WATER MARKS

Louisiana Coastal Wetlands Planning, Protection and Restoration News

September 2008 Number 38

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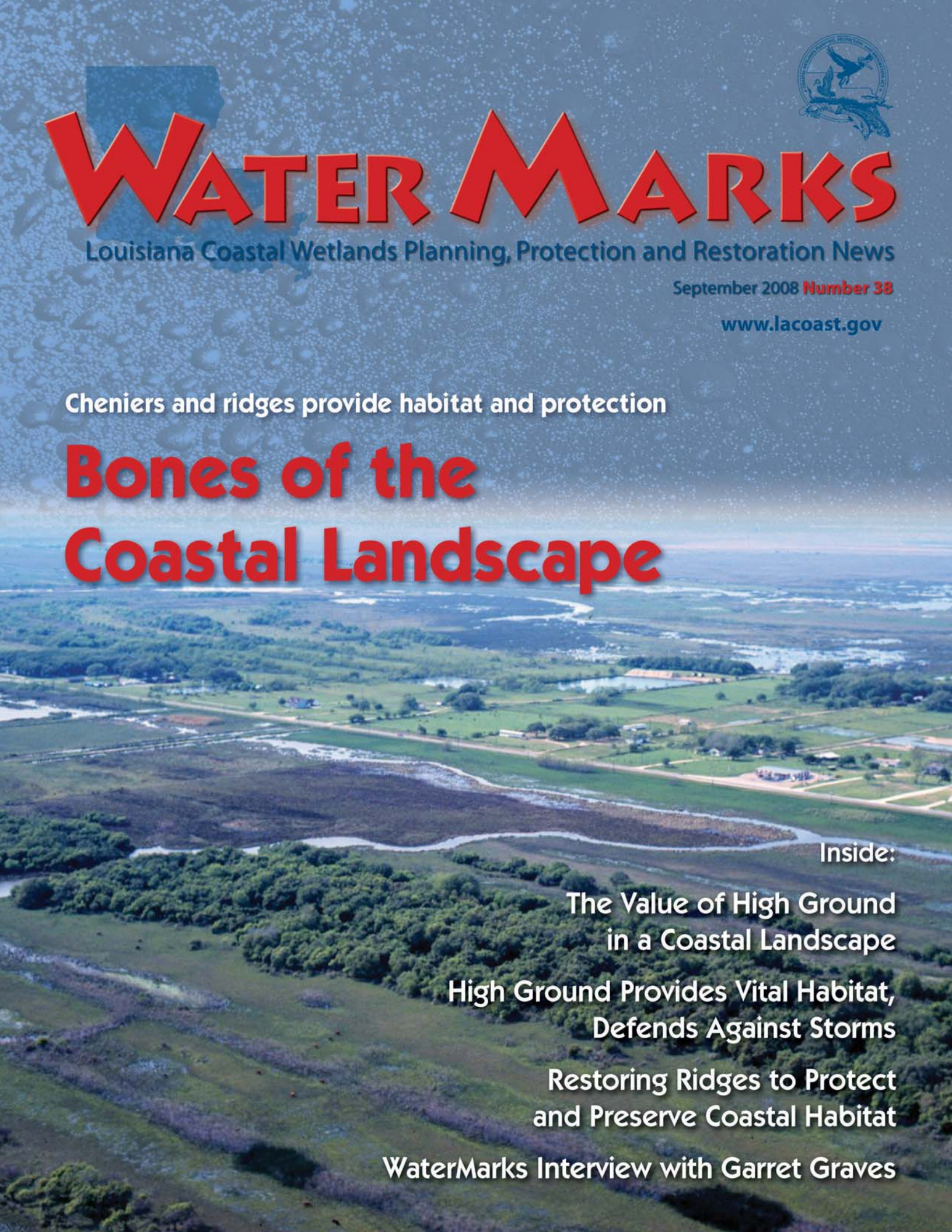
Cheniers and ridges provide habitat and protection

Bones of the Coastal Landscape



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WaterMarks is published three times a year 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 restoration and enhancement projects nationwide, designating approximately $60 million annually for work in Louisiana. The state contributes 15 percent of total project costs.

***WaterMarks* Editor**
Stuart Lee
3737 Government Street
Alexandria, LA 71302
(318) 473-7762

ABOUT THIS ISSUE'S COVER . . .
Cheniers and natural levees rise out of the wetlands and provide upland habitat for flora, fauna and human populations. Only a few feet of elevation distinguish much of the high ground in coastal Louisiana, but even modest heights are sufficient to host vegetation different from that in surrounding marshes and to support agriculture, buildings, highways and other development.

Photo of Hackberry Ridge, courtesy of U.S. Geological Survey

Photo at right by George Ritchey

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CHENIERS, NATURAL LEVEES AND SPOIL BANKS

The Value of High Ground in a Coastal Landscape

While each hurricane season can expose the fragility of the coastal environment, the forces of weather may also reveal the landscape's natural capacity to buffer the effects of storms. Forested ridges — cheniers and natural levees — are the "bones of the coast," serving to lessen the destructive power of wind and water while providing habitat for a variety of species.

No more than 10 feet in elevation and running approximately parallel to the shoreline of the Gulf of Mexico, cheniers are remnants of old beach ridges. They take their name from the French word for the oaks found growing on them. Along the banks of streams and bayous, sediment deposited by floodwaters forms ridges described as natural levees. Even the modest heights of cheniers and natural levees are capable of sustaining upland shrubs and trees, providing a habitat distinctly different from the adjoining marshes and swamps and presenting opportunities for certain plant and animal species and human settlers alike to colonize and flourish.

