaches have only partially recovered from the hurricane. This level of recovery one year after a major storm is consistent with what is expected based on other data sets around the country.

One of the technical findings that is slightly different this year is for the erosion on the west end of Dauphin Island. In last year's state-of-the-beaches report, the lack of historic sand bypassing at Mobile Pass was identified as one probable cause of erosion there. This year, it is identified as the primary cause of the erosion. Based on analysis of the more recently collected beach profiles, the updated shoreline recession data based on air photos, historical shoreline and bathymetric charts, inspection of the beaches since Hurricane Georges, and general coastal engineering and science principles including investigations of beach response near other long-term blockages of the littoral system; it is becoming clear that the ship channel dredge disposal practices are the primary cause of erosion on the west end of Dauphin Island. It appears that these beaches may be just beginning to suffer severely from the decades of complete littoral blockage out by the lighthouse. The patterns of the island's erosion are generally consistent with those found at other places where the littoral system has been interrupted. The west end Dauphin Island erosion problem is consistent with what is expected downdrift of an interruption. This is discussed in the Beach by Beach section for the west end of Dauphin Island below.

Beach management initiatives undertaken in last year

There has been much activity at the local and federal levels of government concerning the management of the beaches and inlets of Alabama. While these initiatives have not widened the beaches yet, several of them have the potential for doing so in the near future.

The City of Gulf Shores has begun to design a beach nourishment project to widen the beaches in the center of the City. This was recommended in last year's "State-of-the-beaches" report. At the time this report was written, extensive sampling was underway to specifically locate and verify the quality of offshore (but near enough to minimize pumping costs) borrow areas for beach nourishment. The quality of the borrow sand is one of the single most critical aspects of the engineering of any beach nourishment project. Two other critical aspects of the coastal engineering design of beach nourishment projects are the estimate of the project's future performance with state-of-the-art tools and the monitoring of the project's post-construction performance. All three critical aspects of beach nourishment design are being pursued by Gulf Shores and will be used to make decisions.

A project is also presently being proposed for a combination beach nourishment and dune restoration project for the west end of Dauphin Island. The project is typically referred to as a "berm" project because the funding authority is a post-disaster emergency response for restoring the sand dune removed by Hurricane Georges. A beach nourishment project, i.e. sand place directly in the surf zone, will have to be built in order to place the dune south of the houses. If it is engineered correctly, this beach nourishment project can successfully widen the beaches and barrier island.

In the aftermath of Hurricane Georges, sand was dredged from Perdido Pass and stockpiled for purchase and use for beach restoration on a lot-by-lot basis. Any sand not replaced in the beach system, either in a stockpile or trucked away, will contribute to beach erosion in Orange Beach and Gulf Shores. The sand bypassing at Perdido Pass should be improved such that all of the sand reaches the beaches. A state-funded study of Perdido Pass scheduled for the coming year should identify the problems more clearly and make recommendations for improved bypassing.

At Mobile Pass, an attempt at sand bypassing was made in 1999 after Hurricane Georges. Three million cubic yards of sand dredged from near the lighthouse was not placed in the usual disposal site that is clearly out of the littoral system. Instead it was placed immediately west of the Mobile Pass ship channel south of the lighthouse in an attempt to place it in the littoral system. However, the selected disposal site was not the best location for returning the sand to the state's littoral system based on state-of-the-art coastal engineering analysis. Better locations would have been in the shallower shoals to the northwest of the site selected or directly on the beaches of Dauphin Island where the sand is needed.

Two presently ongoing studies may contribute to better future sand bypassing decisions at Mobile Pass. A beach management plan is being developed for the Town of Dauphin Island and the state. This plan will make recommendations for the long-term management of the island's beaches. It will be released early in 2000. The U.S. Army Corps of Engineers District, Mobile has just begun a new, multi-year study of the entire north-central Gulf of Mexico coast from Dauphin Island, Alabama to the Appalachicola area in Florida. The study, the Regional Sediment Management Initiative, was funded by the U.S. Congress as the pilot project for several similar proposals across the nation. The primary purpose is to look at how the beach sands can be better managed within the federal framework of laws and regulations to keep them on the beaches but out of the navigation channels. This federal initiative will help the beaches and people of Alabama if it leads to improved sand bypassing at Mobile Pass and Perdido Pass.

Recommendations

The recommendations for beach management are updated forms of last year's recommendations with one addition. Sand bypassing and beach nourishment are restated because they are the primary coastal engineering tools that can help the health of the beaches of the state. Both recommendations have been partially implemented but can be improved.

The recommendation concerning changing the role of government in beach management has been

expanded. Some funding and authority, at the level of state government (or bi-county level), to solve erosion and inlet shoaling problems is recommended. This could save the taxpayers of Alabama money while improving the beaches and passes.

One new recommendation is made to the citizens and professionals of the state that want to preserve the beaches. An Alabama chapter of the American Shore & Beach Preservation Association should be started. The mission of the association is to preserve the beaches of America. The organization has been a national leader for over 60 years and has recently led the efforts in several other coastal states towards preserving beaches.

