WaterMarks

Louisiana Coastal Wetlands Planning, Protection and Restoration News

December 2007 Number 36

Dredged Sediment Reverses Land Loss

Creating Marsh to Rebuild Louisiana's Coast

The Nitty-Gritty of Silt, Sand and Clay

Field Lessons In Marsh Creation

WaterMarks Interview with Ancil Taylor

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ABOUT THIS ISSUE'S COVER . . .

The most powerful technique in the Breaux Act's arsenal, marsh creation reverses land loss to restore wetlands and rebuild barrier islands. By delivering a flood of sediment to project sites, marsh creation rapidly replicates the natural processes that built the coast over the centuries.

Photos courtesy of EPA and NOAA.

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Marsh Creation as a Coastal Restoration Strategy

Erosion and subsidence exact a heavy toll on Louisiana's coastal zone, claiming nearly 2,000 square miles of land in the past 75 years. But scientists and engineers seeking to rebuild barrier islands and restore marshes have a powerful technique at their disposal: marsh creation.

"By replacing sediment compacted by subsidence or eroded away by coastal forces such as tides and waves, marsh creation rebuilds land, restoring marshes and barrier islands to an elevation that can support wetland habitat," explains Russ Joffrion, a civil engineer with the Louisiana Department of Natural Resources (LDNR). "It's the only restoration technique that immediately reverses land loss."

Moving Earth With Pumps and Pipes

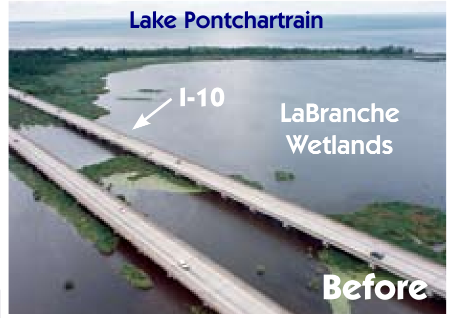
Over millennia, sand, silt and clay delivered via the muddy floodwaters of the Mississippi River built the wetlands of Louisiana's coastal zone. Marsh creation replicates the natural land-building process in a controlled — and much accelerated — fashion.

Workers remove sediment from a "borrow site" using a pipeline dredge, a specialized vessel outfitted with a suction pump and pipe. A cutterhead, a large drill-like assembly, is attached to the end of the suction pipe. As the cutterhead spins, it agitates sediment at the bottom of the borrow site; the pump sucks sediment and water into the pipe, then sends it through a pipeline to the "fill site" — the restoration project area. Once in place, the sediment settles and the water runs off.

Marsh construction and dewatering can take days or weeks, depending on the type of sediment pumped and the project's parameters. But in all cases, says John Jurgensen, a civil engineer with the Natural Resources Conservation Service, "The minute we finish construction, there's land out there — a huge mudflat that will re-vegetate within a year. We've built land where just days before there was open water."

LDNR

Engineers must determine not only how much slurry to pump into a marsh creation project, but also how fast to pump it. "We're trying to achieve the target elevation as quickly as possible, but we don't want to breach the containment dikes — doing so wastes sediment, increases cost, slows the project down and potentially infringes on the land rights of neighboring properties," explains the NRCS' John Jurgensen.



Billy Hicks, USACE

For a marsh creation project at Bayou LaBranche, the U.S. Army Corps of Engineers partnered with LDNR to restore 300 acres of wetland using pumped sediment. The Corps has been creating land with this technique since the 1970s, building some 9,000 acres in marshes and on barrier and bird islands. The knowledge and experience that the Corps, LDNR and other CWPPRA agencies gain from each project are shared and applied to the design and construction of successive projects.

Marsh Creation Projects Meet Specific Goals

CWPPRA partners carefully evaluate every proposed project site to determine whether it is a good candidate for marsh creation.

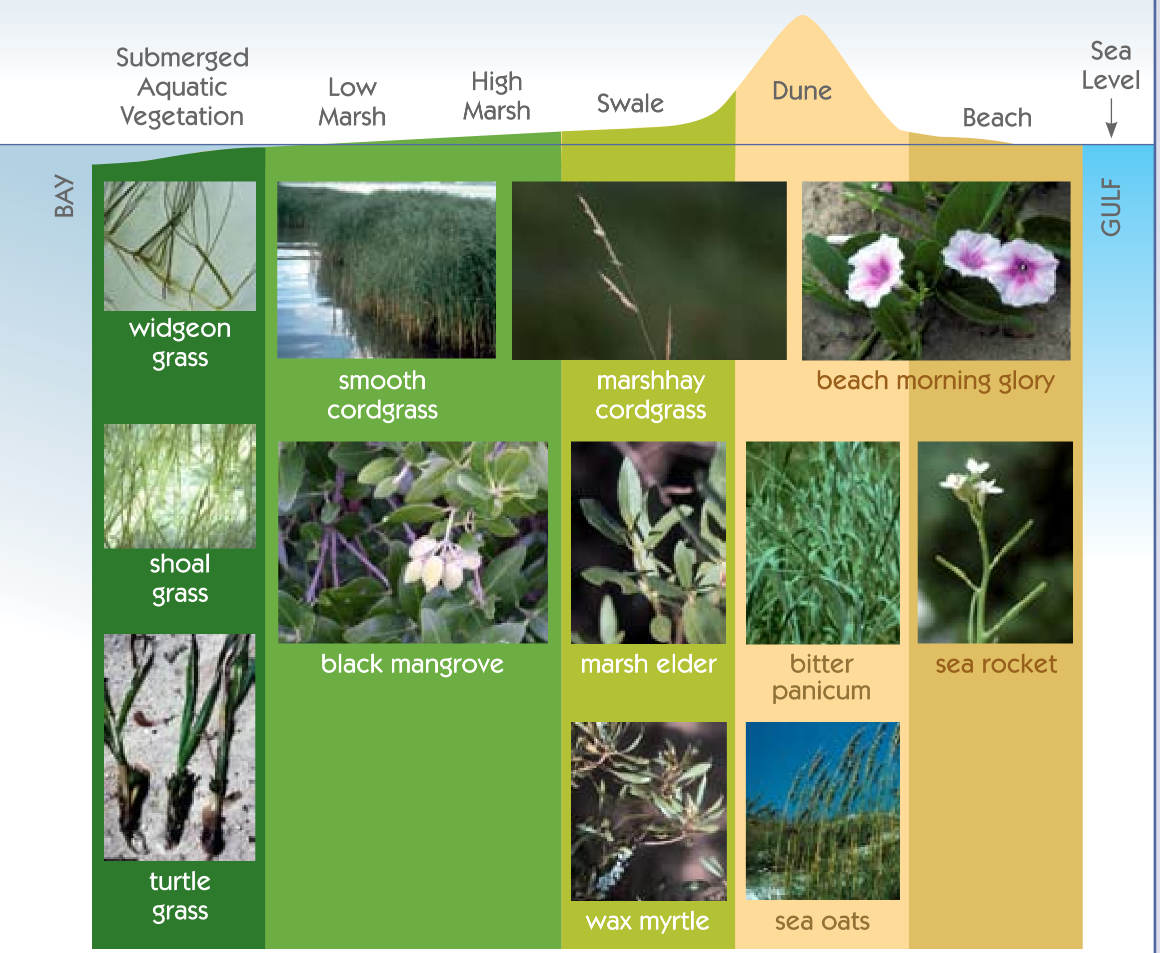
"Marsh creation is feasible in broken marsh areas and in shallow, open-water areas — no more than two feet deep," Joffrion says. Fishing, hunting and oyster leases must be reviewed and landowners' permission obtained before any work can begin. "We also need to work with industry to locate all existing oil and gas pipelines in the area. Hitting a pipeline poses risk to both workers and the environment."

