



WATER MARKS

Louisiana Coastal Wetlands Planning, Protection and Restoration News

January 2004 Number 24

Vanishing *Louisiana*

Land change study predicts loss
of 500 more square miles by 2050

WaterMarks is published quarterly by the Louisiana Coastal Wetlands Conservation and Restoration Task Force to communicate news and issues of interest related to the Coastal Wetlands Planning, Protection and Restoration Act of 1990. This legislation funds wetlands enhancement projects nationwide, designating approximately \$50 million annually for work in Louisiana. The state contributes 15 percent of the cost of project construction.



Please address all questions, comments, suggestions and changes of address to:

James D. Addison

WaterMarks Editor
New Orleans District
U.S. Army Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160-0267
(504) 862-2201
E-mail: James.Addison@mvn.usace.army.mil

ABOUT THIS ISSUE'S COVER . . .

Saltwater marshes are not only an essential component of Louisiana's coastal ecosystem, they are part of an indispensable buffer that protects southern Louisiana's population, commerce and culture from catastrophic flood and hurricane damage.

Photograph courtesy of the Louisiana Office of Tourism

- 3** Once Gone, Gone Forever
Louisiana's Continuing Crisis of Land Loss
- 5** Plot Line: Land Converts to Water
Mapping Out the Story
- 6** The Case of the Vanishing Marsh
The Report Team at Work
- 8** Grounds for Hope Against a
Rising Tide of Loss
- 9** Breaux Act: Lifeline to a Drowning Coast
- 12** *WaterMarks* Interview:
Dr. James "Jimmy" B. Johnston

For more information about Louisiana's coastal wetlands and the efforts planned and under way to ensure their survival, check out these sites on the World Wide Web:

www.lacoast.gov
www.btneq.org

www.americaswetland.com
www.crcl.org

The report *Historical and Predicted Coastal Land Changes: 1978 – 2050* can be found online at
www.nwrc.usgs.gov/special/landloss.htm

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www.lacoast.gov/newsletter.htm

Once Gone, Gone Forever Louisiana's Continuing Crisis of Land Loss

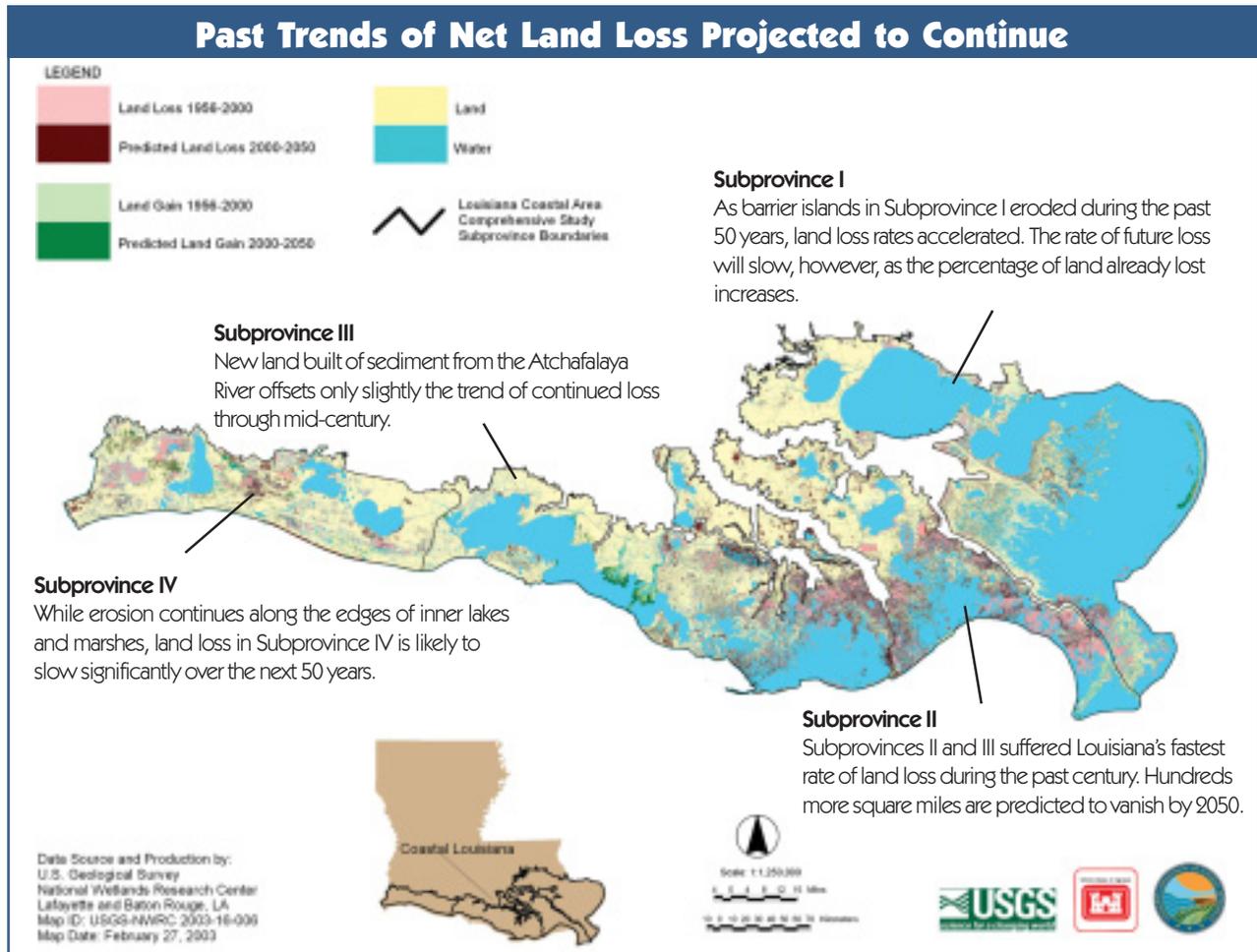
The crisis of land loss in coastal Louisiana is plain to see, according to Windell Curole, general manager of the South Lafourche Levee District. "Even over a few weeks' time you can see changes in the landscape," he says. "You'd have to try hard not to notice the problem."