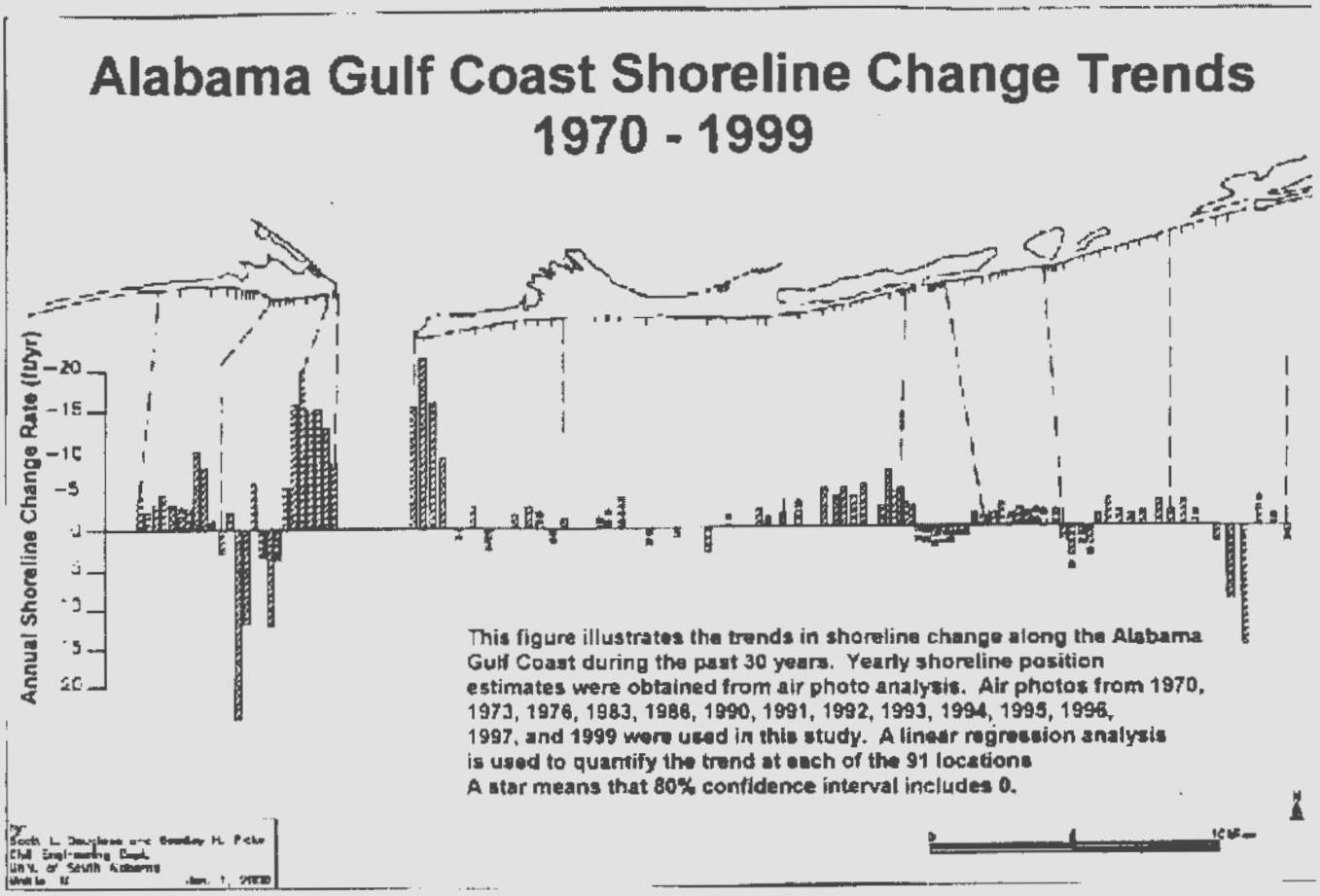
Data and Analysis

Two types of data are regularly used to measure the beaches: aerial photography and beach profile surveying. Aerial photography allows for an estimate of the dry beach width at that moment in time. However, because of cross-shore sand transport mechanisms such as sand bar migration, the dry beach is only a small portion of the complete littoral system. The sand underwater immediately offshore of any sandy beach is also part of the beach system since it reduces wave energy and feeds sand to and from the dry beach. Surveyed beach profiles measure the underwater portion of the littoral system as well as the elevations of the dry beach and dune system.

The University of South Alabama's air photo shoreline change database was used to calculate average annual erosion rate. The data are shoreline positions based on 14 sets of air photos spanning the 1970 to 1999 period. Five of the 14 sets of air photos were taken during the 1970's and 80's. Ten sets of air photos were taken annually, in late September or early October, in the 1990's by the ADECA Alabama Coastal Programs offices. Post-storm photos, such as the October 1998 photos taken immediately following Hurricane Georges, are not used in this analysis. The air photos are part of the Alabama Coastal Shoreline Archives that is housed in the College of Engineering at the University of South Alabama. The archives contain these and other air photos as well as most of the historic coastal charts and surveys of the Alabama coast.

Beach width was measured at 91 fixed locations from arbitrary but consistent points (e.g. the corner of a house, the centerline of a road) to the visible wetline. The measurements were adjusted for the actual scale on a photo-by-photo basis using Global Positioning System (GPS) technology. Sources of error include those due to interpretation of the wetline; water level fluctuations due to tides, winds, barometric pressure, and waves; and photogrammetric errors of tilt and lens distortion.

The data were evaluated using linear regression analysis to determine the shoreline change trend. (An example is shown in Figure 6. All of the data, like Figure 6, for each of the 91 locations is available on the internet at the address given in the preface).



The trend analysis results are given in terms of the average annual shoreline change rate in feet per year in Figure 2. The vertical bars represent the shoreline change trend at each location. They range from an accretion rate of over 20 feet/year at one location on Dauphin Island (on an accreting bulge on the golf course) to a recession rate of over 20 feet/year at another location on Dauphin Island (near the Coast Guard facility) and another location near Ft. Morgan. Positive trends indicate shoreline accretion: i.e. the beach was getting wider. Negative trends indicate shoreline recession: i.e. the beach was getting narrower. It is obvious from Figure 2 that the answer to the question "is the beach eroding" depends greatly on which Alabama beach is being considered.

Confidence intervals were computed for the trend. These intervals can be considered to be analogous to the "margin of error" that typically is presented with polling data.

The interpretation of the Figure 2 locations with bars with the open star (80% confidence interval includes zero) is that there is no trend. The beaches fluctuate but there is no trend. Some exceptions to this interpretation are appropriate at places where, because of man's manipulations, the changes are not linear.

The general summary Figure 1 was generated from the data in Figure 2 using three basic assumptions. One, that there is no trend in the data if the 80% confidence interval for the trend included 0 feet/year. Two, a single location with a significant trend is ignored if the adjacent locations showed no trend. Three, the beaches behaved consistently between data locations.

Locations :

1. DI-2 (West End)
2. DI-8 (Seneca Court)
3. DI-10 (2417 Bienville Blvd.)
4. DI-14 (Ponchatrain Court)
5. DI-17 (Park and Beach Board Beach)
6. DI-27 (Sand Castle Condo's)
7. DI-30 (Coast Guard Beach)
8. DI-32 (Groin Field)
9. B-14 (Cabana Beach)
10. B-19 (Bon Secour Wildlife Refuge)
11. G.S. 7 (2361 W. Beach Blvd.)
12. G.S. 6 (1881 W. Blvd./Whites House)
13. G.S. 5 (1557 W. Beach Blvd.)
14. G.S. 4 (1285 W. Beach Blvd.)
15. G.S. 3 (Edgewater Condo's)
16. G.S. 2 (Main Beach)
17. G.S. 1 (Holiday Inn)
18. B-24 (Gulf Shores Convention Center
19. B-34 (Romar Beach State Park)
20. O.B. 1 (Gulf State Park Cotton Bayou
21. B-41 (Phoenix 7/ Simms House)
22. B-45 (Wind Drift West)
23. B-48 (Floraboma)

Figure 3.

The report also contains beach profiles. 22 beach profiles in the state have been surveyed repeatedly since the early 1990's (see Figure 3 for locations). Some older beach profiles are available for Dauphin Island. The beach profile data were obtained using standard surveying techniques. Elevations along a line perpendicular to the shoreline are surveyed from a fixed benchmark across the dunes, beach, into the water and out to and sometimes across the sand bar. For an example, see Figure 5.

