RESTORING THE GULF COAST

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New Markets for Established Firms

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None of the opinions or comments expressed in this study are endorsed by the companies mentioned or individuals interviewed. Errors of fact or interpretation remain exclusively with the authors. We welcome comments and suggestions.

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List of Abbreviations

ADB  Asian Development Bank
BLS  U.S. Bureau of Labor and Statistics
CIAP  Coastal Impact Assessment Program
CPRA  Coastal Protection and Restoration Authority
CWA  Clean Water Act
CWPPRA Coastal Wetlands Planning, Protection and Restoration Act
DSC  Dredging Supply Company
GAO  General Accounting Office
GOMESA  Gulf of Mexico Energy Security Act
HDPE  High Density Polyethylene
KOICA  Korean International Cooperation Agency
LPBF  Lake Pontchartrain Basin Foundation
NOAA  National Oceanic and Atmospheric Administration
NRCS  Natural Resources Conservation Service
NRDA  Natural Resource Damage Assessment
OCPR  Office of Coastal Protection and Restoration
SBA  U.S. Small Business Association
USACE  United States Army Corps of Engineers
VOV  Voice of Vietnam
WRDA  Water Resources Development Act

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I. Executive summary

The Mississippi River Delta is a priceless resource. It sustains the Gulf region’s unique people and cultures and brings the U.S. economy billions of dollars each year in energy, fishing, shipping and tourism. Yet the delta’s many benefits are under threat, because much of the land area is steadily vanishing underwater. Since 1932, on the Louisiana coast alone, human-induced damage and tropical storms have claimed an astonishing 1,883 square miles of wetlands. Between 1985 and 2010, the rate of land loss equated to an area the size of a football field disappearing every hour (Couvillion et al., 2011). This land loss brings communities in the delta region ever closer to open water, placing them at increasing risk from hurricanes and sea level rise.

At stake in the loss of coastal wetlands is not only the environmental health of the Gulf region, but also several of the nation’s vital industries. The Gulf region’s critical economic role, and the extent to which this role depends on the delta ecosystem, is evident in the following assets provided by the Gulf region:

- 33% of the nation’s seafood harvest (NMFS, 2011)
- $34 billion per year in tourism (Oxford Economics, 2010)
- 90% of the nation’s total offshore crude oil and natural gas production (EIA, 2011)
- 4,000 offshore oil platforms and 33,000 miles of pipeline (BOEMRE, 2011; NOAA, 2010)
- 10 of the nation’s 15 largest shipping ports, by cargo volume (AAPA, 2009)

Coastal wetlands, considered one of the most productive ecosystems in the world, perform at least five crucial environmental services. First, they serve as a nursery for nearly the entire commercial fish and shellfish catch from the Gulf of Mexico. Second, they form the basis of a tourism and recreation industry that includes hunting, fishing, boating, and other revenue-generating and job-creating activities. Third, wetlands act as a sponge for water and wave energy, helping protect against flooding from severe storms and hurricanes. Fourth, they filter pollutants and sediment, acting as a natural water treatment plant. Fifth, healthy wetlands are the largest reservoir of global soil carbon, sequestering millions of tons of carbon annually.

Restoring the Mississippi River Delta, as well as wetlands throughout the Gulf Coast region, will require substantial public funding—an investment that will recover billions of dollars’ worth of lost economic benefits. In addition, the restoration work itself will directly create and save jobs. Restoration projects activate a full supply chain linking materials providers, equipment manufacturers, shipbuilders, machinery repair firms, engineering and construction contractors, and environmental resource firms. Many of the firms are based in the Gulf Coast region. Having long worked in the traditional oil and gas industry, they can apply the same skills and equipment to coastal restoration, thus finding new markets and a more diverse client base.

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2 An overview of the Gulf region’s critical role is found in Mabus, 2010, a plan of federal support prepared by the Secretary of the Navy at the direction of the President of the United States.
3 These environmental benefits, and their economic significance, are summarized in Table 1 on page 8.
A coastal restoration segment is already in place within the marine construction industry. The most comprehensive effort to create demand for restoration work is the Coastal Wetlands Planning, Protection and Restoration Act, through which 151 coastal restoration or protection projects have been authorized over the past 20 years, with funding ranging from $30 million to $80 million annually. Over 110,000 acres in Louisiana have benefited (CWPPRA, 2011a, 2011b). According to the 2007 Louisiana Master Plan, adequately preventing further land loss along the Louisiana coast will cost $50 billion over three decades (GAO, 2007).