The emergence of cheniers

Concentrated in the Chenier Plain of southwestern Louisiana and in the Moreau-Caminada chenier complex south of New Orleans, Louisiana's cheniers are a geographic record of weather, water and land interacting over 4,000 years. During past periods of delta-building activity, waterborne sediment drifted from the mouths of distributaries and collected in vast mudflats extending into the Gulf of Mexico. As the mud accumulated new land emerged, eventually supporting vegetation and developing into marsh. When the rivers changed course and cut off the sediment supply, storms, waves and water currents worked the particles of mud, along with sand and shell

A small rise in elevation is sufficient to give trees a place to root and roads a ridge to run along. Ridges referred to as natural levees run parallel to waterways and are formed of sediment delivered in floodwaters. Ridges known as cheniers run approximately parallel to the Gulf Coast, are remnants of ancient beaches and have a high content of sand and shell.

Darryl Clark, U.S. Fish and Wildlife Service

debris from mud-dwelling creatures, into new arrangements, pushing coarser-grained particles onto shore and into beaches and ridges.

The pattern repeated itself time and again. Gradually the process built a sequence of ridges isolated by stretches of marsh. The most northerly cheniers are the oldest. The youngest, nearest the Gulf of Mexico, were created approximately 1,500 years ago.

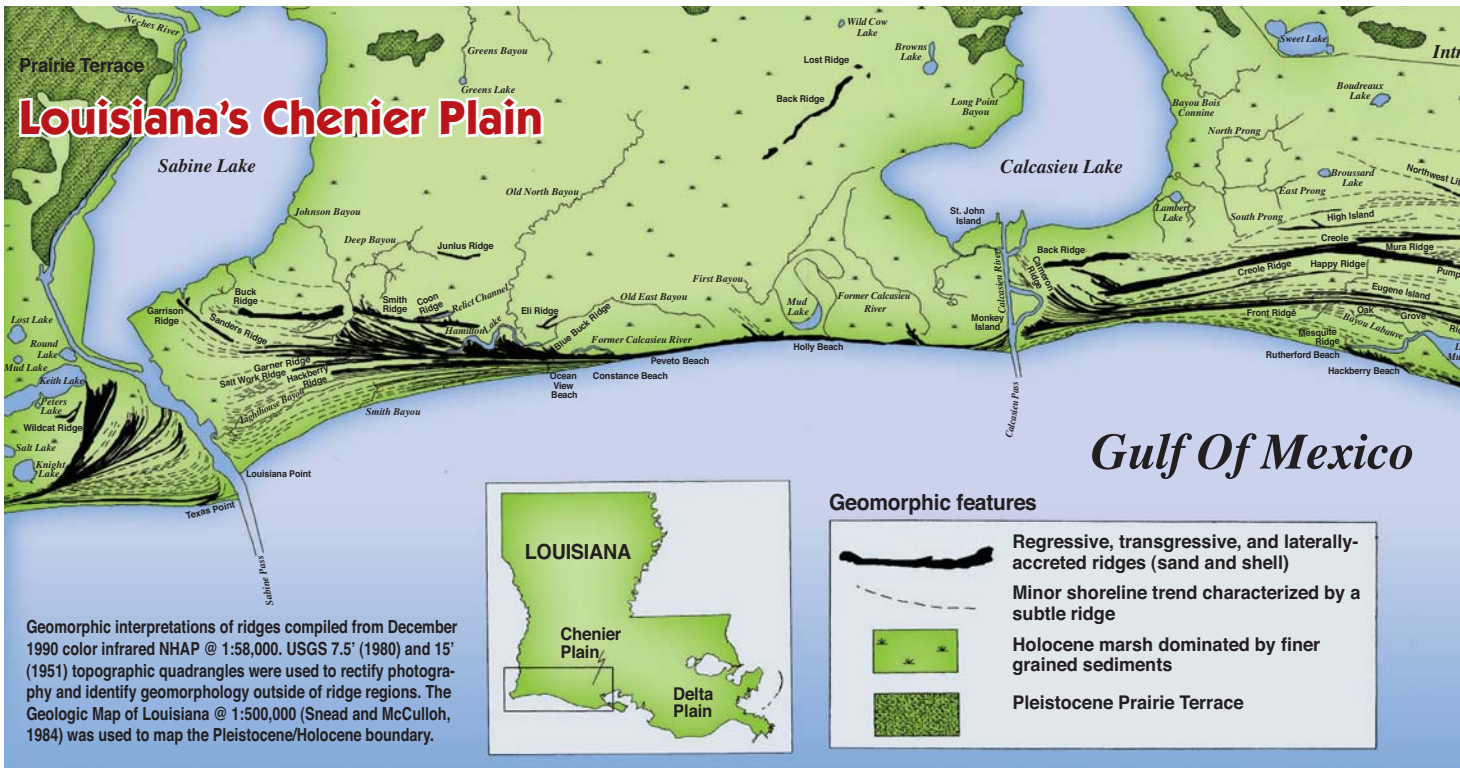
Elevations natural and man-made

Spotting a live oak, toothache tree or wild grapevine in Louisiana does not guarantee the discovery of a chenier. Species populating cheniers seek advantageous elevation and may find hospitable conditions on natural levees — even on spoil banks — as well.

Natural levees are ridges formed from sediments delivered over the banks of rivers and bayous during floods. Finer sediments stay suspended longer and spread over the marsh a greater distance from the water body; coarser sediments fall out close to its edge, eventually building into a parallel ridge. These ridges assist in defining a watershed and in maintaining its natural hydrology. Even the modest elevations of natural levees give many species of coastal flora a chance to thrive.

Spoil banks are constructed of material dredged from navigation channels or oil and gas pipeline canals. Like man-made levees, spoil banks often disrupt natural hydrological patterns, damaging or destroying surrounding wetlands. "You can identify spoil banks by shrubs and trees lining only one side of the water," says Clayton Breland, a geologist with the Louisiana Department of Natural Resources. "But an oak sapling or a palmetto seedling will attempt to grow at two or three feet above marsh level no matter what process deposited the soil there."