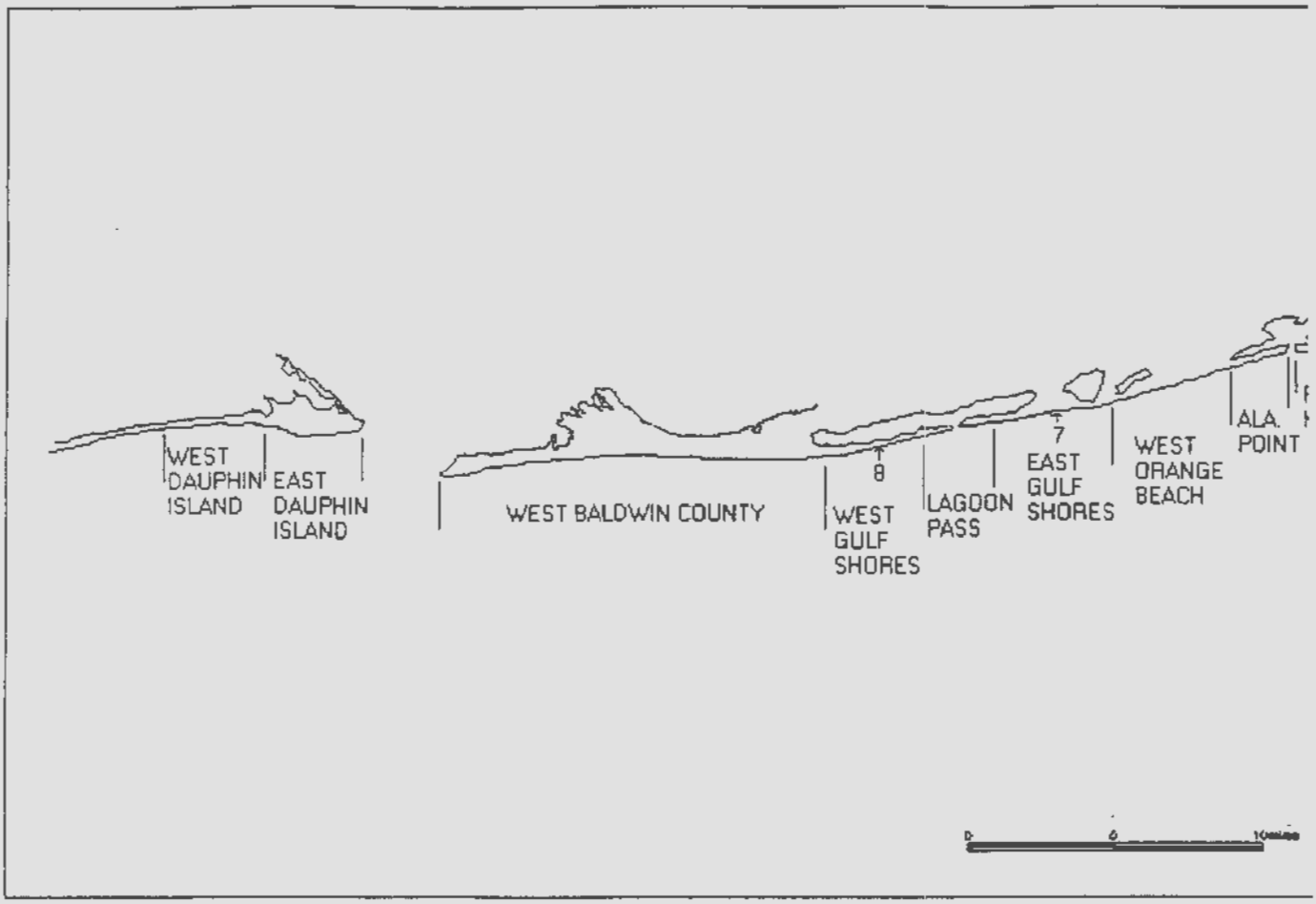


Figure 4.

Beach by Beach results

The following discussion summarizes the results of the monitoring data described above on a beach by beach basis. The individual beach reaches discussed are shown on Figure 4. The discussion also attempts to explain the results in terms of the authors' understanding of the coastal processes of that area based on a decade of research on the Alabama coast and general principles of coastal science and engineering. There is an incomplete understanding of the Alabama coastal processes because of the short duration and limits of our research. We do have a better understanding, through site-specific research, of the coastal processes affecting some portions of the Alabama coast than others.

Perdido Key

The western two miles of Perdido Key are in Alabama. The analysis of the air photos shows no significant trend. There are significant fluctuations, over 150 feet, in shoreline position. The beach profile data here also showed no shoreline change trends.

There are two major engineering projects that are important to the long-term health of the Perdido Key beaches. The jetties at Perdido Pass were built in 1968-69 immediately before the beginning of the air photo database used in this report. The jetties successfully "stabilized" the inlet. Prior to construction, the inlet had migrated along a stretch of coastline extending about 4 miles to the east of its present location in the past several hundred years. The present-day locations of all of the beaches of Alabama on Perdido Key were in the water of Perdido Pass at some point during the last two hundred years. The shoreline position just east of Perdido Pass is essentially fixed in place by the eastern Perdido Pass jetty.

The eastern jetty has a low weir section that allows sand to pass over the rocks into a deposition basin in the pass when sand is moving westward in the wave-driven littoral current of Perdido Key.

A large beach nourishment project was placed in Florida at the eastern end of Perdido Key in the early 1990's. The project was part of a sand bypassing effort with sand dredged from the deepening of the entrance to Pensacola Bay. This is the sort of sand bypassing that is needed in Alabama. A 400-foot wide beach was built along several miles of the Johnson Beach unit of the Gulf Islands National Seashore and even more sand was placed offshore in a constructed sand bar. It is possible that some of that sand may move out of the area to the developed Florida beaches of Perdido Key and eventually to Alabama in the future.

Alabama Point

Immediately west of Perdido Pass (for about 1 to 1½ miles) is one of only two beaches in the state that has gotten significantly wider since 1970. The western Perdido Pass jetty, built in 1968-69 just before the beginning of the air photo database used in this report, is a high, rock jetty designed to keep sand from moving back east into the pass. Figures 1 and 2 show the beaches for about a mile west of the pass have accreted since 1970. Figure 2 shows annual trends of up to 15 feet per year of accretion adjacent to the western jetty.

This deposition of sand adjacent to the western jetty is called a "fillet" by analogy with a fillet weld in the corner of two pieces of metal. The sand fillet formed as the beach planform (shape of the beach as viewed from above) moved toward a new equilibrium position adjacent to the jetty. When waves are approaching the Alabama coast from the southwest and the longshore sand transport is to the east, sand is free to move off the beaches of Orange Beach into this area. However, when waves are approaching the Alabama coast from the southeast and the longshore sand transport is to the west, the sand in this area is partially sheltered by both the rock jetty itself and the shoals around the mouth of Perdido Pass. Essentially, this sand is partially, permanently trapped in this fillet.

The sand fillet is also the location of the disposal area for the sand-bypassing operation at Perdido Pass. Most of the sand dredged from the deposition basin and main channel during the past thirty years has been placed on the beaches within several hundred yards of the jetty or immediately offshore of these beaches. The beaches have fluctuated dramatically in response to sand bypassing episodes. Historically, not all of the sand dredged from the pass has been bypassed. Some of it has been placed around the inlet and some of it has been stockpiled and removed by trucks. Some of it has been offered for sale to local developers at costs that are much lower than the actual cost of acquiring beach quality sand from other sources.

Further research into the correlation of these fluctuations and the dredging/sand-bypassing history is warranted. The bypassed sand has helped the fillet reach its new equilibrium planform or shape since the jetties were built. All of the sand in the fillet is sand that would otherwise have moved east into the channel or west to the other beaches of Orange Beach. Thus, the engineering project has probably permanently widened these beaches but, as explained below, perhaps at the partial expense of the beaches to the west.

West Orange Beach

The beaches of the western portion of Orange Beach appear to be receding from 1970 to 1999 (see Figures 1 and 2). This recessional reach extends roughly from the west end of Cotton Bayou to the western city border at the main unit of the Gulf State Park.

This recession may be due to the engineering of Perdido Pass. In particular, this recession may be due to the sand trapped in the fillet on the west side of the pass and due to the incomplete bypassing. As mentioned above for the wider beaches, this trapping can be explained as an expected response of beaches to construction of a jetty on a coast that has a variable wave climate. When waves are approaching the Alabama coast from the southwest and the longshore sand transport is to the east, sand is free to move off these beaches to the east. However, when waves are approaching the Alabama coast

from the southeast and the longshore sand transport is to the west, that sand is partially sheltered by both the jetty and the shoals around the mouth of Perdido Pass. Thus, the beaches farther to the west of the pass are starved.

Long-term erosion due to jetties typically is displaced some distance downdrift of the jetties due to the fillet formation as described above. At other jettied inlets of comparable size, the downdrift erosion occurs as far as 1 to 4 miles or more from the jetty. Essentially, the formation of an equilibrium shoreline and new ebb-tidal shoal after jetty construction traps large amounts of sand in the inlet vicinity and starves the downdrift beaches.

The pattern of accretion near the jetty and recession farther downdrift (Figures 1 and 2) is consistent with the signature patterns of erosion caused by jetties. Further research is needed to determine the amount of sand trapping by the Perdido Pass system and its effect on the beaches of west Orange Beach. A better, scientifically based, understanding of the coastal processes of the Perdido Pass area would be useful input to future decisions about the best location for disposal of dredged sands. Perhaps the sand bypassing operations could be modified to better include the interests of the downdrift Orange Beach beaches. The state-funded study by the University of South Alabama will address these issues this year.

East Gulf Shores

The beaches of the eastern, developed portion of Gulf Shores, from the western border of Gulf State Park to just west of the main beach area, show varying levels of recession mixed with areas that show no trend (see Figure 2).

This portion of the coast has the narrowest beaches in the state. For example, in the September 1995 photos used in this study, the beach widths, defined as the distance between the buildings or bulkheads and the high water line, averaged about 70 feet and varied from 0 to 130 feet along the central 2.5 miles of Gulf Shores beaches. They average over 200 feet and varied from 120 to 700 feet in the rest of Baldwin County. The narrow beaches in Gulf Shores may be due to encroachment of the buildings more than erosion. To the citizen or the tourist, the result is the same... the beaches are narrower.

