

EROSION CONTROL

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New Directions in Dredging

New techniques, better equipment, and environmental awareness transform an age-old practice.

By Dan Rafter

Dan McDougal has dealt with everything from sea turtles and manatees to rare sea grass not seen in Texas for 20 years. He isn't a marine biologist, though. He is president of Kansas City, MO-based Dredge America, which performs hydraulic dredging projects for lakes, marinas, golf courses, municipal lagoons, and other facilities throughout the country. And in doing his job, he's had to protect the habitats of endangered species, preserve rare aquatic plants, and restore dying wetlands.

Consider the project he and his company tackled in 1999 for the Texas Parks and Wildlife Department. McDougal helped restore a wetland on a small island in the state's Galveston Bay by installing 2.5 mi. of geotextile tubes filled with dredge material as a breakwater. Dredge America workers then planted grasses and plants along the breakwater.

Complications arose during the project, however, when biologists located a rare sea grass that hadn't been seen in the state for two decades. Suddenly McDougal's plans changed, and he had to reroute a good portion of geotextile tube to protect the sea grass.

Then there was the project he took on in 2003 for Florida Power & Light, a massive utility that provides electricity to 4 million homes and businesses across the state. McDougal and his crew had been charged with dredging a channel for the construction of a new intake structure in front of a nuclear power plant in St. Lucie. It would have been a typical dredging job if not for the abundance of marine life with which McDougal and his workers had to contend. Sharks, manta rays, and sea turtles swam through the waters where they were working. McDougal had to be concerned especially with the sea turtles, animals still listed as endangered. In fact, the company faced a hefty \$5,000 fine if McDougal or his dredges accidentally injured a sea turtle. The solution? He installed spray nozzles onto his dredges that would push out streams of water designed to keep the curious turtles away from the sharp edges of the machines' cutter heads.

McDougal doesn't complain about the extra work sea turtles and rare grasses cause him. He knows it's all part of the job. Dredging firms today, whether they are clearing out the bottoms of busy shipping lanes or restoring fading wetlands, deal with a host of environmental issues. Many times firms must find environmentally sensitive ways to dispose of contaminated sediment. Other times they must work around the aquatic habitats of rare or endangered wildlife.

Such environmentally sound dredging is a growing business. And in many ways it is changing the negative environmental reputation dredging has long held.

"Years ago, people generally thought of dredging as something that was harmful to the environment," McDougal says. "But that's changing now. If you consider all of the elements in a lot of these projects, if you consider how dredging is often a component in restoration projects, you can see that dredging is often very good for the environment."

As an example, he points to a recent project his firm handled in Aspen, CO. Using the company's hydraulic equipment to dredge out loads of sand from the bottom of a private lake filled with trophy trout, crews then used the sand to transform an old, unused quarry next to the lake into a usable beach.

"That was sort of a double whammy. This happens a lot. You restore a lake and then restore another area with the dredge spoils," McDougal says.

Dredging firms across the country increasingly are working on environmentally sensitive projects, encountering a host of unique problems, and wielding an equally vast array of techniques to solve them. And don't think the manufacturers of dredging equipment haven't noticed.

"The market for environmentally safe dredging equipment is certainly growing," says Don Mueller, sales manager for Liquid Waste Technology, a Somerset, WI, company that specializes in the manufacture of automated and unmanned dredges. "A lot of our machines are used on small lakes or for homeowners' associations that are dealing with silt getting into sediment ponds because of development. They need to clean them up. Our machines are used a lot to help agencies perform PCB [polychlorinated biphenyl] cleanups on rivers and streams. That is really the biggest percentage of our company's work."

Officials with Innovative Material Systems (IMS), a Prairie Village, KS-based manufacturer of portable hydraulic dredges, also work largely with clients tackling sensitive environmental issues. For example, the City of Cape Coral, FL, recently purchased its eighth Model 4010 Versi-Dredge from the company to help complete a dredging project involving the cleanup of 400 mi. of canals. It is believed to be the largest municipal dredging project in the United States.

"We sell our dredges around the world," said IMS's Ryan Horton. "The people we are working with are doing everything from canal management and reservoir management to channel dredging. And often they have to worry about environmental issues. In Cape Coral, for instance, they are constantly looking out for gators and manatees. That is something they have to focus on."

How are dredging firms meeting the challenge of serving their clients and protecting the environment? We looked at several recent dredging projects, both large-scale and small, to discover the innovative ways in which dredging operations preserve wetlands, protect rare animals, and deal with contaminated sediment.



PHOTO: AMEC EARTH & ENVIRONMENTAL

Transforming Portland's South Waterfront

The hard work paid off in 2003 for Leonard Farr and his crew. That's when Farr, a senior associate with AMEC's Earth & Environmental office in Portland, OR, accepted a prestigious Phoenix Award for a nearly-two-decade-long brownfields redevelopment project that transformed a contaminated waterfront area into a thriving residential, commercial, and recreational area.