The amount of public funding that in fact will be invested remains to be seen. But with so much further work to be done, a question arises: if the commitment were to expand on the scale needed, what kinds of jobs would be created, in what types of firms, and in what U.S. locations?

This study is based on a sample of 140 firms linked to coastal restoration projects already undertaken or completed. The analysis examines all types of firms across eight categories of the value chain.

Six key findings:

1. **Coastal restoration provides job opportunities in the Gulf Coast region and 32 other states.** Of the total 391 employee locations nationwide, 261 locations, or 67 percent, are in the five Gulf states of Texas, Louisiana, Mississippi, Alabama and Florida. Additional, though smaller, concentrations of firms are found in the Pacific Coast (32 locations) and the Midwest (25 locations).

2. **Coastal restoration comprises a small but growing share of work for many firms within the marine construction industry.** For most firms involved, coastal restoration comprises 25 percent or less of overall operations. For the largest firms, the share may be less than five percent. This is not surprising, since to date, the total volume of coastal restoration projects has created a small amount of work at best. Typically, marine construction firms undertake larger flood protection or dredging projects to maintain navigational channels, supplementing such work with coastal restoration.

3. **The firms are mostly small and medium-sized.** According to SBA guidelines on number of employees, 67 percent of the firms in our sample qualify as small businesses. Over 42 percent—or 55 of the 129 firms with employee data—have fewer than 100 employees. Restoration projects involve firms of all sizes, but they appear to be particularly important to small and medium-sized firms, providing a valuable stream of work in a fragile economy.

4. **Coastal restoration offers important opportunities for well-established firms to utilize under-used resources.** The average age of equipment firms is 55 years, and for service firms, 44 years. These firms have a long history of serving oil and gas companies. As such contracts declined along with oil production over the years, a number of firms along the value chain took on work in coastal restoration, thus diversifying beyond a single, shrinking client base. Looking ahead, an expanded coastal restoration effort would enable many more such firms to put traditional resources to use.

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4 The sample was constructed based on USACE contract award lists (USACE, 2011), CWPPRA project completion reports (CWPPRA, 2011c), information compiled by the OCPR, and company interviews.
5. **Equipment manufacturers are increasingly turning to export markets.** With sales of construction equipment down in the United States, exports are an important source of new demand. Several small and medium-sized firms in our sample are orienting increasingly to foreign markets. Depending on the year, exports comprise 30-50 percent of these firms’ business.

6. **Building a job-creating industry will require steady work, and a higher volume of work than in the past.** As in any industry, job creation in coastal restoration is tied to demand for the product. But unlike most industries, demand for coastal restoration work today comes entirely from government-funded projects. A recurring theme observed in interviews with sample firms is the unsteady nature of demand for coastal restoration work—in part because of uncertainties and delays in funding mechanisms, and in part because the total volume of funding historically has been low. Additional funding and stability in investment will make it easier to create and save jobs.

To restore and protect the benefits that coastal wetlands provide to the Gulf region and U.S. economy will require an increased funding commitment, one that is sustained over the coming decades. A significant one-time source of funding—for example, the Clean Water Act penalties from the 2010 BP oil spill—could serve as a kickstart to launch this long-term investment. Similarly, a sustained funding commitment would give relevant firms the confidence to scale up their labor force and capital equipment. Thus, additional economic benefits would accrue to the region and the nation by developing a job-creating coastal restoration segment of the marine construction industry.
II. Introduction

The Mississippi River Delta is a priceless resource. It sustains the Gulf region’s unique people and cultures and brings the U.S. economy billions of dollars each year in energy, fishing, shipping and tourism. Yet the delta’s many benefits are under threat, because much of the land area is steadily vanishing underwater. Since 1932, on the Louisiana coast alone, human-induced damage and tropical storms have claimed an astonishing 1,883 square miles of wetlands. Between 1985 and 2010, the rate of land loss equated to an area the size of a football field disappearing every hour (Couvillion et al., 2011). This land loss brings communities in the delta region ever closer to open water, placing them at increasing risk from hurricanes and sea level rise.