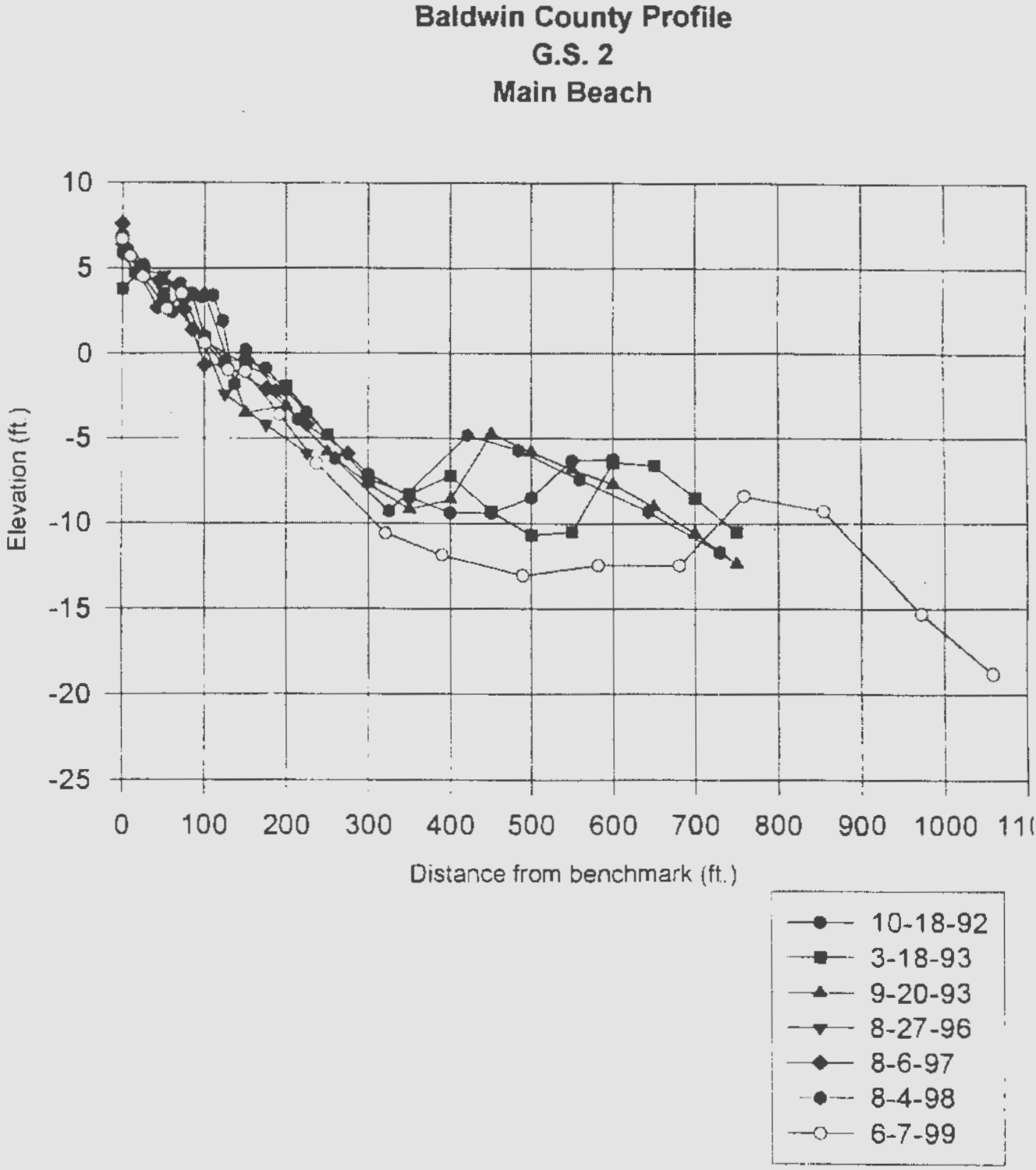


Figure 5.

There are several pieces of evidence that these beaches are more eroded than ever. Repetitive surveys of a beach profile are shown in Figure 5. Sand elevations in front of the aluminum bulkhead at the Main Beach (the "Hangout" area at the south end of Highway 59) at different times since 1992 are shown.

Most of the surveys are near the end of the summer when the beaches are typically at their widest. The figure shows that there is a tremendous amount of sand in the profile that is stored in the sand bar that is offshore.

Figure 5 also shows that the sand bar in 1999 was much farther offshore than at any time in the database and its crest was at a lower elevation. This is probably due to Hurricane Georges. Major storms typically move sand farther offshore to deeper water. Typically, these deep bars can take several years to migrate back to their pre-storm locations. Figure 5 also shows that elevations of the sand across most of the profile in 1999 were lower than at any other time in the database.

There is also some geologic evidence that the entire beachface is more eroded than ever. Relic peat or mud outcroppings were found this year on the beach face in fairly shallow water. They are probably ancient marsh deposits lain down behind the barrier island several thousand years ago. Their presence on the beachface now indicates that the beach and entire barrier island has migrated north so far as to expose these muds that used to be north of the barrier island. Similar mud/peat outcroppings are found on receding shorelines elsewhere.

The narrowness of the beach in this area may also be partially due to the trapping and incomplete sand bypassing at Perdido Pass. Jetty trapping and littoral system blockage has been found to cause beach erosion up to 20 miles away at other locations.

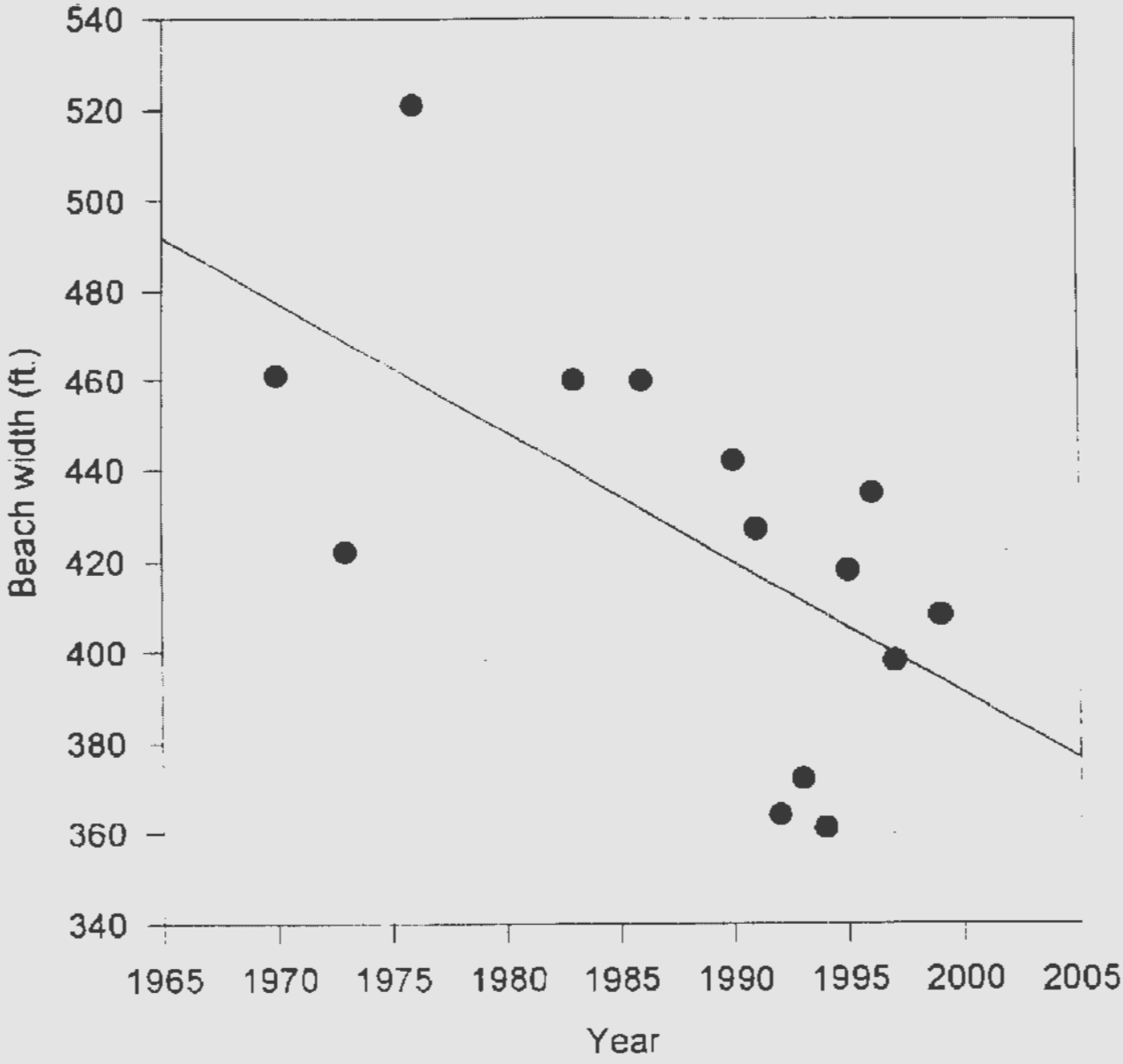
It is possible that the bulkheads and narrow beaches in this area have slightly biased the analysis used in this report. When water is adjacent to the wall, the beach width is measured at the wall instead of some landward or narrower location. It is known from observations that there are days with no dry beach seaward of the bulkheads in this area. It is not known if the frequency of occurrence of this condition is greater than it has been historically. Further research, including more detailed surveys of the full beach profile, is recommended to develop a better understanding of the beach sand volume and processes for future management decisions.