After a project site is selected, LDNR's Ecological Review Unit scientists determine how high to build the marsh platform. "The elevation of the marsh is critical to the ecosystem's productivity because it is a determining factor for the establishment and sustainability of the desired plant community," says Susan Hill, the unit's supervisor. Land built too high might be colonized by upland woody vegetation instead of marsh grasses appropriate to the area. "Alternatively, if the marsh is built too low, it could remain inundated, preventing vegetation from becoming established."

Scientists collect data on elevation, vegetation and other characteristics of the created marsh and compile the data into monitoring reports. As engineers design new projects, ecological review scientists consult these reports in an adaptive management process, seeking ways to enhance projects' performance. "With each project we complete, we learn more about how better to restore our wetlands," Hill says. "We are constantly striving to improve our marsh creation designs and obtain even better results." WM

ELEVATION GRADIENT CREATES CONDITIONS FOR VARIED PLANT LIFE

Barrier Islands Host Diverse Habitats



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MONITORING PROGRAMS PROVIDE CURRENT DATA

Marsh Creation by the Numbers

Marsh creation relies on not only pumps, pipes and sediment but also information. To calculate how high to build new marsh, engineers must know the current elevation of a project site.

Spanning the state's coastal zone, a network of survey monuments provides elevation data for nearly 300 sites in marshes and on barrier islands. Each monument has a unique designation corresponding to a data sheet available from the Louisiana Department of Natural Resources (LDNR) Web site. Data include the monument's elevation, latitude and longitude, and aerial and ground-level photos of the monument site. "Elevation benchmarks placed on or near the ground's surface sink quickly as the land beneath them subsides," says Stephen Melton, an LDNR surveyor. "These monuments consist of steel rods driven 60 to 120 feet into the ground for extra stability. Regularly updating elevation data using GPS survey techniques also helps us ensure accuracy."

And to glean lessons from CWPPRA's past projects, scientists must continually monitor habitat health. Through ongoing collection of salinity, elevation, water level and vegetation data at more than 390 wetland locations, LDNR's Coastwide Reference Monitoring System (CRMS) lets CWPPRA agencies evaluate both individual restoration projects and the health of wetlands across the coast. Using CRMS data, scientists seek lessons to apply to new marsh creation endeavors.

Sediment Particles Serve as Wetlands' Building Blocks

The Nitty-Gritty of Silt, Sand and Clay

A muddy blast of slurry plunges from the end of a pipeline into the shallow water of a deteriorated marsh. Engineers and construction workers watch as the grayish-brown rush of water and sediment fills an open-water area. Over the next few weeks, the slurry will separate, sediment settling to form new land as the water runs off into an adjacent marsh.

How do the engineers know how much sediment to pump? How quickly will the sediment settle and dewater? How much will the earth compact beneath it? Understanding sediment's composition — the proportions of sand, silt and clay particles it contains — lets engineers calculate the answers.