As an example, he points to the Leeville bridge. It wasn't so long ago, according to Curole, that you'd only get a glimpse or two of

the bridge on the way down to Grand Isle. "Now the landscape's flattening out," Curole says. "Ridges are gone. Trees have disappeared. You can see the bridge almost the whole way."

The rate at which Louisiana's land is converting to water is probably the fastest in the world. Since 1932 the state has lost an estimated 1,900 square miles of coastal land, an area about the size of the state of Delaware, or

acreage equivalent to 80 Manhattans. According to the most recent study, the state will lose between 500 and 700 more square miles within the next 50 years, numbers that will swiftly increase should sea levels rise, subsidence rates expand, or accretion diminish. Ninety percent of the lower 48 states' coastal marsh loss occurs in Louisiana, an increase of 10 percent over the past two decades. Consequently, Louisiana's share of



Courtesy of USGS

the nation's coastal marshes has declined from 40 percent in the 1980s to 30 percent today.

That the rate of land loss has fallen from its peak of 39 square miles a year during the 1970s actually indicates how severe the crisis is. "You can't lose the same

aerial photographs and satellite imagery, the team calculated past loss and predicted probable future loss for the next 50 years. The document substantiates the severity of the crisis of Louisiana's vanishing wetlands.

Generally scientists agree that it takes centuries to reverse land loss and that the next several decades will produce little land accretion to offset Louisiana's decline. However, by describing the patterns across the coast where land loss does, or does not, occur; by determining the locations at greatest risk; and by disclosing where there is stable marsh to build on, the report assists planners in designing remedies.

"Two things make a difference," says Denise Reed, "land preservation and land creation. To some degree, we can accomplish both."

Coastal Projects Effect Changes

Land preservation and land creation have been the primary goals of the Louisiana Coastal Wetlands Conservation and Restoration Task Force since it was established in 1990. The task force, composed of five federal agencies and the state of Louisiana, implements the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), or, as it is also known, the Breaux Act. Although land loss from

erosion and subsidence is a natural phenomenon, as is land accretion from sedimentation and vegetative growth, human intervention in Louisiana's landscape is decidedly a major factor in land change. For example, hundreds and hundreds of miles of pipeline canals increase erosion in the marshes of Terrebonne Bay. On the other hand, outflow projects that direct waterborne sediments over the Atchafalaya River delta are causing significant land accretion.