The City of Gulf Shores has begun to design a beach nourishment project to widen the beaches in the center of the City. This was recommended in last year's "State-of-the-beaches" report. At the time this report was written, extensive sampling was underway to specifically locate and verify the quality of offshore (but near enough to minimize pumping costs) borrow areas for beach nourishment.

The quality of the borrow sand is one of the critical aspects of the engineering of any beach nourishment project. The optimal borrow sand for Alabama would exactly match the native beach sand in terms of its composition, its median size, the size distribution about that median, the way that it behaves in the surf, and its color. The optimal nourished beach would feel, look, and function in the local wave climate much like the native beach. However, based on engineering experience elsewhere, the optimal borrow sand quality is rarely achieved in beach nourishment and the result is that the man-made beaches are often different than the native beach sands.

Two other critical aspects of the coastal engineering design of beach nourishment projects are the estimate of the project's future performance with state-of-the-art tools and the monitoring of the project's post-construction performance. All of the critical aspects of beach nourishment design are being pursued by Gulf Shores and will be used to make decisions.

Point 23
Pier 33 W



—— Slope = -2.9

	low	high
80% C.I. =	-4.4	-1.4

Figure 6.

Figure 6 shows the detailed results of the shoreline change analysis for one location. The location of the data is shown by the small "6" in Figure 4. Similar data for all the other locations in the state can be found on the web at the address given in the preface of this report. Figure 6 shows the dry beach width measured from an arbitrary location at 14 times in the last 30 years. The trend is negative. The linear regression line fit through the data is shown. It has a slope of -2.9 feet per year. The 80% confidence interval for the slope is from -1.4 to -4.4 feet per year. Thus, using the interpretations outlined in the previous section, this shoreline is receding.

Little Lagoon Pass area

The engineering of the pass has impacted the beaches around Little Lagoon Pass for at least a mile on either side. The inlet was stabilized by jetty construction in 1981. There was no sand bypassing system put into place. In a classic response to jetty construction, the beaches accreted on the eastern side and receded on the western side for about a decade. In the early 1990's a lawsuit settlement included the nourishment of the western beaches and the shortening of the jetties. With the nourishment and shortening of the jetties, dredging is now needed on a fairly regular basis (about 6 times per year) to maintain depths in the pass. The dredged sand is disposed of on the beaches to the immediate west. Essentially, the current operations are a form of sand bypassing.

The coastal engineering has worked to a major extent. The beaches have been widened on the western side of the pass and the pass has remained open. However, because of the constant dredging and shoaling process, there is some desire to further modify the jetty system. The Alabama Department of Transportation, the agency with responsibility for the jetties, is presently proposing a modification to widen the jetties.

A comprehensive coastal engineering and planning analysis should be done for Little Lagoon Pass. The pass is an outstanding resource for the people in many ways. Its flushing has a major impact on the water quality in Little Lagoon, it has significant impacts on the beaches to the immediate east and west, and it is a highly used municipal park. The pass also provides boat access from the Lagoon to the Gulf. However, the access is often severely limited by the shoaling and dredging operations. Navigation is often treacherous and could be improved with some sound coastal engineering based on a comprehensive look at all the needs and potential uses of the pass. The longshore sand transport along the beach, the tidal flushing of the pass, and the interactions between the two make for a complex situation that is traditionally addressed by coastal engineers.

The recent history of Little Lagoon pass is a good example of how decisions that are not based on sound coastal engineering and comprehensive planning can cause problems. Coastal engineers predicted both the downdrift erosion problem before the court-ordered jetty shortening, and the present-day shoaling problems in the pass. An open, sound, comprehensive coastal engineering and planning analysis for the pass could address the concerns of all the multiple users of the pass and arrive at options which will have public support, be cost effective over the long-term, and not have the negative impacts experienced in the past.

West Gulf Shores

The western beaches of Gulf Shores, from Lagoon Pass to the end of West Beach Boulevard, have been recessional since 1970. The extent of the recession, shown in Figures 1 and 2, includes most of the beaches to the west of Little Lagoon Pass. The causes of this recession are unclear and require further research. Part of the recession may be due to the engineering at Little Lagoon Pass. Another possible cause of the erosion along these beaches is the removal of sand from the beach system that occurs when a large storm hits the area. For example, when Hurricane Opal brushed this coast in 1995 on its way to Pensacola, the storm surge crossed over the barrier island allowing waves to move sand from the beaches and dunes across the road and into Little Lagoon. A layer of sand up to several feet deep was deposited on the lots and West Beach Boulevard at the end of the storm. Little of this overwashed sand was returned to the beaches from which it came. Hurricane Georges resulted in similar overwash. Some portion of the overwashed sand was returned to the beaches but the portion that was on private property,

or in Little Lagoon after the storm, was not returned to the beach. Thus, there was a significant removal of sand from the beach and dune system. The volume of sand removed from these beaches via this overwash process during Opal and Georges was very roughly equivalent to 20 to 30 feet of permanent beach width.

West Baldwin County

Most of beaches of western Baldwin County, from the west end of Little Lagoon to the end of Fort Morgan Peninsula, have no shoreline change trends for the past thirty years. Figures 1 and 2 show that most of these beaches have no significant trend. There has been some speculation that these beaches may be growing over the past century. These data however do not show any significant accretion in the past three decades. The beach widths along some of these beaches are the widest in the state because the construction was set back so far. The perception of healthy beaches may be partially because they are so wide as measured from the construction line. When the waterline is 300 feet from the buildings, shoreline fluctuations of plus or minus 100 feet are hardly noticeable. Figure 2 shows that a few locations have recessional trends. The western tip of Fort Morgan Peninsula, in the state park, in particular has extremely large recession rates. The recession is threatening to uncover some historically important artifacts. These recession rates are probably related to the dynamics of Mobile Pass. The elevations of the shoals offshore of this area have decreased. Part of this decrease may be natural fluctuations but part of it is probably also due to the removal of sand from the outer bar of Mobile Pass. The same problem is influencing the beaches of Dauphin Island.

East Dauphin Island

The Gulf beaches of the east end of Dauphin Island have experienced some of the most dramatic shoreline recession on any inhabited barrier island in the United States in the past 20 years. The shoreline recession is over 500 feet in the vicinity of the Coast Guard R&R facility. Several studies have shown that the location and elevation of the ebb tidal delta of Mobile Pass influence these beaches. Sand/Pelican Island as well as Dixie Bar is part of the ebb-tidal delta.