Because the purpose of man-made levees is to provide protection, not ecological functions, federal regulations require clearing them of any flora but mown grass. However, these elevations also are capable of supporting upland vegetation. "The physical differences between a constructed levee and a chenier are principally their



Geomorphic interpretations of ridges compiled from December 1990 color infrared NHAP @ 1:58,000. USGS 7.5' (1980) and 15' (1951) topographic quadrangles were used to rectify photography and identify geomorphology outside of ridge regions. The Geologic Map of Louisiana @ 1:500,000 (Snead and McCulloh, 1984) was used to map the Pleistocene/Holocene boundary.

Based on reprint from Geomorphology, v. 88, R. A. McBride, M. J. Taylor and M. R. Byrnes, "Coastal morphodynamics and Chenier-Plain evolution in southwestern Louisiana, USA: A geomorphic model," pp. 369-376, 2007, with permission from *Elsevier*.

dimensions and the arrangement of their materials," says Darryl Clark, a senior biologist with the U.S. Fish and Wildlife Service. "To build a levee we take specific soil materials and place them in a certain configuration. A chenier consists of sediments reworked through natural processes, with coarser ones remaining to form a mound that generally isn't as high as a constructed levee, but is much wider."

High ground in present-day Louisiana

Comparing a chenier to a man-made levee points to a fundamental value of forested ridges in today's landscape: They stand as an essential line of defense against storms, forming a physical barrier to floodwaters that threaten marshes, waterways and human habitations.

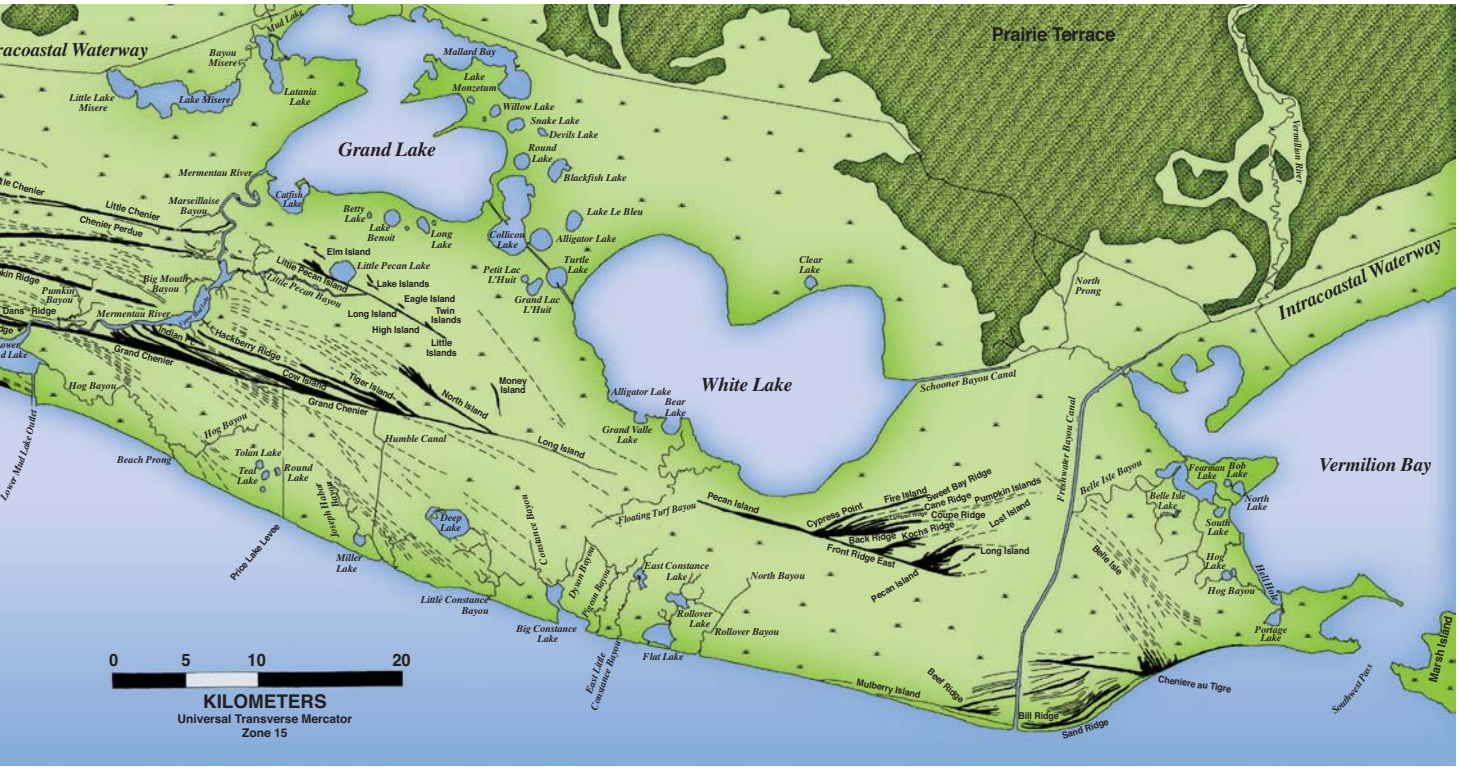
The second fundamental value of forested ridges is the habitat they provide. "Cheniers are islands in a sea of marsh," says Clark. "They provide a refuge from water for animals that feed in the marsh." Ridge vegetation — and the insects that feed on it — is vital to the survival of scores of bird species. "For many birds, a chenier or another kind of forested ridge is the first landfall after a long migratory flight over the Gulf of Mexico," says Clark.

The high ground also provides habitat for the human population. The distribution of roads, houses and buildings in coastal Louisiana follows the lines of natural levees and cheniers.

Fragile bones of a coastal landscape

Louisiana's coastal environment is a network of interdependent ecosystems. Marshes protect forested ridges from erosion, and forested ridges shield marshes from inundation. But the landscape is naturally in constant change. Decline of one feature may diminish the strength of another.