Over its 13-year history, the task force has accumulated valuable experience both in techniques for wetlands restoration and in working together with other concerned parties outside of government to address the crisis. The report *Historical and Predicted Coastal Louisiana Land Changes: 1978 - 2050* gives the team the scientific data needed to shape effective measures to combat land loss and demonstrate why the dire condition of Louisiana's coastal wetlands is a crisis of national concern. **WATERMARKS**

Courtesy of Louisiana Office of Tourism



If current land-change trends are not slowed, Louisiana will lose over 500 more square miles of its coastal region over the next 50 years.

land twice," Denise Reed, professor of geology at the University of New Orleans, points out. "We're losing less land because there is less land to lose."

Report Measures Loss, Past and Future

To appraise the crisis of land loss in Louisiana, the Louisiana Coastal Area Comprehensive Coastwide Ecosystem Restoration Study and the Louisiana Coastal Wetlands Conservation and Restoration Task Force commissioned a team of scientists to produce the report *Historical and Predicted Coastal Louisiana Land Changes: 1978 - 2050*. Analyzing

What We Risk Losing if We Lose Louisiana's Wetlands

Jambalaya, zydeco, pirouges, the Big Easy...

...a region distinguished by its unique traditions, dialects, music and cuisine, the roots of which reveal the rich ethnic mix of earlier inhabitants. Host to events that shaped the course of the country, the area is studded with thousands of historic sites. New Orleans, among the oldest of American cities, has more registered historic places than any other city in the nation.

Plot Line: Land Converts to Water Mapping Out the Story

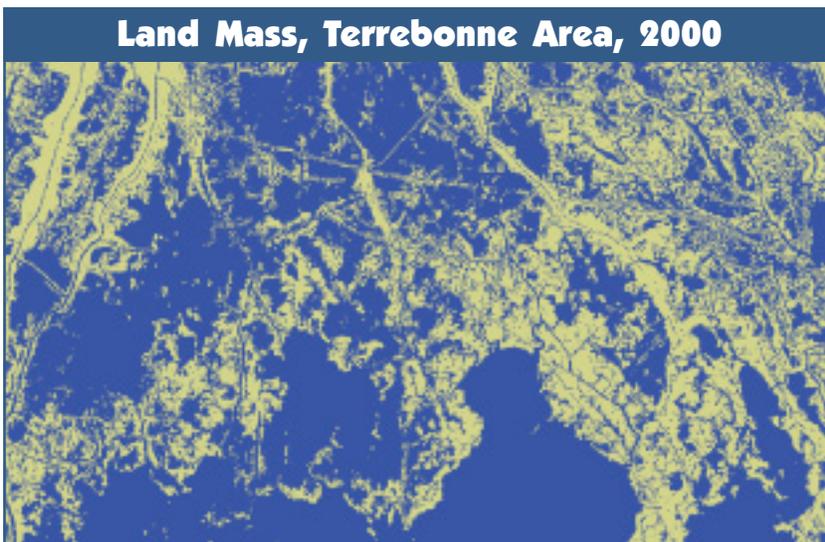
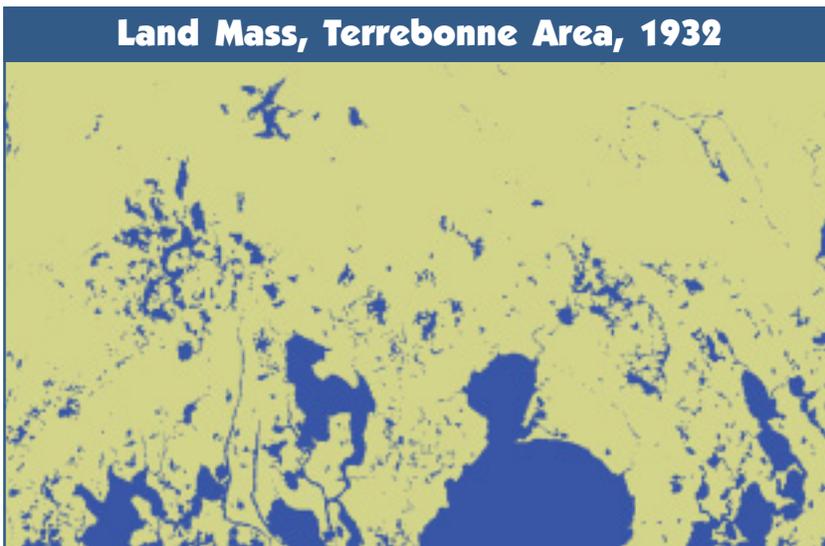
While conservation practices help in slowing the rate of loss, Louisiana continues to lose an alarming amount of land. Even if the Mississippi River were immediately to commence building land at its historic rate, it would take centuries to

regain the land lost over the past 50 years.