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Coastal wetlands, considered one of the most productive ecosystems in the world, perform at least five crucial environmental services. First, they serve as a nursery for nearly the entire commercial fish and shellfish catch from the Gulf of Mexico. Second, they form the basis of a tourism and recreation industry that includes hunting, fishing, boating, and other revenue-generating and job-creating activities. Third, wetlands act as a sponge for water and wave energy, helping protect against flooding from severe storms and hurricanes. Fourth, they filter pollutants and sediment, acting as a natural water treatment plant. Fifth, wetlands are the largest reservoir of global soil carbon, sequestering millions of tons of carbon annually. These environmental benefits and their economic significance are summarized in Table 1.

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5 An overview of the Gulf region’s critical role is found in Mabus, 2010, a plan of federal support for long-term Gulf Coast restoration, prepared by the Secretary of the Navy at the direction of the President of the United States.
Table 1. Economic and environmental benefits of healthy wetlands

<table>
<thead>
<tr>
<th>Type of benefit</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seafood species habitat</td>
<td>Wetlands provide a home to more species, per area, than any other type of habitat. They serve as a nursery for many important marine species such as fin fish, shrimp, oysters and crab. By weight, 97 percent of commercial fish and shellfish catch from the Gulf of Mexico depend on estuaries and wetlands during their life cycle.</td>
</tr>
<tr>
<td>Recreation</td>
<td>Wetlands bring revenue from hunting, fishing, bird watching, boating, and nature photography. Tourism and recreation represent eight percent of jobs in the Gulf Coast Region. In 2009, the Gulf of Mexico accounted for more than 44 percent (by weight) of marine recreational fishing catch in the United States.</td>
</tr>
<tr>
<td>Flood protection</td>
<td>Wetlands act as a sponge for water and wave energy, reducing storm surge and retaining floodwaters. U.S. coastal wetlands provide an estimated $23 billion worth of storm protection annually.</td>
</tr>
<tr>
<td>Water filtering</td>
<td>Wetlands filter pollutants and sediment, saving millions of dollars in water treatment costs. Mississippi River Delta wetlands filter water from 41 percent of the continental United States.</td>
</tr>
<tr>
<td>Carbon sequestration</td>
<td>Wetlands store nearly 33 percent of the Earth’s soil organic matter, making them the largest reservoir of global soil carbon. Loss of Gulf Coast wetlands means that the United States loses 3.2 million tons of CO₂ sequestration every year—or the equivalent of adding 600,000 automobiles to the road annually.</td>
</tr>
</tbody>
</table>

Source: (Gordon et al., 2011; Gulf Restoration Network, 2010; NOAA, 2011)

Unfortunately, economic exploitation of Gulf Coast resources has taken a serious toll on wetlands, marshes, estuaries, and offshore resources such as barrier islands. Agriculture and urban development have converted extensive forested wetlands (also called marshes) along the Mississippi River Delta. The oil and gas industry has damaged thousands of acres of wetlands through exploration, drilling, site preparation, and pipeline installation. Depressurization from oil and gas production increases subsidence (land loss through sinking), while oil spills destroy marine grasses, kill marine wildlife, and erode marshes (Ko & Day, 2004).

In addition to this damage from the oil and gas industry, engineering of shipping canals and navigation networks has further degraded wetlands. Likewise, large-scale water management projects designed to prevent flooding along the Mississippi River Delta have starved the wetlands and barrier islands of the sediment and nutrients they need (CPRA, 2008; Wilkins et al., 2008). Finally, climate change presents additional threats. Sea rise from the Gulf of Mexico not only inundates low lying marshes, but also alters
salinity in naturally freshwater or brackish areas. Extremes in rainfall trends in watersheds hundreds of miles up the Mississippi River have varying effects on sediment dispersion (Twilley, 2007).