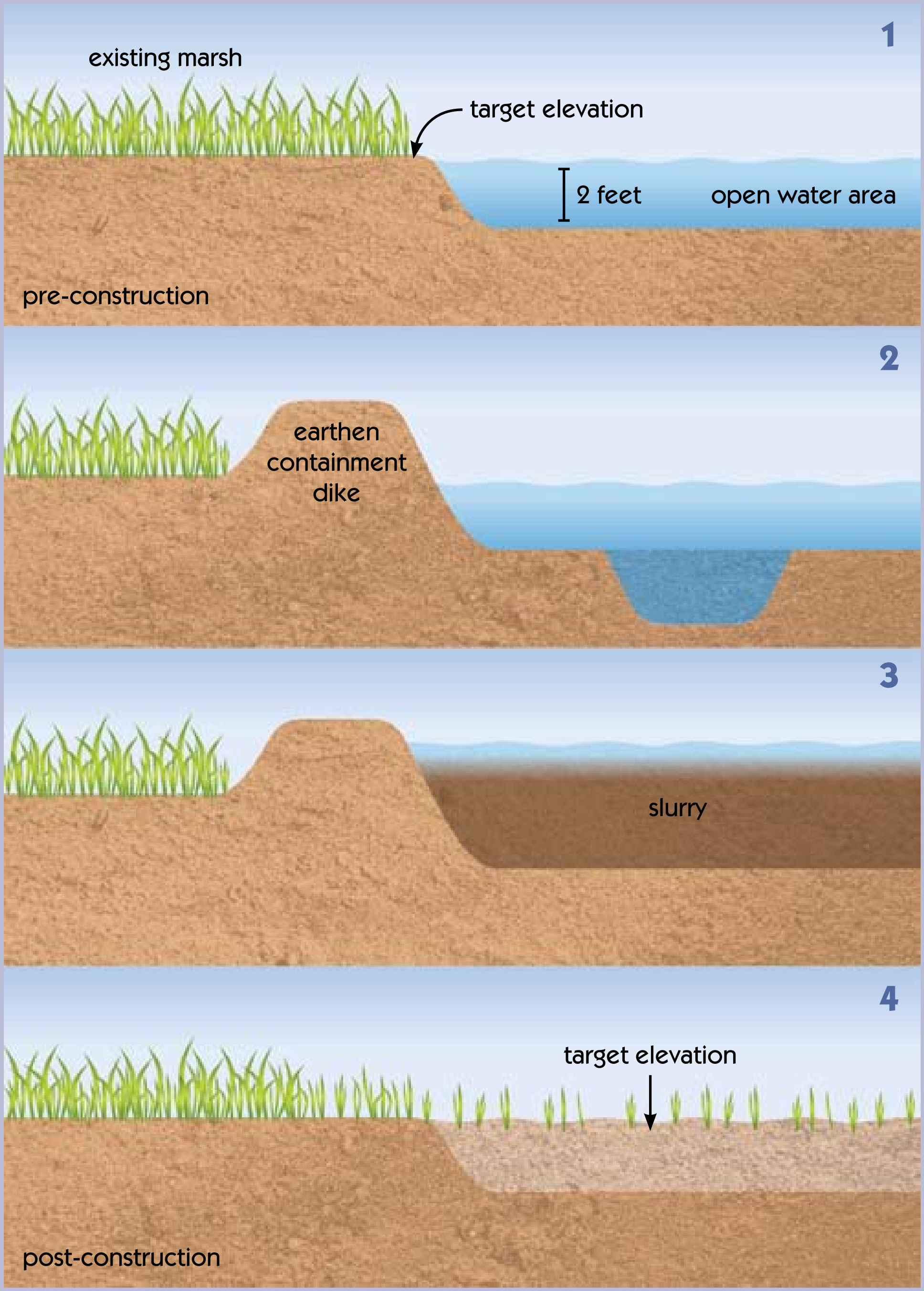
Project Designers Seek Sediment Sources

One of the first steps in marsh creation is identifying a sediment source. Ideally, the borrow site is within five miles of the project area; the closer the site, the less it costs to transport the material.

To evaluate soil type and particle size of the proposed borrow sediment, engineers drill deep into the marsh to collect soil samples. By assessing these borings, engineers can determine the sediment's performance and settling characteristics. Sand settles faster than silt or clay; heavy particles settle faster than lighter ones.

NOAA

Roaring from the end of a pipe, one kind of slurry looks much like another: a grayish-brown, muddy rush. But in slurry the proportions of sand, silt and clay vary, and particle size determines how much water must be used to keep the sediment flowing through pipes. A typical slurry is 80 percent water, 20 percent solids. Fine sand and silt particles require less water to keep them moving through the pipeline, while gravel and chunks of clay need as much as 95 percent water to 5 percent sediment.



BUILDING LAND IN MONTHS, NOT MILLENNIA

Marsh Creation Replaces Open Water With New Land

1. Engineers begin by establishing a project's target elevation — the desired height of the new land — based on the elevation of adjacent healthy marshes. Knowing the target elevation and the size of the open water area to be filled, engineers can calculate how much sediment to pump.

2. Prior to pumping sediment, construction workers scoop soil from the bottom of the project site, pile it up along the site's perimeter, then shape the soil to form flat-topped earthen containment dikes.

3. Slurry is pumped into the project site, filling the open water area to the desired depth. Sediment settles to the bottom of the fill area, and water runs off through weirs or gaps in the containment dikes.

4. After the sediment consolidates, workers degrade the dikes to the elevation of the surrounding marsh. The area might be left to revegetate naturally, or hand-plantings might be used to speed colonization. Within one to three years, the new land supports healthy marsh.

"With inland marsh creation, we have to use whatever the available borrow site offers," explains Ronnie Faulkner, design engineer with the Natural Resources Conservation Service (NRCS). "If we can determine the sediment's characteristics, we can work with it and predict its performance."

For a marsh platform on a barrier island restoration project, sediment characteristics needed determine the choice of a borrow site. "Restoring barrier island beach and dune requires heavy-grained sand free from silt and clay particles," explains Darin Lee, coastal resources scientist with the Louisiana Department of Natural Resources. "That kind of material is often found buried beneath mixed sediments — old deltaic deposits of mud and muck — below the sea floor."

Engineers prefer to use the muddy material to create the island's marsh platform and the sand beneath it to rebuild the beach and dune.

LDNR

As sediment settles, water flows out of the project area through gaps in the containment dikes. Because particles settle at different rates, a small amount of sediment flows out with the water and is lost during the dewatering process. Engineers take this sediment loss into account when they calculate the amount of slurry they must pump to achieve target elevation.

"If the island experiences such strong wind and waves that fine-grained, muddy sediment would blow or wash away, we may use the heavier sand in the marsh so it stays in place," Lee says.

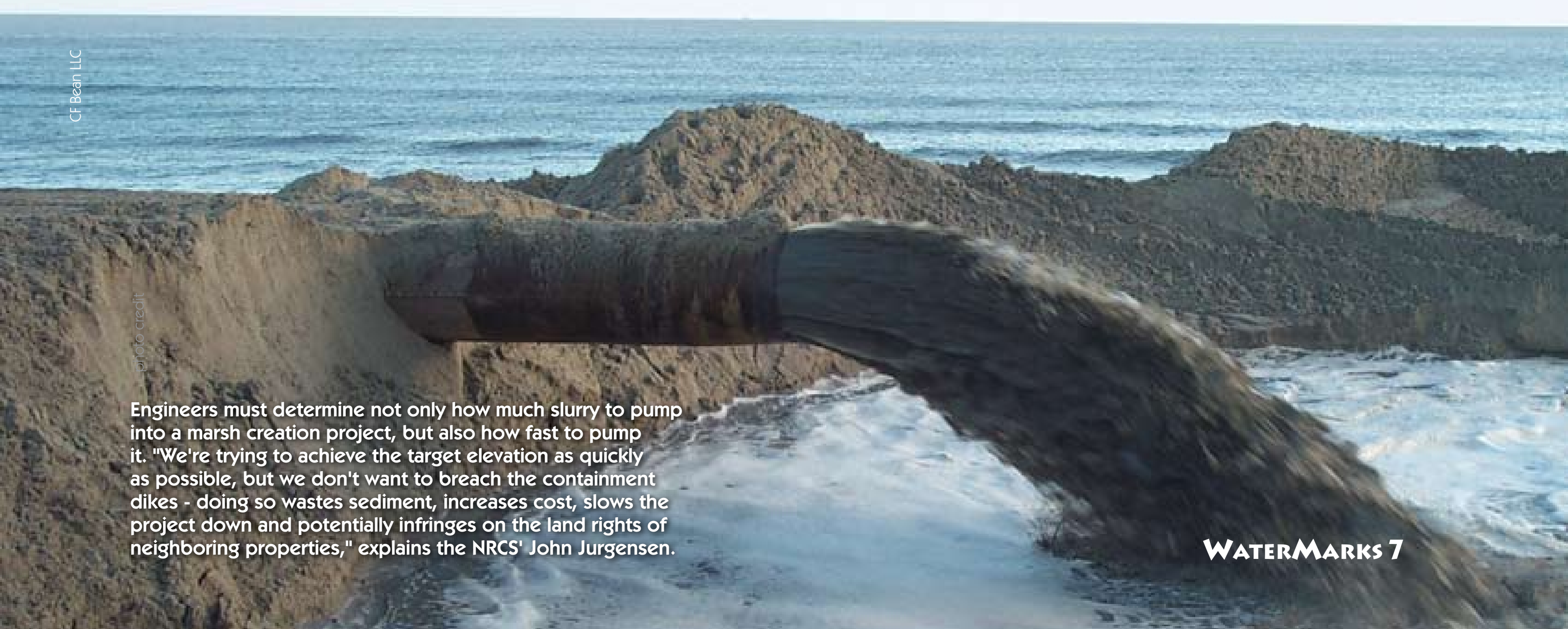
Sediment Properties Shape Project Parameters