Maps illustrate land changes that have occurred as well as those likely to occur during the next 50 years. Over the past several decades, the subprovince composed prima-

rily of Terrebonne Parish has suffered the most dramatic loss, over 10 percent of its area converting to water since 1978. Projections indicate it is likely to lose another 11 percent (229 square miles) by 2050. WATER MARKS

Courtesy of USGS



How much land has Louisiana lost?

Traveling at 60 mph it would take 2 ½ hours to circumnavigate an equivalent area

The lost area is

- about the size of Delaware
- 31 times the size of the District of Columbia
- the size of New York, Chicago, Los Angeles, San Diego, and Houston combined

On average, Louisiana has lost an area the size of

- an executive desk top every second
- a tennis court every 13 seconds
- a small cottage every minute

In the next 50 years, the rate of loss will approximate

- one coat closet every second
- one office cubicle every 10 seconds
- one large conference room every minute

In the time it has taken you to read this chart, a chunk of Louisiana 50 times the size of your easy chair has converted from land to water.

The Case of the Vanishing Marsh

The Report Team at Work

It was a task that could puzzle the shrewdest of sleuths and perplex the brightest of brains — identify precisely the parts of Louisiana’s coast that are already missing, and then predict which areas will disappear in the next 50 years.

Fourteen experts in remote sensing technologies, geographic information systems and ecosystem processes accepted the challenge of detecting land loss in Louisiana. Representing nine academic institutions and government agencies, this team used satellite imagery, aerial photography, maps and previous land-change studies to calculate

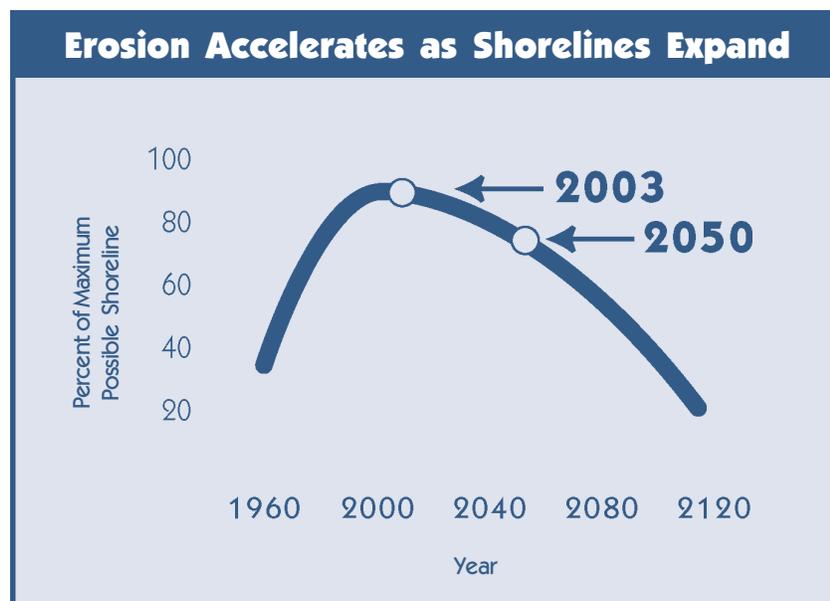
the number of square miles lost in the past 25 years, and to project those losses into the future.