"Time threatens all of Louisiana's coast," says Harry Roberts, former director of the Coastal Studies Institute at Louisiana State Univer sity. "Without an influx of sediment to counter subsidence and compaction, marshes deteriorate and break apart. Broken marsh opens into little lakes; little lakes merge and become larger lakes. It's a natural process — human activity doesn't



cause it, but we do accelerate it by tampering with the hydrology, by managing floodwaters and restraining the flow of sediment into the marshes."

Shipping channels and pipeline canals also alter hydrology, disrupting drainage patterns and permitting the ingress of salt water. Increased salinity in surface water and aquifers converts marshes to more salt-tolerant habitats, endangers agricultural practices and threatens community sources of drinking water.

While building structures on ridges does not directly reduce their elevations, development can jeopardize their physical structure. Because plants hold soil together, clearing land increases the risk of erosion — denuded sites wash away more quickly than areas where a network of roots resists the forces of wind and rain.

Ridges, particularly cheniers, do face a direct threat in the practice of sand mining — digging up the relatively heavy, coarse chenier soil primarily to use for raising elevations at building sites. Such mining reduces the cheniers' substantive barrier and weakens their protective capacity. Cheniers close to the edges of beaches risk additional sand loss from the erosive action of waves.

Other practices, while not placing the region's geography at physical risk, diminish or destroy habitat conditions. Of the live oak ecosystem extant at the beginning of European settlement in the 18th century, estimated to have been between 200,000 and 500,000 acres, only 2,000 to 10,000 acres, or two to 10 percent, survive today. In addition to age-old, natural cycles of renewal and deterioration, ridge habitats coastwide face continued disturbance, fragmentation and destruction resulting from activities such as residential and commercial development, infrastructure maintenance and livestock grazing.

Because forested ridges are not easily restored, CWPPRA favors projects that protect these landscape features. Safeguarding cheniers and natural levees sustains their unique natural habitats and preserves the critical protection against storms, floods and wave action that they provide. WM

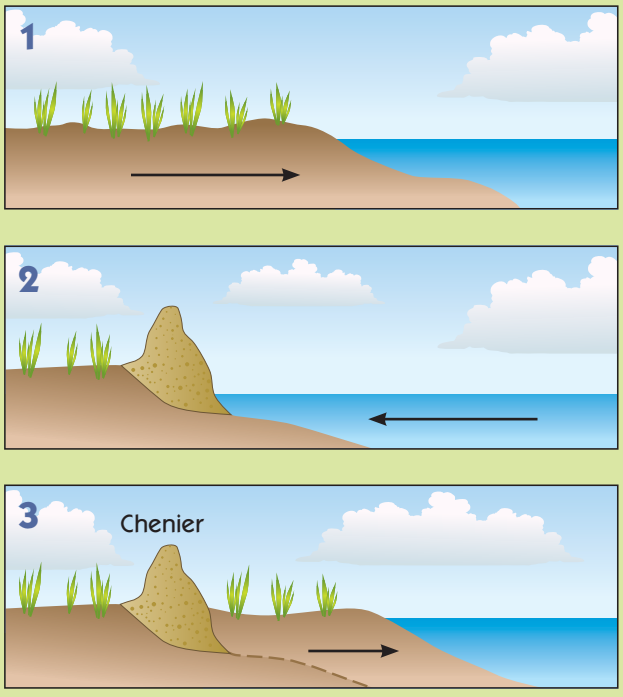


Diagram based on graphic from study by Randolph et al.

1. Mudflats accrete, land builds seaward
When water currents delivered river sediment to an area, mud flats built up in the shallow water along the shore. Land emerged.

2. Ocean reworks sediments into beach ridge
When the river shifted course and changed the direction of the water currents, sediment delivery to the area ceased. Waves and ocean currents worked against the mud flats, pushing mud particles, mixed with sand and shell debris from organisms living in the mud, onto the beach and into a ridge.

3. Mudflats accrete, land again builds seaward
When the river changed its course back to its previous direction and restored the deposition of sediment to the area, new mudflats developed in front of the ridge. The ridge, or chenier, was stranded behind a new stretch of beach.

Repeated over centuries, the process formed a complex of ridges and flats that comprise Louisiana's Chenier Plain and Moreau-Caminada chenier complex.


U.S. Geological Survey

LOUISIANA'S CHENIERS AND NATURAL LEVEES

High Ground Provides Vital Habitat, Defends Against Storms

At ground level, the elevation scarcely looks intimidating. Even in a Louisiana summer a person may stroll to its summit without breaking into a sweat. Only the most detailed topographic map depicts it with a contour line. But in the flat coastal landscape, a 10-foot ridge of sandy soil is a crucial geological feature, providing dry habitat and serving as a bulwark against invasive waves and storm waters.

In Louisiana, ridges form a critical line of defense against storms. Even cheniers and natural levees rising no more than three or four feet contribute consequential protection to the region's communities and coastal ecosystems. "Cheniers act as a breakwater to hurricanes and slow down the storm surge," says Tina Horn, Cameron Parish administrator. "They restrain waters pushing in from the Gulf of Mexico. Without them, we would see the reach of floods extend much farther inland — north of Johnson Bayou to the town of Sulphur, and north of Cameron to Lake Charles."

Protective partnerships between landscape features

Providing elevation above sea level for residential and commercial development, cheniers are remnant beaches stranded among stretches of marsh. "Island" in the name of some cheniers, like Pecan Island, indicates the isolation of these ridges in an expanse of wetlands.

Marshes and ridges provide complementary protection. During normal weather, even a three-foot-high chenier blocks salt water from reaching marshes behind it. During storms, the mile or two of marsh surrounding most cheniers helps to reduce tidal surge and calm wave energy. "If a marsh in front of a chenier reduces a 15-foot storm surge by five feet," says Darryl Clark, senior biologist with the U.S. Fish and Wildlife Service, "that's obviously significant to people and animals taking refuge on a 10-foot-high chenier."