Before construction, engineers evaluate the earth underlying the fill area, taking borings to assess soil composition and moisture content. "Under the weight of new sediment, soft, mucky soil compresses more than firmer earth does, so to reach the target elevation in a very wet, spongy marsh we must apply more sediment," explains John Jurgensen, NRCS civil engineer.

Engineers use computer models to estimate the settlement properties of both the slurry and the underlying soil, then use this data with topographic and bathymetric survey data to calculate the volume of the area they must fill. With that information, Faulkner says, "We can calculate how many cubic yards we must pump and place to achieve the right elevation."

Knowing the composition and volume of sediment to be pumped, engineers design containment systems to hold the material in place at the project site. "We must allow time for particles to settle before the water runs off, or we'll lose some of the material we pumped," Faulkner says.

Understanding how quickly placed sediment will settle and how much the earth beneath it will compact is crucial to achieving the target elevation. "Most of the settling will occur in the first three to five years after construction, but that varies from project to project," Jurgensen says. Some projects lose a foot of elevation in the first three years and six inches over the next 17 years; others subside continuously throughout the 20-year project life. "Marsh creation presents many challenges," he says, "but one of the best ways to recover lost acreage is to put more soil out there." WM



CF Bean LLC

Engineers must determine not only how much slurry to pump into a marsh creation project, but also how fast to pump it. "We're trying to achieve the target elevation as quickly as possible, but we don't want to breach the containment dikes - doing so wastes sediment, increases cost, slows the project down and potentially infringes on the land rights of neighboring properties," explains the NRCS' John Jurgensen.

Field Lessons in Marsh Creation

In theory, creating marsh is simple: make a bowl with earthen sides and fill it with sediment. But constructing a living ecosystem in an ever-changing, dynamic environment presents both scientific and engineering challenges.

A look at two CWPPRA projects exposes some of the complexities and demonstrates CWPPRA's continual improvement in developing effective, efficient coastal restoration techniques.

Goals Drive Decisions

"Establishing the purpose of a project answers a lot of initial questions," says Rachel Sweeney, ecologist and project manager for the National Marine Fisheries Service. "Why are we building marsh here rather than there? How much marsh do we need? Are we creating a certain kind of habitat? Is there infrastructure that we want our marsh to protect?"

The goals of the Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake (BA-37) project were to reduce erosion by erecting a rock dike along the Little Lake and Round Lake shorelines and to create or nourish nearly 1,000 acres in an area of open water and broken marsh south of Round Lake. BA-37 is among the largest of CWPPRA projects, but as Daniel Dearmond, civil engineer with the Louisiana Department of Natural Resources (DNR) and construction engineer for Little Lake, says, "From a construction point of view, there are no physical limits to the size of marsh we can build. All we need is a sediment source, a place to put the sediment, and money."

"A single 1,000-acre project is more economical than three 300-acre projects," says Cheryl Brodnax, marine habitat specialist with the National Oceanic and Atmospheric Administration. "Size doesn't significantly increase the expenses of planning and design, securing land rights and mobilizing the dredge operation. But availability of marsh-building material can be a limitation."

Sediment for Little Lake's Marsh

Miles from the Mississippi River and dozens of miles from borrow sites in the Gulf of Mexico, the Little Lake project used sediment pumped from the lake bottom to build and nourish the marsh.

"We try to use material from sources that can be replenished with new sediment entering the wetland system, such as the Mississippi or Atchafalaya rivers," says Dearmond. "That's preferable to simply moving sediment around within the

To slow rapid erosion — 20 to 40 feet per year — along the shoreline of Little Lake, the design of the Little Lake restoration project called for four miles of rock dike. But before the project could be built, hundreds of additional feet of lakeshore were lost in hurricanes, forcing engineers to realign the dike.

Daniel Dearmond, LDNR

Predicting Performance of Sediment and Slurry

Years of experience in marsh creation have proved that understanding the characteristics and behavior of materials increases the efficiency and economy of building CWPPRA projects. To predict probable sediment performance, scientists and engineers use tests, tables and numeric modeling. "By modeling the characteristics of clay, silt and sand, we can determine how our material will flow through pipes, how fast it will stack up, how it will settle out, how fast our marsh platform will sink," says Cheryl Brodnax.

Engineers feed soil performance data into a model to determine the fill height necessary to reach a project's target elevation. The Primary Consolidation, Secondary Compression, and Desiccation of Dredged Fill (PSDDF) model predicts the results of three natural processes: the settlement of fine-grained dredged material; the consolidation of underlying, compressible foundation materials; and the settlement following surface drying of confined dredged material.

Data from this model is used to produce a settlement curve predicting a 20-year elevation range. "Many iterations of fill height versus settled height over time generate the settlement curve," says Faulkner. "If we choose one fill height and the projected elevation at, say, year five is higher than we want, we select another fill height from the curve. We repeat this until we find the fill height that gives us the elevation we want in our target year."

system, robbing a borrow area in a static, inland lake where — if it fills in at all — it fills in with material from a neighboring sloughing area. But sometimes, with our limited funding, an internal borrow area is the only available source."