Shoreline change analysis shows that roughly the easternmost mile of the island is receding while the next mile of beaches to the west is accreting! This pattern is due to a shift of sand from the easternmost mile to the next mile to the west. This pattern of sand shift is consistent with one due to wave driven longshore sand transport along the beaches.

About 400,000 cubic yards of sand shifted from the easternmost mile of Gulf beaches to the next mile of beaches to the west between 1984 and 1996. The probable cause of this shift is a change in longshore sand transport rates due to changes in the wave climate caused by the northwestward migration of Sand/Pelican Island and the loss of elevation of the shoals around the outer portion of the ebb-tidal delta (near the Sand Island Lighthouse on both Dixie Bar and Sand Island Bar).

A wave-driven longshore sand transport model has been used to evaluate the sensitivity of the beach shift to the shoal elevations. The beaches of Dauphin Island were found to be so sensitive to the sheltering afforded by the shoals that a two-foot increase in the elevation of the shoal crest near the lighthouse would have reduced the longshore sand transport rate, and thus the erosional shift of sand along the beach, to roughly 50% of what was experienced. The implication is that the most landward recession on these beaches is attributable to the removal of sand from those shoals for maintaining the ship channel to Mobile. Over 16 million cubic yards of sand have been removed from the outer bar of the ebb-tidal delta and dumped offshore in the past 30 years.

West Dauphin Island

The Gulf beaches of the west end of Dauphin Island, from the little red schoolhouse to the end of the road, have been receding since 1970. The data analysis for this study stopped at the west end of Bienville Boulevard and did not include the undeveloped portion of the island. The recession rate has averaged 2 to 5 feet per year. This is one portion of the state that had much narrower beaches one year after Hurricane Georges than one year before the storm. The recession is so severe that the pilings

supporting several houses have been in the surf consistently during this past year. These houses were very close to the surf occasionally prior to Hurricane Georges. The beach profile data show loss of sand elevations across much of the profile.

The primary cause of erosion on Dauphin Island appears to be the federal navigation project at the Mobile Ship Channel. Specifically, the disposal of sand offshore, out of the littoral system, has caused both the west and east end beaches of the island to erode. Millions of cubic yards of sand have been removed from the littoral system near the Sand Island Lighthouse in the past several decades. The lighthouse is several miles "upstream" in the littoral system from the west end beaches. Sand apparently naturally moves via wave driven processes along the outer edge of the ebb-tidal delta (Sand/Pelican Island) from the area near the lighthouse towards the fishing pier. It then naturally moves from Sand Island to the beaches of Dauphin Island in the form of migrating sandbars between the pier and the general vicinity of Ponchatrain Street. From there, some of the sand is moved west via wave driven longshore sand transport toward the west end of Dauphin Island and some of it moves back toward the fishing pier. In essence, the "river of sand" that feeds the beaches of the west end of Dauphin Island is being interrupted by the dredging removal near the lighthouse. It appears that the west end beaches are beginning to suffer severely from the decades of complete littoral blockage near the lighthouse. There is also some natural component of this fluctuation. Shorelines near inlets often naturally fluctuate more than other shorelines because of inlet dynamics. Separating out the man-induced portions of erosion is difficult. One of the ways to do this is to compare with other inlets where the littoral system has been blocked.

The patterns of the west end erosion are generally consistent with those found at other places where the littoral system is interrupted. And they are consistent with what should be expected based on sound coastal engineering principles. One expected aspect is that there is some lag time between the beginning of the interruption and the downdrift erosion problem. This is due to the time it takes for sand to move through the littoral system. For example, at Little Lagoon Pass in Gulf Shores, the downdrift recession did not get critical until about a decade after construction of a jetty that trapped sand. The Dauphin Island/Mobile Pass littoral system is much larger than that one.

A more appropriate comparison for Dauphin Island may be Ocean City, Maryland where a new inlet for navigation created in 1933 trapped littoral sand in a new ebb-tidal delta and starved the downdrift barrier island. The starvation became critical within several decades and is still continuing to be felt over sixty years later up to 20 miles away. Initially at Ocean City Inlet, the downdrift shoreline began to recede. Then some large hurricanes caused significant island overwash. Eventually, numerous small winter storms caused frequent overwash as the dune field was not able to re-establish itself on the downdrift island (the north end of Assategue Island). Essentially, the downdrift barrier island was destroyed to the extent that it has migrated an entire island's width landward and is no longer inhabited. The scenario that played out at Ocean City Inlet fifty years ago is beginning to be played out again at Dauphin Island, Alabama. A total blockage of the littoral system gradually destroys the downdrift island.

Another aspect of the Dauphin Island erosion pattern that is consistent with what is to be expected downdrift of a littoral interruption is the distance. Dauphin Island's west end erosion due to this starvation mechanism begins several miles away from the ship channel and extends at least to the end of the road and probably much farther west (we have no data for the undeveloped portion of the island).

Another aspect of Dauphin Island's erosion problem that is consistent with what is to be expected downdrift of a littoral interruption is the fact that most of the obvious erosion and recession occurs during storms. Most littoral drift occurs during storm events and all island overwash occurs during major storms. It must be emphasized that the storm was not the underlying cause of the erosion but the agent that hurried it along. The beach is responding to the long-term starvation and most of the responding occurs during storms. Hurricane Georges was a big storm but Dauphin Island has experienced much bigger storms for centuries without the level of recession seen this time. Also, the shoreline position recovery of the rest of the state's beaches indicates that the west end of Dauphin Island is being stressed more in other ways. Beaches that are starved prior to a storm will erode more due to the storm.

There is a clear solution to the beach erosion problem on Dauphin Island. It is sand bypassing of the

dredged sands. They must be placed in the littoral system so that they begin to feed the beaches the way they would naturally. Good sand bypassing principles are discussed in the Recommendations section of this report.

Consideration should also be given to restoring the volume of beach sands that have historically been removed at Mobile Pass. Probably between 20 and 50 million cubic yards (the volumes prior to 1974 are apparently unknown) of sand have been removed from the littoral system this century. This could be partially restored with limited beach nourishment.

What can be done to improve the health of the future beaches

Some of the fondest memories of many Alabamians are of trips to the beach. Alabama has some of the prettiest beaches in the world today but many citizens would argue that they were prettier twenty years ago. The real issue is... how pretty will they be twenty years or fifty years from now? This section of the "State-of-the-beaches" report presents suggestions for the management of Alabama's beaches based on the technical findings presented above. Management decisions made along the coast during the past several decades has influenced the present day state-of-the-beaches. Likewise, management decisions made in the next few years will influence the future state-of-the-beach. The philosophy underlying these suggestions is that beach management and development decisions should be made either:

1. to work with the natural coastal processes, or
2. with an understanding of the costs of working against the natural coastal processes.

Successful management strategies are not based on technical information alone. They are based on value judgements of the policy-makers and the decision-makers. The technical information provided by this report is one input to the decision-making process. Thus, the technical input can be used to come to different management conclusions. These suggestions are based on a blend of an understanding of the technical results, the authors' perceptions of what is most important to Alabama at this time, and treating the beach sands of the state as a valuable resource. They deal with technical and management issues. The technical issues are:

A. improved sand bypassing at inlets
B. beach nourishment engineering

The management issues are:

A. changing the role of state government in beach and inlet management
B. public access
C. coastal construction practices

A recommendation is made to interested laymen and professionals to start an Alabama chapter of the American Shore & Beach Preservation Association.

Sand bypassing at inlets

Sand dredged from inlets should be placed either on the adjacent beaches or in a location where it will migrate rapidly to the beaches. This practice, called artificial sand bypassing, is a common engineering tool used to minimize the impact of inlet dredging on adjacent beaches. Essentially, sand bypassing just replaces the natural process that channel dredging interrupts.