As project manager for the South Waterfront Redevelopment Project, Farr oversaw a crew that helped transform a 73-ac. industrialized area south of downtown Portland into an upscale residential and commercial area. Today the site features 480 residential units, 40,000 ft.² of commercial space, a 74-room hotel, an athletic club, 26,500 ft.² of retail space, an 83-slip marina, and 34 ac. of public parks, streets, and open space. But when Farr first set foot on the site in the mid-1980s, he immediately faced a huge problem.



PHOTO: AMEC EARTH & ENVIRONMENTAL

Construction crews had dredged about 3,000 yd.³ of river sediment. When Farr and his workers tested the stockpiled sediment, they found evidence of hydrocarbons. That meant workers couldn't simply use the soil as infill. Hauling it to the nearest landfill would have meant a huge additional expense for the project.

So Farr and his associates used the sediment to build an embankment for a light-rail project being led by the Portland Airport. This decision saved more than \$50,000 in disposal costs.

During the project, completed in four distinct phases, Farr had the opportunity to view the changing role environmental issues played. When Farr first began work on the South Waterfront project in the 1980s, he faced few environmental restrictions. In fact, AMEC completed the first phase of the project without encountering a single environmental concern.

"Looking back at it now, you wonder if there truly weren't any environmental problems or if there just wasn't anyone out there looking for them," Farr says. "It was probably a little bit of both."

This changed by the time AMEC began the second phase of the project. And as the years have progressed, Farr notes, state officials have become more concerned with environmental issues.

This isn't the case only with the South Waterfront project. "In Portland, our harbor four years ago was added as a Superfund site. Up until that time, sediments were not closely regulated by the state. But the listing of the Portland Harbor has really raised awareness here in the city about the environmental issues associated with dredging," Farr says.

Watching Out for the Manatees

For the last 17 years, workers with the Public Works Department of the City of Cape Coral have dredged the bottoms of the 400 mi. of stormwater canals that run through the municipality. Regarded as the largest municipal dredging project in the US, the goal of all of this work is to remove layers of soil and decaying material from the canals—which were draglined in the late 1950s and early 1960s and then neglected until the late 1980s—and thus deepen them.

During the nearly two decades of this dredging project, Kevin McGhee, public works supervisor for Cape Coral, has seen plenty of strange things. Once, a hammerhead shark with a length of at least 15 ft. swam into a canal where McGhee and his crew were working. The monstrous creature swam to the end of the canal, took a brief look around, and then turned, creating "one hell of a wake" in the process, he recalls.

"That was awhile ago, but we still remember things like that," McGhee says. "That shark was almost as big as the boat we were in. And everyone commented on how ugly it was."

But the ugly shark was also a reminder to McGhee and his crew of just how careful they have to be to protect the canal environment, which is home to a wide variety of aquatic species—everything from monitor lizards to snakes to alligators. Workers take care that their dredging doesn't disturb these critters. But they take the most care when dealing with the manatees that also call Cape Coral's canals home.



PHOTO: IMS DREDGES

One of eight dredges the City of Cape Coral operates to maintain more than 400 mi. of stormwater canals.

Manatees, seal-like aquatic mammals that average 9–10 ft. in length and 1,000 lb. in weight, are endangered. McGhee has found that they also happen to be extremely curious. This can cause problems. McGhee and his crew have to immediately shut down if they happen to spot a manatee nearby, and they can't continue dredging until the creature leaves the scene.

The problem is that McGhee and his crew are not allowed to scare away manatees. They can't even give them a little "shoo." "Even if it's a whole day or even two, whatever it takes, we have to shut down," McGhee says.

He's been fortunate, though; the longest he remembers a manatee shutting down the project was for two hours. And there is always plenty of work crews can do while waiting for the manatees to move on. For instance, part of the dredging job requires monitoring the turbidity of the canal waters every hour. Members of the crew can do this while the manatees satisfy their curiosity.

"We never think of the manatees or any of the other animals here as a nuisance," McGhee says. "This is their home. They were here well before us. We're trying to help them out. We go in and clean up the canal, and it makes everything better for them. When we take the dead, decaying layer off of the bottom, it opens up the canal and allows more fish to come in. We're getting rid of 40 or 50 years' worth of garbage, rotted grapefruit—you name it. When we scrape it clean, it benefits everyone."

McGhee, it is clear, enjoys his work and his environment. And why shouldn't he? It gives him great stories, such as the time when he and his crew reported to work one morning and lifted a dredge out of the water only to find a 4-ft. alligator sitting atop the cutter box. The crew lifted the hydraulic dredge in and out of the water several times until the tiny alligator finally slipped off and swam away. Fortunately the gator's mother never showed up.