Once the slurry started entering the Little Lake fill site, differences between plan and execution surfaced. "About 80 percent of the project site was open area," says Dearmond. "We thought there would be enough friction in the material for it to stack up and slope into the existing marsh. But instead there were areas where the material slid underneath the marsh. Patches of marsh lifted up and rode on top of the slurry out of the project area. To get the acreage we wanted we had to adjust our plans and build additional containment dikes."

"A lesson we learned was to determine if existing marsh by itself provides adequate containment for pumped sediment," says Brodnax. "Building fewer containment structures saves money and lets the marsh develop its own natural hydrology. When we use dikes to hold newly built marsh, we often have to return and cut gaps in them to allow water to flow in and out. That water exchange is essential for the marsh to become useful wildlife habitat."

Peak Time for Habitat

Establishing desired habitat depends on building the marsh to the correct elevation, as elevation affects soil hydrology and determines the kind of vegetation that will grow. But, says Dearmond, "Mud is not an engineered material. It's highly variable and consolidates a lot, which makes determining how much you'll need to reach a target elevation something of a game." Settlement tables and a growing body of data on sediment characteristics give scientists clues for solving the puzzle.

Because settling occurs over time, project design specifies not only what the target elevation will be, but also when to achieve it. "Some want to see ideal marsh elevation very quickly," says Dearmond, "but to allow for consolidation, settlement and subsidence, I would shoot to reach target elevation in five to 10 years."

"If we build marsh on the high side," says Darin Lee, senior coastal resources scientist at DNR, "we end up with some kind of vegetation. But if we build marsh too low, we end up with the same open water, even though it's shallower than before."

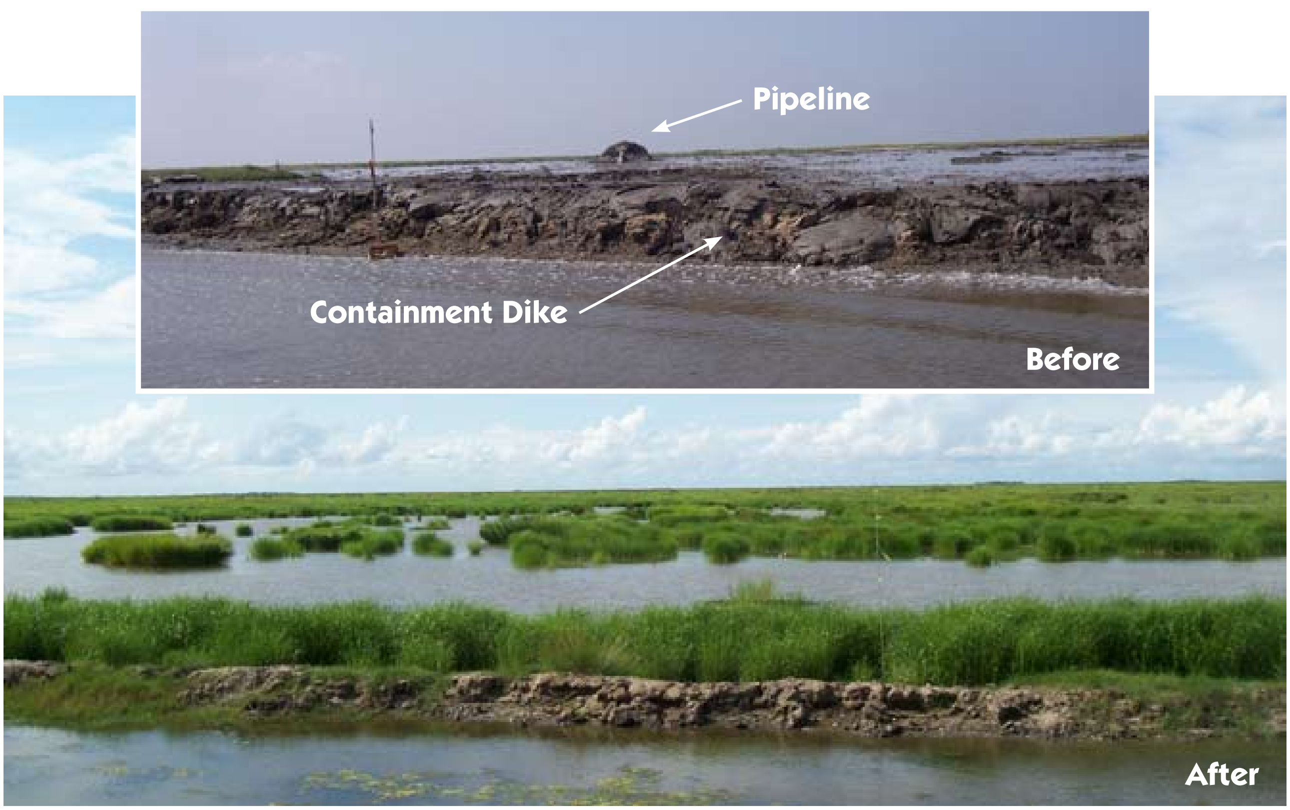
"With each project we're learning just how high to pile containment, how to calculate optimal elevation, how soil quality determines project quality," says Brodnax. "We're also learning how to build projects more economically, how to leverage the advantages of scale, and how to improve the language of construction contracts so that we get what we want from each dollar we spend."

Marsh on Barrier Islands

Engineers have learned from past projects that marshes are an essential structural component of barrier island restoration. "Behind the sandy dunes, these areas provide a platform for wind- and wave-driven sand to roll onto, saving it from falling into water and supporting the incremental migration of the barrier island system," says Patty Taylor, an environmental engineer and project manager for the Environmental Protection Agency. "The marshes help to sustain the island's width, reducing the likelihood tidal inlets will cut new passes from the Gulf of Mexico to interior estuaries."

Creating marsh on barrier islands is similar to creating interior marsh, but Taylor says island conditions present special problems. In determining dune height and platform width, design engineers must include wind, wave energy and tidal range in their calculations. A location typically 10 to 15 miles offshore complicates construction logistics. Construction schedules must take seasonal weather patterns, shorebird nesting and bird migrations into consideration. Storms can alter the landscape, splitting one island into two. Storms may also cause an unexpected

Daniel Dearmond, LDNR



Top: A pipeline pumps sediment into an open water area near Little Lake.
Bottom: Thirteen months after construction ended, new vegetation has grown on the created land. In addition to building 488 acres of intertidal wetlands, the Little Lake project nourished 532 acres of existing marsh by spreading a thin layer of sediment to feed vegetation and mitigate subsidence.

escalation in fuel costs, labor shortages and damage to natural features already incorporated into a project's design.