Bowed by the incessant force of weather, stripped of leaves in hurricane winds, trees growing on cheniers and ridges nevertheless provide vital defense against the brunt of coastal storms, their roots holding soil in place and their trunks and branches slowing the wind's full-strength advance.

Beach Restoration Saves a Chenier

The benefits beach restoration provides to cheniers and to infrastructure built on them was demonstrated in 2005 during Hurricane Rita. In 1991, the state placed rock breakwaters offshore to reduce erosion at Holly Beach. In 2003, fearing that their lone evacuation route, Highway 82, would be lost if the chenier on which it was built collapsed into the gulf, the local community instigated CWPPRA project CS-31, Holly Beach Sand Management. This, the first barrier shoreline project completed by CWPPRA, rebuilt the beach in front of the breakwaters, then planted vegetation and erected fencing to hold the sand in place. Although Hurricane Rita swept away all the buildings in Holly Beach, the restored beach and dunes withstood the storm sufficiently to protect the adjacent chenier and highway from destruction.

U.S. Geological Survey

Right: Photos of Holly Beach before and after Hurricane Rita struck in September 2005. Although the storm destroyed all the buildings in the community, the restored beach protected the chenier on which the highway is built. Arrows establish a common reference point between the photos.

Below: Restoration of Holly Beach began with the placement offshore of rock breakwaters. These barriers altered the pattern of currents, causing sand to accrete and extend points of land into the water. A later project rebuilt the dunes and beach in front of the chenier along which Louisiana Highway 82 runs and added fencing to trap blowing sand and accelerate its accumulation into dunes.

Sharon Coogle, Koupal Communications

The vegetation supported by ridge elevations adds to their protective capacity. "It's not just the ridges but also the trees that grow on ridges that are important in quelling storms," says Richard Martin, director of conservation programs for The Nature Conservancy's Louisiana field office. "In 2005, homes built in wooded areas withstood Hurricane Rita better than structures that were exposed." And native species like live oak and hackberry weather storms better than shorter-lived, invasive species such as the Chinese tallow tree.

Erosion and wetland degradation pose the greatest dangers to Louisiana's centuries-old cheniers and natural levees. Recognizing the importance of these landscape features in the coastal environment, current plans for safeguarding them take a dual approach:

- restore shorelines along the gulf and inland water bodies to reduce the erosive threat that waves pose
- improve the health and protective capacity of marshes flanking ridges by controlling saltwater intrusion and by using diversions and dredged materials to nourish and rebuild them

Private efforts preserve high-ground habitat

While recent government activities focus on building levees for flood protection, other ongoing efforts, both public and private, concentrate on conserving forested ridges.

Conservation tools range from programs supporting conversion of farmlands back into native wetlands

George Ritchey

Modeling Tests Potential of Restoration Strategies

What is the height of surge from a hundred-year storm making landfall at one place or another on the coast? Can drainage features in levees prevent water from being trapped too long or at too high a level? What is the capability of a forested ridge to attenuate wave energy? What plants are most effective in reducing storm surge? How will rainfall patterns predicted under conditions of climate change alter hydrology in the Chenier Plain?

These and scores of other questions will shape Louisiana's hurricane protection and coastal restoration projects. To answer the questions as comprehensively and accurately as possible, planners turn to modeling.

"Computer modeling allows us to explore regional restoration strategies and evaluate the potential benefits of different approaches," says Ehab Meselhe, director of the Center for Louisiana Water Studies at the University of Louisiana, Lafayette. "Then we can select the most promising concepts, test the results of optimizing their features and compare their efficacy, feasibility and cost."

The more information incorporated into modeling the more closely the results mimic nature. Data describing hydrologic patterns, habitat changes, marsh elevations, temperature, wind, rainfall, water levels, salinity, sediment movement, biological productivity — the richer the data, the more accurate the modeling. "We'll never mimic nature with 100 percent accuracy," says Meselhe, "but we come as close as possible."