Detecting What’s Missing

To figure the amount of land already lost, the team classified all cartographic points as either land or water. By comparing data from the same location in different years, they determined which points had converted from land to water, or from water to land. Their measurements indicated that, since 1932, Louisiana has suffered a net loss of 1,900 square miles. Although loss

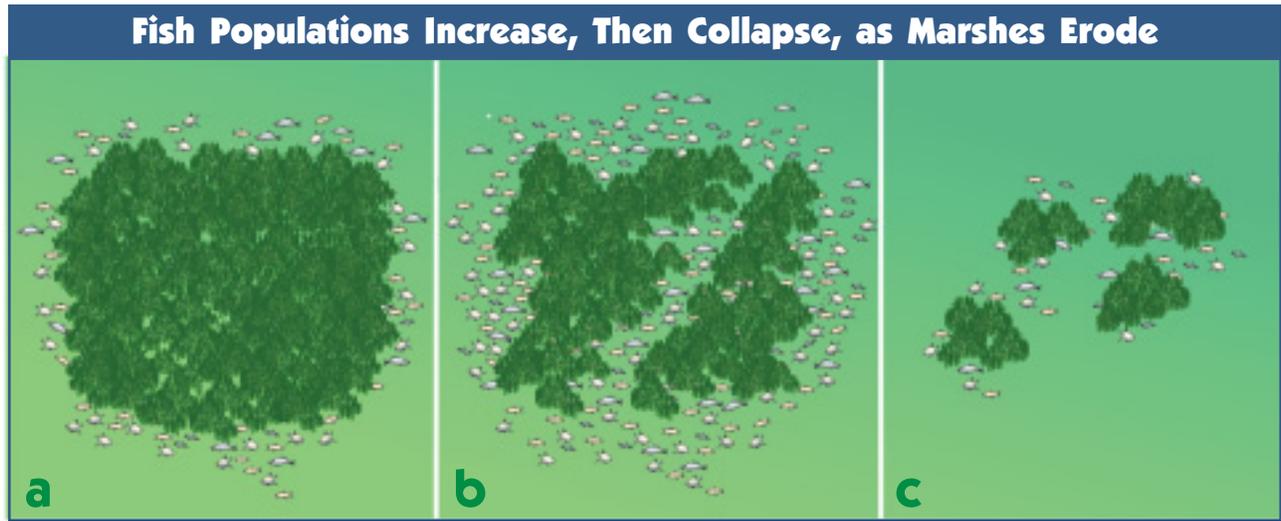
rates peaked in the 1970s, between 1978 and 2000 Louisiana continued to lose land at a rate of 29.9 square miles a year.

“At first glance, this decline might look like good news,” says Rex Caffey, professor at the LSU Agricultural Center and Louisiana Sea Grant, “but it really shows how dire the situation is. If you think of the marshes as a huge slab of Swiss cheese floating in the water, land erodes along the inside edges of the holes. As the holes grow larger and connect, there is more water and less edge, less interface between land and water.” As a consequence, the rate of loss declines even though conditions may not have improved. A graph describing this phenomenon, known as the Browder curve, indicates that the maximum amount of land-water interface in coastal Louisiana might have occurred in 2002. Since then, the shrinkage of land area has itself caused the rate of loss to fall. “Rather than indicating that the problem is less severe,” Caffey says, “the declining rate of loss shows us how much damage we’ve suffered already.”



Estimate of combined shoreline, or land-water interface, peaks about 2002, after which land area decreases, interface shrinks, and land loss rates slow.

(Based on graph by Browder, et al. 1985, 1989)



S. Coogler, Kourpal Communications, based on diagram in Louisiana Sportsman

- a. Erosion occurs along the edge of marsh, where fish find food and habitat.
- b. As marsh erodes and breaks apart, edge perimeter increases and fish populations multiply.
- c. As eroded marsh vanishes, edge perimeter declines and fish populations collapse.

Foretelling the Vanishing Points

After a careful analysis, the report team concluded that it could use the conditions present between 1990 and 2000

as a baseline for the next 50 years. The team divided a map of the coast into areas that shared a similar cause, extent and pattern of land change, and compared shifts in each set of

circumstances to discern trends in land change.

Combining this information with the baseline data, the team predicted the likely location and degree of future land loss, estimated the amount of possible land gain and calculated the balance of expected change. The team concluded that, if no further action is

undertaken to slow the loss, at least 513 more square miles of Louisiana land will vanish by the year 2050. The total amount of land lost since 1932 would then exceed 2,400 square miles, reducing the coastal area of the state by a third in a little over 100 years. **WATER MARKS**



Courtesy of Louisiana Office of Tourism

In declining wetlands, the perimeters of small segments of marsh increase the total measure of land-water borderlines.