Lessons in Land-building at Chaland Headland

The goals of the Chaland Headland portion of project BA-38 were to prevent breaching of the barrier shoreline between Pass La Mer and Chaland Pass and to protect and create over 400 acres of dune, swale and intertidal marsh habitat. Enhancing these landscape features would shield wetlands and infrastructure to the north of the headland from storms, wind and waves originating in the Gulf of Mexico

"Katrina hit right as construction of the Chaland Headland section of project BA-38 was starting," says Brodnax. "The storm reshaped the project's footprint. Before we could continue, we had to update our survey and recalculate the amount of material we needed."

The project's design specified making tidal creeks and access channels for water to flow in and out. During construction it became evident the creeks would form on their own. "Before, during and after construction we collect data to verify engineering assumptions," says Sweeney. "We have to stay flexible while implementing a project, adjusting to lessons we learn along the way."

LDNR

At Little Lake, workers waded through thigh-deep muck to hand-plant 50,000 plugs of smooth cordgrass. A hardy, fast-growing species, cordgrass is often used at restoration project sites to stabilize soil and speed the establishment of vegetative cover on newly built land.

Lessons from Chaland Headland included realizing the benefits of using a small dredge and more flexible pipe. "A smaller dredge delivering less volume with less force reduced the danger of blowing out containment dikes," says Sweeney. "And it slowed the pace of production so we didn't have to shut down to dewater — we could leave one section to settle and move the pipe to another area. Because the pipe was lightweight plastic, we could move it easily and direct sediment into all the nooks and crannies of the project area."

Applying lessons from previous projects, the Chaland Headland project erected sand fencing within a week of finishing a section of rebuilt dune. "Wind was blowing our sand away," says Sweeney. "We wanted to trap that sand and get a grass cover growing as soon as possible."

As the project ages, rates of settlement, the contour of land, hydrologic measures and vegetative surveys will be monitored and the collected data will inform the design of future projects. "We'll never get every single detail correct," says Dearmond, "but we have to go out and build marsh anyway. We design to the best of our ability and handle the variables as we encounter them in the field."

Building the Future

Even the largest marsh creation projects built to date are dwarfed by Louisiana's annual 24-square-mile loss. "Each project is small compared to the entire coastline of Louisiana," says Dearmond. "But to the local community, each project is very significant. Our current condition in Louisiana didn't develop overnight; it's taken 40 or 50 years. The first pipeline canal cut through the marsh didn't have a significant impact on Louisiana's coastline, but over time, each canal has become very significant. It's the same situation with restoration — we're fixing one piece at a time. For future generations, I think each project will prove very significant."

"The long-term vision is to build islands and marshes with sediment from the Mississippi River," says Brodnax. "CWPPRA's smaller projects lay the groundwork for the next level. They will segue into the large-scale picture of restoring coastal Louisiana using renewable resources."

"If we have time, money and sediment to build with, marsh creation can combat Louisiana's problem very effectively," says Lee. "In a geologic timescale, sustainability will come from river diversions. Marsh creation works in societal time. It's a very important first step."

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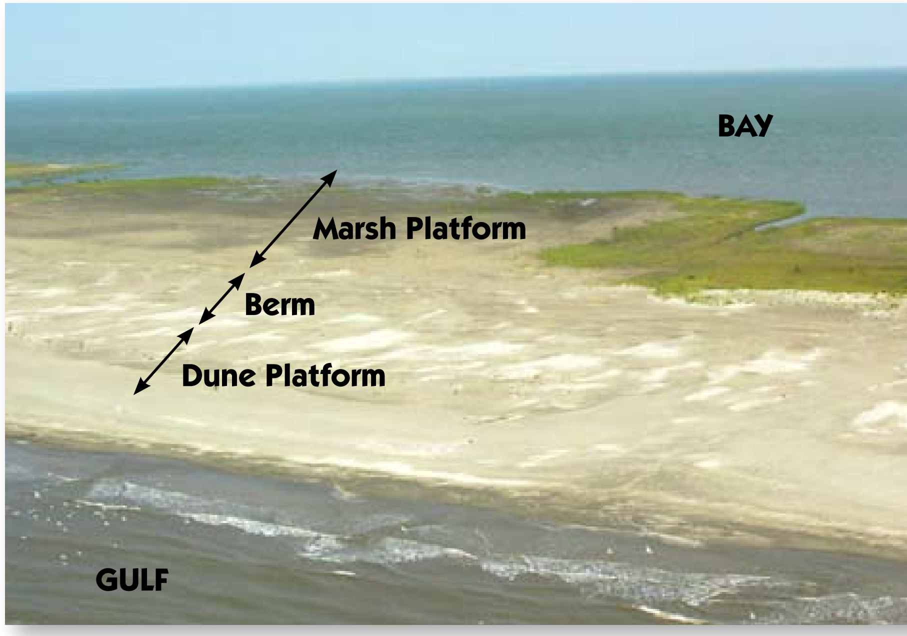
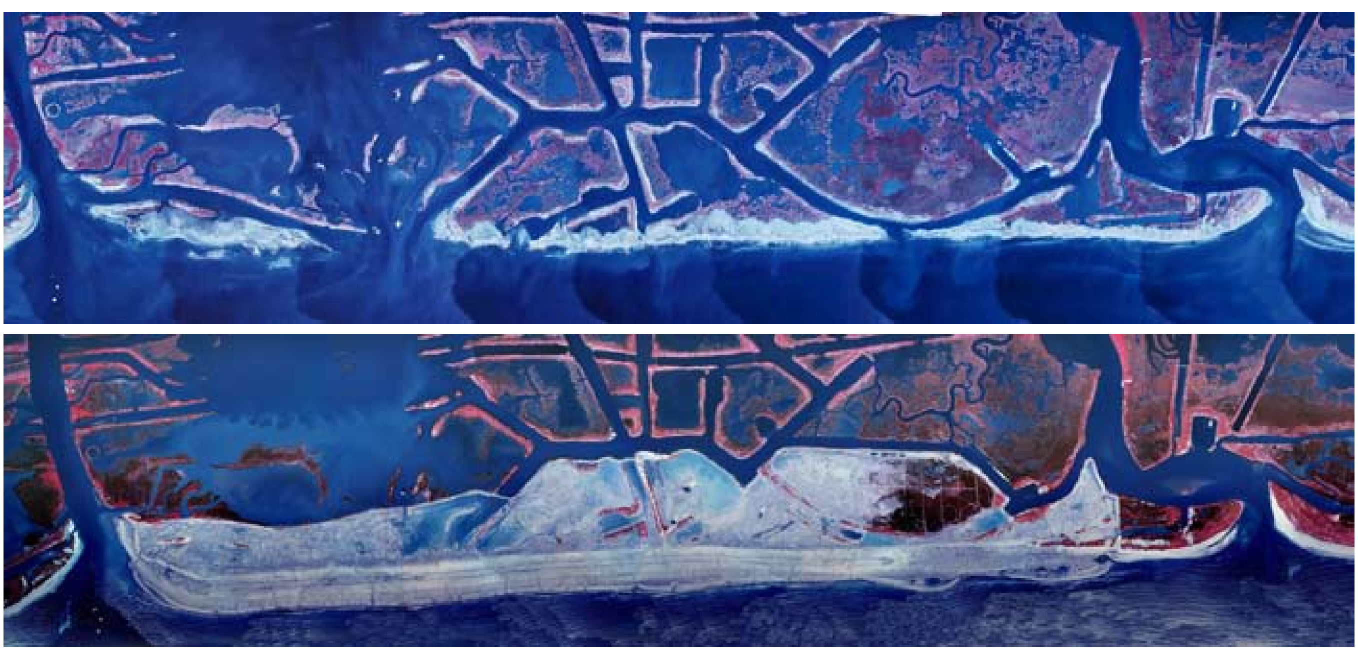