Improved sand bypassing is vital to the long-term health of the Alabama beaches. The state should consider legislation that requires full sand bypassing at all inlets. We have to stop hurting our beaches by removing beach sands at the inlets. Most of the shoreline recession in the state is due in part to inlet

engineering and all beach quality sand should be returned to the beaches. The proper engineering design of sand bypassing is critical. The details of the bypassing operations should be based on sound coastal engineering principles and analysis.

Sand bypassing practices in Alabama have improved in the last decade. At present, bypassing of some limited form is occurring at all three inlets in the state: Perdido Pass, Little Lagoon Pass, and Mobile Pass. However, the operational decisions regarding the bypassing are primarily driven by the need to maintain adequate depths of water in the passes at the least cost to the dredging proponent. Bypassing schemes should be adopted which also directly consider the adjacent beach widths and the costs to the beaches of erosion caused by not bypassing.

At Mobile Pass, bypassing typically has not occurred. Millions of cubic yards of sand have been permanently removed from the littoral system by the dredge disposal practices used to maintain the Mobile Ship Channel. From 1974 to 1997, over 16 million cubic yards of sand were permanently removed from the littoral system of the state and dumped offshore in deep water. This is enough sand to widen the beaches of the inhabited portion of the island about 1000 feet. The removal of this sand from the littoral system has contributed to the beach erosion on Dauphin Island, both on the east end and the west end, and possibly to the beach erosion on Fort Morgan Peninsula. The removal of this sand from the littoral system is not a sustainable development practice if the future of Dauphin Island is considered.

An attempt at sand bypassing at Mobile Pass was made in 1999 after Hurricane Georges. Three million cubic yards of sand dredged from near the lighthouse was not placed in the usual, offshore, disposal site. The usual disposal site is clearly out of the littoral system. Instead, the sand was placed immediately west of the ship channel south of the lighthouse in an attempt to place it in the littoral system. However, the selected disposal site was not the best location for returning the sand to the state's littoral system based on state-of-the-art coastal engineering analysis. Better locations would have been in the shallower shoals to the northwest of the site selected or directly on the beaches of Dauphin Island where the sand is needed.

However, the selection of the disposal site was based, in part, on legal requirements to minimize the cost of the dredging operations. Placing the sand in one of the better locations for getting it into the littoral system would have cost more money. Unfortunately, the costs of starvation of the downdrift beaches are not considered in the federal government's cost analysis. The money for the added cost will either have to come from the federal government or some non-federal government. The non-federal co-sponsor for the Mobile Ship Channel is the Alabama State Docks with monies from the Alabama State Legislature. A major problem is that there is no state agency with legislative responsibility and funding for the beaches. This is discussed below.

In 1995, the National Research Council made specific recommendations concerning the use of beach quality sand from federal navigation projects for beach nourishment. In 1998, the American Coastal Coalition proposed a new national coastal policy that directly calls for "statutory language in the Water Resources Development Act that directs the placement of beach quality sand dredged from a navigation project on nearby beaches." It is suggested that the federal government to protect the beaches of Alabama from further degradation due to inlet engineering adopt these recommendations. Consideration could also be given to requiring the federal government to restore to the beaches the sand that has been historically removed for navigation dredging.

Beach nourishment engineering

Beach nourishment is the direct placement of sand on the beach to widen the beach. Beach nourishment can successfully widen beaches and decrease damages due to storms. The lessons learned from beach nourishment engineering nationwide in the past decade, and the very limited experience with beach nourishment in Alabama, indicates that it is a technically feasible way to widen the Alabama beaches. It is suggested that beach nourishment engineering be considered where wider beaches are desired in Alabama. Beach nourishment might be the appropriate solution along the heavily developed portions of the Alabama coast experiencing erosion including Gulf Shores, Orange Beach, and Dauphin Island.

The proper engineering design of beach nourishment projects is critical. There have been successful and unsuccessful beach nourishment projects worldwide. Some of the most famous beaches in the world; including Waikiki Beach, Miami Beach, and Los Angeles County's "Baywatch Beach;" are artificial beaches. However, many beach nourishment attempts have been characterized as failures. The "failures" are most often due to projects being built without following beach nourishment design standards. The proper engineering design of beach nourishment projects has evolved rapidly in the past several decades. There is much more engineering analysis and design involved in beach nourishment than just "dumping sand on the beach and hoping for the best."

The National Research Council has concluded that beach nourishment can provide protection from storm and flooding damage provided that state-of-the-art engineering standards are used for planning, design, and construction. Beach nourishment engineering includes properly evaluating both the native beach and borrow site grain size distribution and color, properly estimating the cross-shore movement of the placed sand, properly applying analytical and numerical models of the spreading of sand to adjacent beaches, understanding and accounting for background erosion rates and causes, and post-construction monitoring to properly evaluate performance.

State's role in beach and inlet management

There is no single government agency in Alabama with overall responsibility for beach and inlet management to which a citizen with a beach erosion or inlet shoaling problem can turn for assistance. Yet, because of the nature of the littoral system where actions at one place can cause erosion problems at a different location, the citizen has little recourse to address the problem without the assistance of government. It is recommended that the Alabama Legislature assigns responsibility to a single state agency for beach erosion and inlet management and provides funding for those activities.

Most other coastal states have such an agency at the department or division level of state government. These agencies are the focus of providing solutions to beach erosion problems throughout each state. They often are the focal point for state monies for coastal engineering projects such as beach nourishment, dredging, and non-federal matching monies to bypass sand at federal navigation projects. They usually provide coordination and technical services to the local governments with beach problems.

Most states have had such agencies for several decades. The most recent trend in other states is obtaining dedicated funding sources for coastal engineering solutions. Florida recently obtained the legislative authority for a dedicated funding of $30 million dollars per year for coastal engineering. With federal and local matching monies, that $30 million dollars is typically being leveraged into $100 million per year for projects to fix beaches. New Jersey also recently obtained legislative authority for about $20 million per year in state monies that is being heavily leveraged with federal monies so that roughly $75 million dollars per year is being spent on coastal engineering solutions such as beach nourishment and sand bypassing at inlets. Even Texas, which has historically lagged behind all the other states in coastal zone management issues, now has provided funding for coastal engineering solutions to beach erosion. The Texas legislature passed an initiative developed by Governor George W. Bush to fund $15 million for beach restoration through the Texas General Land Office over the next two years.

Meanwhile, Alabama has not specifically earmarked any state funds for beach erosion and inlet management solutions and has not given legislative responsibility to any part of the state government. The major responsibility for the beaches and inlets is split between at least five state agencies (Alabama Department of Economic & Community Affairs, Alabama Department of Environmental Management, Alabama Department of Conservation and Natural Resources, Alabama Department of Transportation, Alabama State Docks) with several others having some input. Each of these agencies has other primary missions. Some of them clearly do not even want to "be in the beach business."

This recommendation for a new beach and inlet management agency follows the spirit of the report to the 1996 Alabama legislature on the role of government in beach management from the Alabama Coastal Area Erosion Task Force, which was created by joint legislative resolution. Shoreline erosion management is an appropriate role for state government in close cooperation with coastal county and

municipal governments. The interconnectedness of the beach and inlet sands that make up the littoral system requires government intervention. The state's $1 billion annual coastal tourism industry that provides over $50 million in state, federal and local tax revenues ultimately rests on the quality and health of the beaches.

The "beach erosion and inlet management" agency should be assigned the responsibility and funded at a level adequate to carry out its mission in three areas:

1. *funding and implementing solutions to beach erosion and inlet shoaling problems.*
2. *monitoring the beach and inlet sand resource at a level adequate for selecting appropriate erosion responses.*
3. *Coordinating the state's responses to beach erosion and inlet shoaling and representing the state's beach related interests when the sand resources are manipulated.*

There are two inlets that this agency could take responsibility for immediately: Little Lagoon Pass and Pass Drury. The state taxpayer has paid roughly $500,000 per year (counting staff costs, legal settlements, and contractors) for the Alabama Department of Transportation (ADOT) to maintain Little Lagoon Pass. The responsibility and funding could be transferred from ADOT to this beach erosion and inlet management agency for better management of the pass. Also, Pass Drury (a small pass between Mobile Bay and Little Dauphin Island Bay) has become a problem for Dauphin Island and the Alabama Department of Conservation and Natural Resources. Solving its problem will require some comprehensive planning and sound coastal engineering.