What We Lose if We Lose Louisiana's Wetlands

Fish Nurseries

Louisiana provides more than 25 percent of the seafood consumed in the United States. Over 75 percent of the commercial and recreational fish species in the northern Gulf of Mexico spend some part of their life cycle in the Louisiana wetlands, where ample edge habitat provides plentiful food and protected hiding places. As marsh breaks apart, edge habitat temporarily increases, boosting aquatic populations. As fragmented marsh converts to open water, however, habitat vanishes and the entire ecosystem collapses.

Grounds for Hope Against a Rising Tide of Loss

Most of those who are familiar with the condition of Louisiana's coast perceive the situation as dire and believe that the unfolding crisis will dramatically affect the ecology and economy of both the region and the nation. But reasons for hope exist: Across the state and nation there is a growing concern about the problem, and in the wetlands, scientists are developing ways to combat the crisis effectively.

At Stake: A Region and Its Riches

As knowledge about land loss in Louisiana increases, so does understanding of its potential critical impacts. The disappearance of each square foot of wetlands threatens:

- oil and gas production facilities and pipelines that deliver over a quarter of the nation's energy supplies
- emergency fuel stored in U.S. Strategic Petroleum Reserve sites
- shipping and trade through the first, fourth and 10th largest ports in the country, measured by tonnage
- nursery grounds for over 75 percent of the Gulf of Mexico's

commercial and recreational fish species

- fisheries that supply over a quarter of the nation's seafood
- the natural buffer that mitigates hurricane damage to historic sites and population centers, including the city of New Orleans



Creation of new land continues to occur when river-borne sediment is deposited in coastal wetlands. Green areas on the map above indicate places where water has converted to land in the Atchafalaya River delta.

Ways to Protect and Restore the Wetlands

For more than a decade, CWPPRA-sponsored projects have developed and refined techniques proven effective in combating land loss. Most projects aim to restore and protect coastal wetlands by decreasing erosion, improving soil stability or restoring natural

hydrological conditions. Some measures, such as building marsh terraces or planting vegetation, are simple and not expensive to carry out. Others, such as constructing gates on navigation canals or pumping dredged material into the marshes, require more complex engineering and millions of dollars to implement.

These restoration techniques are already creating notable areas of new acreage. Diverting river water, trapping nutrients and sediment in structures and vegetation, and using dredged materials to build elevations capable of sustaining plant colonies have all proven successful. In addition, coastal Louisiana is realizing the benefits of strict regulations governing industrial practices. No longer can oil and gas wellheads dump brine directly into the wetlands, nor can new pipeline canals cut through and fragment the marshes.

Effective Efforts Involve Difficult Decisions

Projects scaled to stem Louisiana's disastrous rate of

land loss, however, will change the landscape, cost billions of dollars and affect millions of people. Policymakers, community leaders and other stakeholders confront difficult decisions in undertaking these costly and controversial actions. Among measures being considered are closing the Mississippi River Gulf Outlet, operating diversions at full capacity, and allowing as much as a third of the Mississippi River to be reintroduced into the wetlands. Although the estimate of \$14 billion is but a fraction of the worth of the property, infrastructure and commerce at risk, the price, nonetheless, is far higher than Louisianans alone can shoulder. **WATER MARKS**

What We Lose if We Lose Louisiana's Wetlands

Industry and Commerce

"The Louisiana coast is a working coast," says Jerome Zeringue, executive director of the Terrebonne Levee and Conservation District. "The disappearance of coastal wetlands puts at risk industry and commerce that serves the entire country."

Delivery of 30 percent of the oil and gas consumed in the United States, including 80 percent of domestic production, uses the services and infrastructure of coastal Louisiana. The dependability of the nation's energy supplies rests on the region's roads, bridges, shipping and navigation yards, chemical and petrochemical plants, oil and gas wellheads, and services for offshore drilling. These would vanish with the disappearance of Louisiana's wetlands.

Breaux Act: Lifeline to a Drowning Coast

Shoring up the roadway with oyster shells, raising their houses on 10-foot stilts, watching streets, trees, telephone poles and cemeteries tumble into encroaching water, residents are constantly reminded that coastal Louisiana lies imperiled.