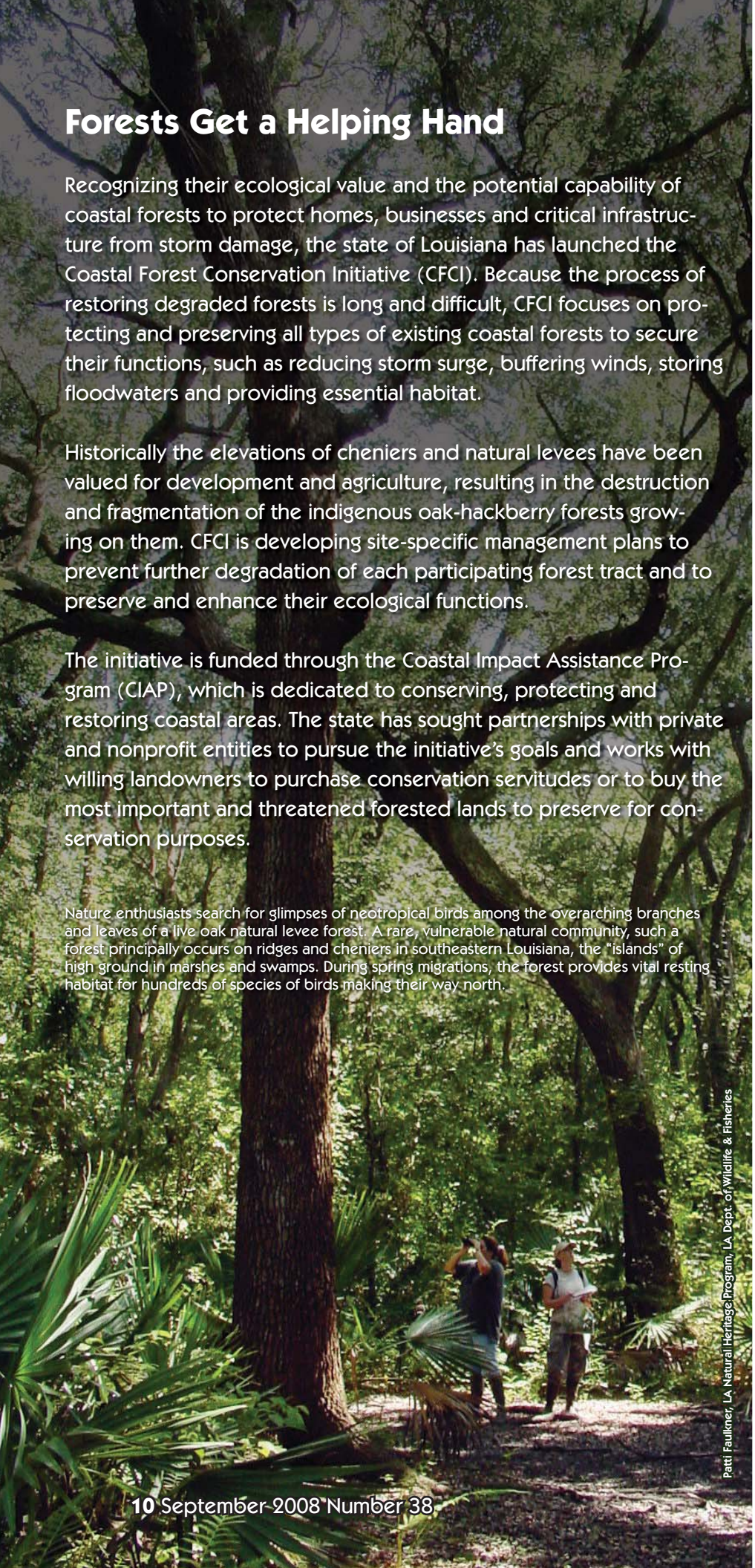
For the past 10 years Meselhe has worked on calibrating and validating computer modeling for the Chenier Plain. He will use the tool he has developed to screen numerous restoration strategies for the region currently under consideration by the state of Louisiana and the U.S. Army Corps of Engineers. "Since the region has no major source of fresh water, approaches revolve around preventing saltwater intrusion and managing freshwater resources," says Meselhe. "Modeling is a formal way to evaluate all strategies and select the ones that have the greatest potential for controlling salinity levels, building land and sustaining the ecology."

Forests Get a Helping Hand

Recognizing their ecological value and the potential capability of coastal forests to protect homes, businesses and critical infrastructure from storm damage, the state of Louisiana has launched the Coastal Forest Conservation Initiative (CFCI). Because the process of restoring degraded forests is long and difficult, CFCI focuses on protecting and preserving all types of existing coastal forests to secure their functions, such as reducing storm surge, buffering winds, storing floodwaters and providing essential habitat.

Historically the elevations of cheniers and natural levees have been valued for development and agriculture, resulting in the destruction and fragmentation of the indigenous oak-hackberry forests growing on them. CFCI is developing site-specific management plans to prevent further degradation of each participating forest tract and to preserve and enhance their ecological functions.

The initiative is funded through the Coastal Impact Assistance Program (CIAP), which is dedicated to conserving, protecting and restoring coastal areas. The state has sought partnerships with private and nonprofit entities to pursue the initiative's goals and works with willing landowners to purchase conservation servitudes or to buy the most important and threatened forested lands to preserve for conservation purposes.



Nature enthusiasts search for glimpses of neotropical birds among the overarching branches and leaves of a live oak natural levee forest. A rare, vulnerable natural community, such a forest principally occurs on ridges and cheniers in southeastern Louisiana, the "islands" of high ground in marshes and swamps. During spring migrations, the forest provides vital resting habitat for hundreds of species of birds making their way north.

Patti Faulkner, LA Natural Heritage Program, LA Dept. of Wildlife & Fisheries

to conservation servitudes, or easements, to outright purchases of property for natural preserves. "Hundreds of nonprofit and public agencies are working on habitat and species' protection," says Martin. "But we'll achieve our long-term goals only if our country increases its level of awareness about endangered species, habitat loss and other conservation issues."

The Nature Conservancy's project on Grand Isle brought attention to the hemispheric phenomenon of migratory songbirds making landfall on the Louisiana coast. The vegetation growing on barrier islands, ridges and cheniers provides food and shelter that sustain the life of millions of birds. "The Nature Conservancy bought land," says Martin. "We gave away trees. We encouraged residents of Grand Isle to plant native trees — even just one. Local businesses made donations and the town council lent their support to our project. The area's major industrial landowner allowed tree plantings on its property. We worked with school kids to collect seed and grow native plants for their yards. The intent was to expand the amount of habitat available to migratory birds, but the project instigated an awareness of conservation that reached far beyond the tree canopy of Grand Isle." WM

Restoring Ridges to Protect and Preserve Coastal Habitat

Historically, projects conducted under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) have focused on wetland rather than upland habitats. However, the program has long recognized the essential value of uplands in maintaining a sustainable, functional coastal ecosystem. Consequently, projects increasing the health and resiliency of marshes that protect cheniers and ridges score highly in the project selection process.

Pairing ridge and marsh to recover a bayou

In late 2007, CWPPRA approved a novel project proposing to restore both a ridge and wetlands adjoining Bayou Dupont in Jefferson Parish. "No longer meandering slowly through the marshes, Bayou Dupont is fast deteriorating," says Cheryl Brodnax, a biologist with the National Oceanic and Atmospheric Administration. "Altered hydrology, erosion and subsidence have caused rapid land loss in the area. With water bodies coalescing, tidal surge and sheet flow move through quickly, washing away the natural ridges and eroding the bayou shoreline. Without preventative action, you soon won't be able to tell where the bayou stops and the bay begins."

To halt the deterioration, the Bayou Dupont Ridge Creation and Marsh Restoration project, BA-48, plans to refurbish a section of the bayou's natural ridge and rebuild areas of highly fragmented marsh. The resulting elevation and expanse of healthy marsh will redefine the bayou, helping to return it to a slow, meandering flow, and will provide the levee adjacent to the project area protection from wave-induced erosion.