This agency would allow the citizens of Alabama a more significant role in the management of the two federally maintained inlets in the state: Mobile Pass and Perdido Pass. The engineering at the passes has hurt the adjacent beaches. The federal bureaucracy has been slow to recognize the problem fully. One of the issues, however, has been the lack of local or state matching monies to help. Most federal programs today require non-federal cost sharing. In most other states the beach erosion and inlet management agency of state government provides this.

An alternative to a state-level agency, since there are only two coastal counties in Alabama, is some bi-county entity established by the counties with the support of the legislature that performs the same functions with coordination from the state. Perhaps one of the organizations that have formed for cooperation between Mobile and Baldwin Counties could take a lead role in developing this concept. Whichever way is chosen, someone in state or local government should have general responsibility for management and maintenance of the beaches and the inlets in the state. The beach focus initially should be on the Gulf beaches but there should be some responsibility for helping with bay and bayou shoreline erosion problems.

It should be noted that while state government historically has taken the lead role in helping Alabama's beaches, most of the recent efforts have come from the local and federal levels of government. Historically the state government, through the coastal programs offices of ADECA and ADEM, has been pro-active in beach management issues. In the past decade, these programs have improved the quality of beaches in the state. However, most of their limited funding is actually federal Coastal Zone Management Act monies, not state monies. Therefore, it can only be used for specific types of activities. It cannot be used to put sand on the beaches. The significant new initiatives outlined earlier in this report (see pages 7-8) are being funded by local (e.g. Gulf Shores beachfill design) and federal (e.g. Regional Sediment Management Initiative) government.

Public Access

Public access to the Alabama Gulf beaches is limited. There are long stretches of beach that have no public access today. Several decades ago, this was not true. Anecdotal evidence indicates that access across private property was common several decades ago but is severely blocked by parking restrictions and fences today. As property values continue to increase, and people from out of the area buy more of this property, Alabama citizens will have less and less access to their own beaches.

In the words of the syndicated columnist Rheta Grimsley Johnson in a series of columns about the coast in 1998,

"Used to be, eccentrics eddied up to the shore; now it's rich people who relish rules"

"It's the same story again and again, especially if there is a beach involved. We create a traffic jam getting there, raise buildings that block public access and jealously guard the limited turf"

The limited public access is an insidious threat to the future health of the Alabama beaches. Because of the interconnectedness of the natural littoral system, the most cost-effective solutions to beach erosion problems require government action. The political consensus needed for such proper action will be much harder to obtain when the general public perceives that its access to the beaches is limited. A reasonable analogy is highway construction. Highways are the best solution to many transportation needs. They are usually paid for with public monies, and receive public support because they are accessible to all citizens.

Opponents of beach improvement projects often cite the lack of public access. Unless public access to Alabama's beaches is improved, it is likely that the best solutions will not be politically possible and the beaches of the state will continue to deteriorate for another generation. Methods of increasing public beach access include: requiring access to government supported beach improvement projects, requiring beachfront condo developers to provide public access, constructing parking facilities at existing access ways, and acquiring beachfront property by state and local governments for access.

Beachfront building codes and practices

Setting construction of hard structures (bulkheads, buildings, etc) farther back from the water should be considered whenever and wherever possible. This is the only way that individual property owners can effectively widen their own beach. Allowing the beach to fluctuate without hitting structures is an excellent approach to insuring adequate beach width. The existing construction control line provides, at best, a small "buffer zone" to accommodate shoreline fluctuations. These should be considered minimal distances. Local governments and individual landowners should consider greater setbacks. Beach nourishment, suggested above, may be a viable engineering alternative to setting construction farther back. However, very preliminary analysis based on the geotechnical testing of the offshore sands for the beach nourishment design at Gulf Shores indicates that beach quality sands for nourishment may be limited along the Alabama coast. It may turn out that the best sands for beaches may be the sands buried under the buildings on the barrier islands. Waves, winds, and water levels have selectively sorted these sands for millennia along this coast. Construction setbacks are an easy way of utilizing those sands for beaches.

Alabama Chapter of the American Shore and Beach Preservation Association

The citizens and professionals of Alabama should start an Alabama chapter of the American Shore & Beach Preservation Association (ASBPA). ASBPA was founded in 1926 and has been a national leader in the preservation of beaches for public and private use. The mission of the association is to preserve the beaches of America. The ASBPA's stated objectives are as follows

"This Association is formed in recognition of the fact that the shores of our oceans, lakes and rivers constitute important assets for promoting the health and physical well-being of the people of this nation, and that their contiguity to our great centers of population afford an opportunity for wholesome and necessary rest and recreation not equally available in any other form. The purpose of the Association is to bring together for cooperation and mutual helpfulness the many agencies, interests and individuals concerned with the protection and proper utilization of these lands, and in all legitimate ways to foster that sound, far-sighted and economical development and preservation of the lands which will aid in placing their benefits within the reach of the largest possible number of people in accordance with the ideal of a democratic nation."

Successful beach preservation efforts in other states have recently been led by local chapters of the

ASBPA. An Alabama chapter of ASBPA could bring diverse interests from both coastal counties and throughout the state to discuss common problems and alternative solutions. The ASBPA has traditionally provided a forum for a good dialogue between coastal professionals and the laymen citizens who use and enjoy the beaches. It could do the same in Alabama.

Future research

Suggestions to federal, state and local government for future coastal research that will have the most impact on the management of the Alabama beaches are in three directions:

1. Applied research on the design of civil engineering projects in the wave, sand, wind and water level climate of the Gulf of Mexico including beach erosion control and management technologies and inlet maintenance technologies. Specific suggestions are for research into beach nourishment engineering and sand bypassing engineering. Since it appears that beach nourishment is part of the future of Alabama beaches, research into the best ways to build beaches including analysis of project fate is warranted. Applied inlet dynamics research is critical since engineering at the passes apparently causes most of Alabama's beach erosion problem. Improved methodologies for understanding the optimum locations for sand bypassing are needed to minimize the full costs (including the costs to the downdrift beaches) of future dredging. Research on the design of roads, bridges, buildings and other structures that are occasionally exposed to hurricane conditions is also needed.
2. Site-specific coastal processes studies. Management decisions ultimately rest on our understanding of how each portion of the Alabama coast works. There are unique aspects of each of the coastal engineering problems in the state. Understanding the local coastal processes including beach-inlet dynamics better will be valuable input to decision-makers. Specific locations in need of further site-specific research include each of the state's passes and the main beach sites in each county.

   One example mentioned in this report is Little Lagoon Pass. A comprehensive coastal processes, engineering and planning analysis should be done for Little Lagoon Pass. The pass is an outstanding resource for the people in many ways. Its flushing has a major impact on the water quality in Little Lagoon, it has significant impacts on the beaches to the immediate east and west, and it is a highly used municipal park. The pass also provides boat access from the Lagoon to the Gulf. However, the access is often severely limited by the shoaling and dredging operations. Navigation is often treacherous. The navigability of the pass could be improved with some sound coastal engineering. An open, comprehensive coastal engineering and planning analysis for the pass could address the needs and potential uses of the pass and arrive at options that will have public support and not have the negative impacts experienced in the past.
3. Continued and improved monitoring of the state's beaches. Suggested improvements include more densely spaced survey information about the behavior of the beaches and some measure of the forces, primarily waves, causing the behavior. Also, the behavior of any project that adds sand to the beach and dune system should be monitored to develop an improved understanding of the overall impacts of engineered projects along the Alabama coast.

The beach management decisions made in the past several years were based on an understanding of the causes of beach erosion and the effects of various alternatives on the beaches. This understanding was developed with input from a decade of nontechnical, applied coastal research. Future management decisions will also be positively influenced by sound research input.

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