But Louisiana has not been cast off and abandoned. In 1990 the country acknowledged the national significance of this environmental crisis with the passage of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA, or the Breaux Act). With the act providing approximately \$50 million a year, the CWPPRA task force has spearheaded the development of over 120 projects with the goal of restoring the coastal wetlands of Louisiana.

Partnerships Strengthen Projects

The Breaux Act involves five federal agencies and the state of Louisiana, and is managed by

the Louisiana Coastal Wetlands Conservation and Restoration Task Force. The agencies comprising the task force each partner with Louisiana's Department of Natural Resources on different restoration projects, combining resources for their

Number of CWPPRA projects by basin	
Atchafalaya Basin	3
Barataria Basin	23
Breton Sound Basin	3
Calcasieu/Sabine Basin	18
Coastal Basin	5
Mississippi River Delta Basin	6
Mermentau Basin	12
Pontchartrain Basin	13
Teche/Vermilion Basin	12
Terrebonne Basin	27
TOTAL	122

construction, operation and maintenance. Federal monies fund 85 percent of a project's costs, including monitoring, and state or local dollars cover 15 percent.

"CWPPRA has demonstrated

continued on the following page ...

Lifeline to a Drowning Coast ... continued

that agencies working as partners produce better plans that garner wider public support than do individual agencies working independently and focusing on a single interest," says Gregory Miller, project manager in the Coastal Restoration Branch, U.S. Army Corps of Engineers, New Orleans. "CWPPRA has also involved thousands of citizens across the coast in planning for the restoration of wetlands. Collectively developing projects through local meetings and interagency reviews has resulted in improved design."

Science-driven Achievements

Currently there are 123 active CWPPRA projects throughout coastal Louisiana. Basically, four techniques have proven effective in restoring and protecting the coast: dedicated dredging, river diversions, shoreline protection and vegetative plantings. Each technique addresses a specific

type of environmental condition or erosion problem, and is selected according to an area's water depth, wave energy and proximity to sediment-laden river flow. In light of its expanding knowledge, the task force continually revises its list of proposed projects and estimates their costs with increasing accuracy.

CWPPRA's scientific contributions include initiating the Louisiana Coast 2050 study, which examined the condition of Louisiana's coast and put forth a program to develop a sustainable, functional, coastwide ecosystem. CWPPRA was also a sponsor of the recent study *Historical and Predicted Coastal Louisiana Land Changes: 1978 - 2050*, mapping probable land loss and gain through the year 2050.

Over the course of its 20-year authorization, CWPPRA will spend an estimated \$1 billion to protect and restore coastal Louisiana. But CWPPRA has offered more

What we lose if we lose Louisiana's wetlands

Buntings, flycatchers, vireos...

...and other song birds familiar at backyard feeders throughout the country. "These neotropical migrants feed in Louisiana's swamps before their flight to winter grounds in Central and South America," explains Richard DeMay, senior scientist at Barataria-Terrebonne National Estuary Program. "As the wetlands retreat inland their journey becomes longer, and more birds die in migration."

Louisiana also provides critical habitat for shore birds, such as Forster's terns, and wading birds, like egrets and herons. Ducks and geese and other migratory game birds winter in southern Louisiana. "If we continue to lose coastal habitat," says DeMay, "we will continue to lose bird population."

than just a string of restoration projects. By developing a model for federal and state agencies and local stakeholders to work together; by devising a flexible structure capable of adjusting to scientific advances; and by drawing national attention to coastal Louisiana's plight, CWPPRA offers the region hope for success in preserving and restoring its wetlands. **WATER MARKS**

Members of the Louisiana Coastal Wetlands Conservation and Restoration Task Force

- Department of the Army, U. S. Army Corps of Engineers (Chair)
- Department of Agriculture, Natural Resources Conservation Service
- U. S. Environmental Protection Agency
- Department of Commerce, National Marine Fisheries Service
- Department of the Interior, U. S. Fish and Wildlife Service
- Louisiana Governor's Office

WaterMarks Interview ... continued from back cover

Barataria and Terrebonne Basins, just west of the Mississippi River, land loss rates have continued to increase. By 2050, up to 80 percent of all land loss in coastal Louisiana is likely to have occurred in these two basins.