EPA

In the high-energy offshore environment, three factors determine a barrier island's survival: elevation, width and availability of sediment. Island restoration projects place dredged sand to build dune to the desired elevation, then apply more sediment to create berm and marsh on the back of the island to increase its width.



NOAA

Top: Along a three-mile section of barrier beachfront between Pass La Mer and Chaland Pass, subsidence, erosion and sea level rise claimed beach, dune and wetland habitat and breached the shoreline, threatening wetlands to the north.

Bottom: To reestablish the Chaland Headland beachfront, the Barataria Barrier Island Complex project (BA-38) pumped in 2.5 million cubic yards of sediment, creating over 420 acres of dune, beach and marsh (visible in white on this satellite image).

WaterMarks Interview with Ancil Taylor

CF Bean LLC

Mr. Taylor is vice president of the Louisiana-based C.F. Bean Corporation. In operation since 1941, the company is recognized internationally as a leader in the marine business. It has been involved all over the world in virtually all phases of sediment dredging and transport and in the construction of land through reclamation of soils from both inland and offshore sites.

WATERMARKS: As a businessman working in coastal Louisiana for nearly 30 years, you've witnessed marshes converting to open water at an alarming rate. Given the extent of Louisiana's land loss, are the current techniques of marsh creation practical?

TAYLOR: We're facing a huge challenge in Louisiana, and we need to see the big view. To rebuild Louisiana's coast quickly and on a meaningful scale, I believe we need to do two things: transfer large quantities of sediment — millions of cubic yards — into the wetlands system, and then allow nature to shape it into marsh habitats.

We're spending a lot of time, effort and resources right now and achieving relatively little. We're moving only a few hundred thousand cubic yards of sediment into small areas, then spending significant amounts of money pushing the material to achieve elevations that it doesn't naturally make.

In many cases we use rock dikes to contain the sediment and protect the particular elevation of a created marsh. These rocks, completely unnatural in the Louisiana landscape, are going to subside quickly and disappear. Instead of defining project boundaries with rock, I suggest we pump massive amounts of material — millions of cubic yards — into an area and let the material form its own edge according to the slope that it naturally takes.

WATERMARKS: But can this degree of slope give us the elevation we need for the desired habitat?

TAYLOR: I'm suggesting we use the material we have available and let nature determine the elevation. Instead of saying we're going to build marsh at a certain elevation to create fish habitat requiring vegetation that grows only at this height, we should be saying the material we have will build a marsh this high and nature will populate it appropriately.

CF Bean LLC

Workers connect 20-foot sections of pipe to build a pipeline — typically two to five miles long — from borrow area to fill site.

Above: As it spins, the massive cutterhead churns up sediment and directs it into a suction pipe.

Right: The cutterhead dredge Meridian completes a project near South Pass, Louisiana.

Let's imagine we undertake a project spanning thousands of acres in open water. Let's say we have available a silty sand material that's conducive to building ridges and terraces, so we'd build a terrace out through the water to an elevation of maybe six or eight feet. The sediment would take the shape of a wide finger with very long, very gradual slopes on both sides. A few hundred feet over we'd build another finger, and then another. Instead of the difficulty and expense of trying to shape this silty sand into an elevation right at or near the water surface, we'd let the character of the material shape our fingers and allow the sediment to settle as it wants to do naturally.

Initially our fingers would only be mounds of sediment rising out of water, but with only a little help from us, nature will turn them into marsh. And because the habitat you find at seven or eight feet elevation is different from the habitat you find at the water's edge, our fingers will create a diversity of habitat as opposed to a single habitat over a large area. Ultimately, nature will achieve the final, ideal elevation.

WATERMARKS: So you envision bringing in more sediment and letting it fall out over a bigger area. What about property rights in "sediment-flooded" areas?

TAYLOR: That's a complicated issue to deal with no matter what the size of our restoration area. But remember that even without a hard structure the project area will have an edge. The material won't migrate significantly. We should be able to accommodate property limits in our project design.

WATERMARKS: How would we create marsh where we don't have large expanses of open water to build long fingers?

TAYLOR: The Louisiana landscape holds a broad spectrum of sediment that, by its nature, can be shaped differently. A very sandy silt is going to allow itself to be shaped differently than silty sand. Creating a flat pancake with this material is easier than making fingers because sandy silt does not stack up. We can create a large area with it that will, over time, subside and settle in, achieving an elevation that matches other healthy marshes in the vicinity. But right now contractors are required to impose tolerances on materials that don't behave the way we're asking them to. I see it as a great waste when we spend money trying to meet precise elevation specifications instead of transferring significant quantities of sediment — tens of thousands, hundreds of thousands of cubic yards a day — into the wetland system and leaving the work of arriving at appropriate conditions to nature.