The project proposes to use material dredged from the nearby Mississippi River both to construct the ridge and to nourish the marsh. The technique has already been explored in a previous marsh creation project, but this will be the first attempt to rebuild a ridge with river sediment. Indeed, this is the first CWPPRA project to undertake rebuilding a ridge.

"The first step is to decide the target elevation," says Brodnax, who serves as the

Machines shape dredged material to rebuild the historic maritime forest ridge just north of Port Fourchon. At a final elevation of eight feet, the 60-acre ridge shields adjacent wetlands from waves and storm surges and provides conditions suitable for the growth of woody plants — excellent habitat for migratory songbirds.

Davie Breaux, Greater LaFourche Port Commission

Michael Seymour, LA Natural Heritage Program, LA Dept. of Wildlife and Fisheries

Shore birds that nest in bare sand, such as least terns, immediately populated the restored habitat at Port Fourchon, followed by marsh birds that prefer sparse vegetation. "As conditions change, the site attracts different species," says Richard deMay, the senior scientist at the Barataria-Terrebonne National Estuary Program. "At its maturity, the ridge will provide a forest canopy for migratory songbirds."

federal project manager for BA-48. "We'll survey the surrounding habitats and other natural ridges to learn how high we want to build our ridge, then do tests on river materials to determine their rates of compaction and settlement. Depending on the materials' characteristics, we may have to stack materials five or six feet high initially to achieve a final ridge height of four feet."

Stacking material along waterways is not unusual in southern Louisiana. Spoil banks, the result of maintenance dredging, line miles and miles of navigation channels and oil and gas pipeline canals. The difference between spoil banks and natural ridges, according to Brodnax, is intention.

"Spoil banks are an afterthought of maintenance," says Brodnax. "They are built haphazardly and support whatever vegetation sprouts on them. We're aiming to consciously re-create the topography and vegetation of a natural ridge, to construct it so that it will supply optimal ecological services. At its maturation we expect it to provide the quality habitat of native, woody plants like live oaks and hackberries."

Building lessons from Port Fourchon

Although the ridge at Bayou Dupont is CWPPRA's first ridge-building endeavor, some of CWPPRA's partners are seasoned ridge builders, having participated in creating the Port Fourchon Maritime Ridge. The idea for Port Fourchon's ridge was spawned by the inadvertent success of a spoil bank.

"Birders had discovered that a spoil bank of dredged material created during earlier port development provided terrific bird habitat," says Davie Breaux, director of operations at Port Fourchon. "When we started to plan an expansion of the port, we decided to enhance the benefit for birds by using the dredged material to restore a maritime forest ridge."

While the project proved that rebuilding a natural ridge is possible, it also points to the relative ease and economy of preservation compared to reconstruction. "It is costly to pump materials," Breaux says. "We had the advantage of industrial construction in close proximity to the ridge site."

Ridge builders underwent a learning process to make best use of those materials. "At first we tried to trap all the sediment we pumped into the site," says Breaux, "but there was so much water in it that we lost our elevation when it dried out. In the second phase we used an open-ended containment design. The lighter sediments floated out to create an adjacent marsh and left the heavier sands to form the ridge. We learned to couple building a ridge with building an apron of marsh around its perimeter."

Other lessons included the challenges of planting in salty soil. "The Natural Resources Conservation Service did test plantings here, as did the Louisiana Department of Natural

(continued on page 15)

WaterMarks Interview with Garret Graves

Plans Customize Protection, Restoration for Region of Cheniers

Garret Graves is the director of Louisiana's Governor's Office of Coastal Activities

WaterMarks: The landscape of Louisiana's Chenier Plain is distinctly different from the imperiled Mississippi delta region to the east. Are the southwestern coastal parishes also in jeopardy?

Graves: Although less visible and dramatic than land loss problems in the wetlands to the east, the ecological threats facing Louisiana's southwestern coastal parishes are no less serious. Saltwater intrusion is the region's most critical problem. Navigation channels and oil and gas pipeline canals have allowed sea water to infiltrate the hydrologic system. Increased levels of salinity in marshes, freshwater lakes, ground water and aquifers damage wetlands and pose problems for the area's historical practices of growing rice, cattle and crawfish. And with natural drainage patterns disrupted, storm surges such as those caused by Hurricane Rita can become trapped behind the cheniers, burning marsh vegetation and drenching the soil with salt.

Darryl Clark, U.S. Fish and Wildlife Service

Natural components of hurricane protection in southeastern Louisiana include expanses of marsh that quell wave energy and vegetated cheniers that reduce storm surges. Other safety measures in this largely rural region of the state include public works such as raised highways and personal actions such as complying with building codes and heeding evacuation advisories.

George Ritchey

WaterMarks: Are there ways to limit saltwater intrusion?

Graves: Certainly, and in our planning we are considering a variety of approaches. To reduce intrusion through our canals and waterways, we can employ a number of water control devices such as gates, locks and weirs. To protect against inundation from waves and storm surges, we can armor shorelines and use barriers such as raised highways and ridges along canal banks. We're enacting policies to speed the removal of dam-forming debris that storms can leave behind. We might cut release channels from the region's interior to accelerate drainage of surge waters following a storm. And we must safeguard our natural line of defense, the cheniers themselves.

WaterMarks: Do you mean that restoring cheniers could enhance hurricane protection?

Graves: Absolutely. Restoration and protection are complementary processes. Consider how a healthy marsh helps to shield a levee from erosion on a daily basis and is crucial to reducing surges and wave energy during storms. And during Hurricane Rita we saw how a rebuilt beach limited erosion of an adjacent chenier that was shielding inland marshes from storm surge. These are examples of how restoration can enhance protection.

But it works the other way, too. We can design protective structures to provide the hydrologic functions essential for restoration. For example, suppose we built a levee and wanted to restore a marsh to reduce erosion on its seaward side. By incorporating a gated, freshwater diversion in the levee structure, we could provide the flow of water necessary to nourish and maintain the marsh. In this single design we can derive both protective and restorative benefits.