Then there was the time when one of McGhee's workers dredged up what looked to be a large femur, or thighbone. McGhee called the police. Fortunately the bone did not turn out to be human. "They said it might have been from a cow or a calf," he says. "But you'd be surprised at what we dig up out here."



PHOTO: DREDGE AMERICA

Massive Undertaking on the Mississippi River

As a project manager for the US Army Corps of Engineers, Greg Miller has tackled quite a few big projects. But none of them compared to the recently completed West Bay Sediment Diversion Project.

This project represents an effort by the corps to restore 10,000 ac. of wetlands along the Mississippi River as it passes through southern Louisiana. As part of the project, Oak Brook, IL-based Great Lakes Dredge & Dock Company supplied its large dredge *California* to work on a channel 25 ft. deep and 2,500 ft. long from the river through its low and narrow bank to the West River.

John Hall, public information officer for the corps' New Orleans District, says the *California* has dredged up about 1.6 million yd.³ of sediment. Project officials have put this to good use, creating about

100 ac. of new marshland from the sediment.

"Right now there are hundreds and hundreds of birds out there enjoying themselves," Hall says. "I imagine from a bird's point of view it's great to have a place where there is food all over the place, thanks to freshly moved sediment, and no bushes or trees to block your view of any dangers that may be coming over."

Construction on the project began in September 2003 and finished in November. The channel now diverts 20,000 ft.³/sec. of water from the Mississippi. Project workers did not build any additional structures or gates to help rebuild the area's wetlands. The canal itself will do all of the rebuilding. Miller says the West Bay Sediment Diversion Project is the first to try capturing the river's natural ability to build wetlands.

Such a big project certainly comes with a host of challenges. But surprisingly the biggest challenges in this effort came before construction began, Miller notes. "The construction part was actually simple technology, and it went very quickly and smoothly. The engineering and design challenges were far more significant. We've spent many decades trying to control the Mississippi River. We came at it with the idea to let it flow back into the marshlands. It was, in many ways, counter to the flood control efforts we had been doing."

Although construction of the channel is complete, the diversion project is hardly finished. Miller and the corps now will spend the next 20 years monitoring the project's impact. The goal is to see if the project rebuilds the wetlands the way engineers planned. To do this, engineers will fly above the newly built channel to observe the progress firsthand. They also will use high-altitude aerial photography to help measure the slow creation of new wetlands.

Although the official verdict won't be in for several years, Miller is confident the project will have a beneficial impact on the area's fading wetlands. "This was really a very impressive project," he says. "It was a very large dredge to construct. We did have an opportunity to fly over the area several times while construction was going on. You could see the material we were digging from the riverbank being used immediately to build new wetlands. It wasn't being stockpiled or wasted. That was a good thing to see."



PHOTO: US ARMY CORPS OF ENGINEERS

Protecting a Lagoon From the Sea

Some dredging projects are true engineering marvels. An ongoing project in Ghana on Africa's west coast is protecting a body of fresh water, the Keta Lagoon, from being inundated by the salty waters of the Gulf of Guinea. The problem is that only a narrow isthmus—a strip of land as small as 10 m wide in some locations—separates the sea from the lagoon. And that strip of land has been suffering from continuous and severe erosion.

If the sea were to breach the isthmus, it could result in disastrous consequences to the local fishing and agricultural industries. Unfortunately the stretch of land between Keta and nearby Kedzi erodes at a rate of 4–8 m/yr.

Since 1999, officials with Great Lakes Dredge & Dock have been involved in the project, dredging up land to restore the buffer between the fresh water and the sea. They are reinforcing this reclamation with a kilometer-long revetment and a system of six groins. The project, which is nearly complete, will cost about \$83 million.

When Richard Adams, Great Lakes' publications manager, traveled to Ghana to view the project, he was amazed by what he saw. "This is a remote part of the world. We had to construct our maintenance base for two dredges," he says. "We needed stone, so we found a stone quarry. We've been mining stone from the quarry and trucking it over roads that we built. It's really been quite an extensive and comprehensive project."

When one examines all of these projects, it's clear that today's dredging operations are doing their part not only to sustain the environment but also to improve it. And those involved in the industry expect this to continue.

Hall of the Army Corps of Engineers says his New Orleans Division's Mississippi River project is the latest example of the balancing act of protecting commercial interests and environmental concerns that is now a part of most dredging projects. "The challenge is how to go in an area where there is considerable development—things that are important to human beings—and do a project that not only doesn't negatively impact them but also helps protect the environment. You have to balance the needs of the homes, job sites, transportation hubs, and utilities with the importance of preserving the environment."

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