WaterMarks: *The study predicts that by 2050 over 500 more square miles of Louisiana will disappear. Is this a realistic projection?*

Johnston: Yes, we should expect to lose that much land, if not more. We're getting very good at analyzing data and understanding the interaction of different causes of land change. The study includes precise information about past loss and current conditions, giving us a solid basis for identifying trends and projecting future changes.

If there's any inaccuracy, I think it's in overestimating the amount of land gain that we may see. Presently we're operating the diversions at Caernarvon and Davis Pond at lower capacities, reducing their potential for building new land. Also, we're assuming that conditions will stay roughly the same as they have been over the past decade or so. However, land loss could increase for a number of other

reasons, such as rising sea levels or more frequent hurricanes.

WaterMarks: *We've been investing in projects to address this crisis for years, and yet the situation has worsened. Have we wasted our money?*

Johnston: Not at all. The projects we've put into place so far are designed to address conditions at specific sites. Already these smaller projects have created or protected thousands of acres of coastal wetlands. They've provided us with information about how marshes respond to different restoration strategies so that we can refine our techniques.

WaterMarks: *Can anything really be done to reverse Louisiana's land loss?*

Johnston: The study indicates that only bold strategies will be effective in addressing the crisis of land loss in Louisiana. Coastwide, we need to look at large landscape-scale management. Ultimately, the solution lies in the Mississippi River, in accessing its course and load of land-building sediments and restoring its historic role in rejuvenating the wetlands.

WaterMarks: *When you talk of a landscape-scale management plan, you're talking about a huge expense. Is it worth the money involved?*

Johnston: If we do nothing further to stem the loss, 2,400 square miles of Louisiana will be under water by 2050. Just at the local level, the worth of property, commerce and infrastructure is many times more than the



Courtesy of Louisiana Office of Tourism

The current trend of land loss jeopardizes southern Louisiana's population, commerce and culture.

estimated \$14 billion it will take to prevent the crisis. That doesn't even consider the value of intangible things, like southern Louisiana's history, culture and heritage, which would vanish with the land.

Nationally, who can be complacent about losing a third of a state's coastline? If a third of coastal Massachusetts or a third of Florida's coast disappeared, wouldn't the country mobilize to reclaim it? **WATER MARKS**

The **WATER MARKS** Interview



Dr. James "Jimmy" B. Johnston

Louisiana Coastal Ecosystems Science Coordinator and Spatial (Habitat) Analysis Director, National Wetlands Research Center, U.S. Geological Survey, Lafayette, LA

Dr. Johnston has been involved in land loss studies since 1978, when he was instrumental in developing the first land loss data for Louisiana's entire coastal zone for the U.S. Fish and Wildlife Service.

WaterMarks: *There have been land loss studies in the past. Why is the report Historical and Predicted Coastal Louisiana Land Changes: 1978 – 2050 so significant?*

Johnston: This report gives us a thorough, detailed picture of the current status of coastal Louisiana and of its future trend. Primarily, it documents that conditions have continued to deteriorate, and that Louisiana is still losing tens of thousands of acres of coastal land every year. The report also prescribes that the best hope for recovery lies in immediately undertaking large-scale remedies. It depicts the urgency of the current situation in solid scientific facts and figures.

WaterMarks: *What was your response when you first saw the study results?*

Johnston: To tell the truth, I was surprised — shocked, actually — by the numbers. I thought 25 years of improved coastal management practices and restoration efforts would produce a dramatic decline in land loss rates. They didn't. Louisiana continues to lose an alarming amount of land every year. In fact, Louisiana accounts for 90 percent of the total coastal marsh loss within the continental United States, up from 80 percent 15 years ago. If nothing further is done to reverse or control the current trend, by the year 2050 a third of the entire coast of Louisiana will be gone.

WaterMarks: *But the report shows that the rate of land loss is decreasing. Isn't that good news?*

Johnston: Unfortunately, it's not good news at all, because it indicates just how badly Louisiana's coast has already deteriorated. Between 1990 and 2000, the rate of coastal land loss, about 24 square miles a year, was two-thirds of what it was between 1978 and 1990. But this decline in the rate is just an illusion — simply the result of already having lost large areas of land. Land that has washed away cannot be recounted. That leaves less land, which shows a lower rate of loss.

In some areas, such as in the

continued on page 11 ...

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DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

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