WATERMARKS: Are sufficient quantities of sediment available to pump millions of cubic yards into Louisiana's marshes?

TAYLOR: Absolutely. And this is new sediment, sediment not already within the system, that we'd be introducing. The two most well-known sources are the Mississippi River and Ship Shoal.

Ship Shoal is a massive site of sand deposited thousands of years ago seven miles off shore. According to studies, even if we completely exhausted the Ship Shoal deposit — which we would never have to do — the effect on wave patterns reaching the coastline would be negligible. The benefits of rebuilding our barrier islands with the beach-quality sand we take from there far outweigh any detrimental effect that we can foresee.

The Mississippi River is an enormous, renewable source of sediment. Year after year we let tens of millions of cubic yards escape down the river. By dredging sumps, or catch basins, in the river, we can remove three to four million cubic yards of material and transport it into the marshes. Material carried down the river will refill the catch basins. Not only would this get needed sediment into the wetlands, it would reduce the amount of maintenance dredging required in the navigation channel.

But presently we're not even maximizing the use of the sediment we're already recovering from the river. In my 30 years in the dredging business, I've been party to carrying 16-20 million cubic yards a year out of the federal navigation channel, carting it off shore and dumping it off the continental shelf. That's just unacceptable. We've got to stop that practice.

WATERMARKS: How can we be throwing away material that our wetlands need so desperately?

TAYLOR: We're failing to see the big view. Each agency working in coastal restoration has its own mission, its own agenda. For the agency charged with developing fish habitat, a 300-acre marsh-building project at a certain elevation makes sense; it is — according to their mission — successful. The agency responsible for navigational dredging in the river isn't focused on wetland repair but on disposal of this material in the least costly fashion.

There's a cost to utilizing dredged material in the marshes, and someone has to come up with the funds. We're already spending federal money to maintain navigable waterways; all we need to pay for is the difference between placing the material in the marsh and dumping it off the continental shelf.

In the past we did not have the money to step up and pay for placing dredged material in the wetlands. Now we have money promised to us. The science, technology and equipment exist; now it's a matter of will, of shifting our paradigm and recognizing that we can no longer afford not to maximize our resources. And to make the most of our resources we need to use the economy of scale and let nature do the work. WM

PROPERTY OWNERS PROPOSE SITES FOR MARSH CREATION

Louisiana Landowners Help Rebuild Wetlands

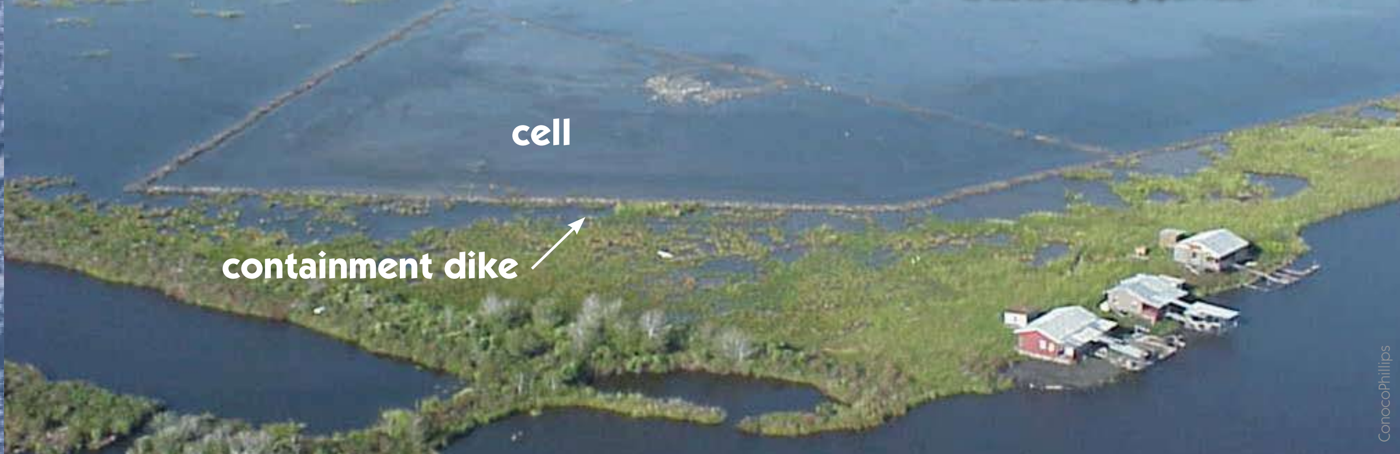
For many Louisiana landowners, the crisis facing the coast is personal: They've seen their own property erode, subside and convert to open water. Those property owners can apply to recover some of that lost land — at no cost to them — through the Department of Natural Resources' Dedicated Dredging Program.

Since 1997, the state-funded program has built marsh creation projects on privately owned wetlands in Jefferson Parish, Golden Meadow, south Terrebonne Parish, Lafourche Parish and the Mississippi Delta. The program restores land by pumping hydraulically dredged sediment into the project area. A typical site is around 40 acres of shallow water, contains no pipelines or other structures and is owned by just one landowner.

"One could argue that 40 acres isn't much marsh, but rebuilding a small parcel of land can help protect an existing ridge or a larger section of wetland from erosion or saltwater intrusion. By restoring a variety of habitat in different areas of the coast, this program also helps preserve the state's biodiversity," says Rudy Simoneaux, DNR staff engineer. "Many of these landowners shrimp, hunt and fish — activities that depend on healthy wetlands. This program gives them a way to fight the land loss that threatens Louisiana's wildlife and fisheries."

Landowners interested in the DNR Dedicated Dredging Program can learn more about selection criteria and complete an application form at http://dnr.louisiana.gov/crm/coastres/ddp.asp. WM

At Grand Bayou Blue, DNR's Dedicated Dredging Program restored 40 acres of privately owned wetland using a technique called "celled construction." Engineers divided the project area into five cells bordered by containment dikes; when sediment pumped into the first cell (foreground) reached target elevation, workers notched a small weir into the dike, allowing the first cell to dewater into the second. "Past projects dewatered outside the project area, resulting in loss of dredged sediment," explains Rudy Simoneaux. "By allowing the runoff to flow into the next cell, we kept that sediment within the project area instead of losing it to the surrounding open water."



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