Hurricane protection and coastal restoration are so closely connected that the state of Louisiana has combined the office responsible for hurricane protection, in the Louisiana Department of Transportation, with the office responsible for coastal restoration, in the Department of Natural Resources. Henceforth these functions will be conducted through the Coastal Protection and Restoration Authority's Implementation Team.

WaterMarks: Since the storms of 2005, has hurricane protection become a more prominent consideration in restoration planning for southwest Louisiana?

Graves: Those storms forced the public to pay more attention to hurricane protection. People had become comfortable with the level of risk they thought they were living with. Now they are more aware of the dangers of hurricanes and in public meetings are asking for more protection.

One thing we're doing is looking at integrating different approaches to protection. For instance, the Dutch employ many different elements in their protective system. From preserving a wetland buffer to erecting protective structures, from regulating land use to enforcing building codes, their efforts combine to reach their standard for protection.

WaterMarks: Under the state master plan for coastal protection and restoration, what is proposed for southwest Louisiana?

Graves: Right now we're using modeling to discover the region's vulnerabilities and determine where structural protection is required and where nonstructural means of protection are preferable. The plan recommends levees in the population centers of Lake Charles and Sulphur, where there is critical oil and gas infrastructure. Possibly we'll build a protective levee along the Gulf Intracoastal Waterway. Elsewhere we will elevate highways and raise spoil banks — ridges built along waterways from material dredged during channel maintenance. We're looking at ways to enhance the protective functions of the natural cheniers, preserving their vegetative cover and reclaiming pits where sand has been mined.

We can draw on the experience of Rita to understand how to mitigate the effects of such a storm. Some solutions are rela-

tively easy — for example, we can reduce saltwater impoundment by removing storm debris quickly. We can diminish property damage by elevating our homes and buildings. Everyone in southern Louisiana is realizing they must assume a greater role in personal protection.

WaterMarks: CWPPRA projects in southeastern Louisiana seem more numerous than in the southwestern region. Are the coastal parishes of the Chenier Plain receiving their fair share of protection and restoration dollars and activities?

Graves: We started recognizing problems in the Mississippi River Delta decades ago. Projects now under construction in southeastern parishes are the results of studies begun as early as the 1940s. Only later did we realize the environmental situation in the Chenier Plain also demanded our attention. The first comprehensive study of the southwestern coastal region began in 2005.

There are two facts about the progress of the new, integrated study that should encourage people in the region. First, we've already reduced the timeframe from an average of 10 years for a study to three years. In part this is the result of all that we've learned about coastal restoration in the southeastern parishes over the past half-century.

Second, we're pushing the idea of spinning off individual recommendations. We can initiate action on individual components and accelerate work on portions of the plan without waiting for the entire study to be completed.

There are some folks who say that one region of coastal Louisiana is more important than another. We don't view it that way. As a result of the storm season of 2005, the state recognized that it cannot provide disparate standards of protection for different areas of the coast. The method of achieving protection may vary — structural protection is best suited to densely populated areas whereas it is impractical in rural areas — but the state's commitment to each area is equally strong. WM

Michael Seymour, LA Natural Heritage Program, LA Dept. of Wildlife and Fisheries

Restoring Ridges... continued from page 12

Resources," says Breaux, bringing up yet another lesson of the project: the importance of partnerships. Nonprofit organizations worked side-by-side with industrial heavyweights. Nature enthusiasts shared observations and insights with government scientists and engineers. Hundreds of volunteers contributed thousands of hours planting vegetation. And there's the seemingly incongruous symbiosis between industrial activity and nature. "We've learned we need the natural system around us to protect us," says Breaux, "so when we consider what we need to do to enhance our business, we look for ways to build it that can improve the environment."

Port Fourchon has established the entire area surrounding the maritime ridge as a sanctuary. When work is finished at the 970-acre site, footpaths and boardwalks will invite visitors to view birds and other creatures benefiting from the newly created marsh and ridge habitats. WM

Symposium to Focus on Chenier Plain Science

The symposium *Ecosystem Functions and the Natural Processes of the Chenier Plain* will discuss the region's hydrology, geomorphology, ecology and hurricane protection.

Organized by the CWPPRA partner Coalition to Restore Coastal Louisiana (CRCL) and four other institutions, the event is scheduled for January 8-9, 2009. For information, please visit www.crcl.org/coalitionprograms/cheniersymposium.html WM

Songbird Migration a Hemispheric-scale Phenomenon

In a single day in mid-spring as many as two million birds end their nonstop journey over the Gulf of Mexico by alighting in the trees and shrubs of coastal Louisiana and neighboring gulf shore states. "The birds look like a gigantic cloud stretching from Galveston to Vermilion Bay," says Wylie Barrow, a wildlife biologist at the National Wetlands Research Center. Exhausted and hungry after the long flight, the birds tumble from the sky in a "fall-out." The woody vegetation of cheniers, ridges and barrier islands provides food and shelter where the birds rest and replenish their stores of energy before flying on to summer destinations across the continent.

Using Doppler radar Barrow and his research team track the birds' distribution and movement across the landscape. What he learns helps to shape practices for restoring and managing the habitat that songbirds depend on in their semi-annual migration. In one project Barrow combines his data with satellite imagery to show how birds interact with various kinds, sizes and densities of vegetative cover. "We're locating gaps of tens or hundreds of miles between patches of forest," Barrow says. "We're discovering how small an area can provide useful habitat. And we're examining conditions within that habitat, looking at issues such as invasive plants' influence on the availability of insects and other sources of nutrition.

"Because the greatest number of birds end their trans-gulf migration here each spring, the Chenier Plain plays a pivotal role in songbirds' survival," says Barrow. "Now we need to translate this awareness of the area's importance into conservation actions, protecting and restoring the remnant forests of the gulf coast." WM

George Ritchey

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