Added to these causes of human-induced degradation, a series of natural and man-made disasters have caused alarming jumps in wetland loss. The U.S. Geological Survey estimated that tropical storms Katrina and Rita in 2005 claimed roughly 217 square miles of wetlands (Schleifstein, 2011).6 Storms Gustav and Ike in 2008 damaged another 94 square miles. According to the U.S. Geological Survey, over the past 25 years, the Louisiana coastline has lost more than 16 square miles of wetlands per year, or the equivalent of a football field every hour (Couvillion et al., 2011). While the natural process of marsh building takes place over thousands of years, in less than 100 years the Mississippi Delta has lost 1,875 square miles of land (see Figure 1). It is estimated that without bold, immediate action, another 513 square miles will be lost by 2050 (CPRA, 2008).

Figure 1. Land area loss in coastal Louisiana, 1932-2010

In recent years, considerable damage in the Gulf region has been attributed to wind and storm surge from hurricanes. The actual impact of extreme storms varies from year, but on average, the Gulf Coast experiences an estimated $14 billion in economic losses annually. Further land development and subsidence, along with sea-level rise, are expected to contribute to an acceleration in such losses. It is estimated that by 2030, the cumulative economic damage could reach $350 billion (Entergy, 2010).

Wetland loss is a crisis of dramatic proportions, and addressing the crisis will require substantial investment. However, this investment will not only restore the lost economic benefits that wetlands provide; it will also create and save jobs linked to the restoration work. The projects activate a full supply chain linking materials providers, equipment manufacturers, shipbuilders, machinery repair

6 However, when the flooding receded, this figure was later adjusted downward as a portion of the affected wetland area seemed to recover (Schleifstein, 2011).
firms, engineering and construction contractors, and environmental resource firms. Many of the firms are based in the Gulf Coast region. Having long worked in the traditional oil and gas industry, they can supply the same skills and equipment to coastal restoration, finding new markets and a more diverse client base.

A coastal restoration segment is already in place within the marine construction industry, consisting exclusively of government-funded projects. In the 20 years since the enactment of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), 151 coastal restoration or protection projects have been authorized, with funding ranging between $30 million and $80 million annually. Over 110,000 acres in Louisiana have benefited (CWPPRA, 2011a, 2011b). Projects use various techniques to divert sediment from major rivers into wetland areas, restore or mimic natural drainage patterns, reduce shoreline erosion, protect barrier islands, create marshes, and plant vegetation. The work involves a large variety of firms in and around the Gulf as well as others throughout the United States.

This report will describe in detail what coastal restoration comprises and what kinds of jobs it can save and create. The analysis will provide the following:

- **Overview** of the specific equipment and services that perform coastal restoration

- **Value chain analysis** of the firms involved

- **Firm-level analysis** of lead firms in the 13 most significant categories of the value chain

- **Case study of two Gulf Coast firms** that traditionally served the oil and gas industry but have found an additional market in coastal restoration

- **Discussion of the types of jobs and geography of jobs** in the coastal restoration value chain

The intent of this analysis is to provide a foundation for further study of the potential for U.S. firms, especially Gulf Coast firms, to grow a thriving niche in the marine construction industry around restoring coastal wetlands in the United States.
III. What is coastal restoration?

The most effective way to restore and protect wetland ecosystems is to encourage, and usually accelerate, the same natural dynamics that created the Gulf coast and the Mississippi River Delta in the first place. Typically, a project seeks to restore or build natural buffers by erecting barriers, recover the natural flow of river water, and dredge sediment from a river channel so it can be re-deposited to build up a wetland area.

Over the past two to three decades it has grown clear that coastal restoration is a necessary complement to traditional flood protection structures such as levees and flood walls. Damage from Katrina and other storms demonstrates that within a feasible budget, structural measures alone cannot fully protect the Gulf coast from a 100- or 500-year storm. In reality, to protect the coast adequately and realize the benefits of wetlands, flood protection (structural measures) and coastal restoration (natural buffers) must go hand in hand (CPRA, 2008; Entergy, 2010).

To date, government funding for projects in the Mississippi Delta region has gone overwhelmingly to flood protection. In this report, we focus specifically on the coastal restoration side, since it has received far less attention but is just as vitally needed. Coastal restoration represents an important opportunity for firms in the Gulf Region and elsewhere in the United States to grow a new market. In addition, many of the firms already engaged in structural flood protection are well positioned to do coastal restoration also.

Three project types

For the purposes of this report, coastal restoration projects are simplified into three main categories: 1) shoreline and barrier island protection, 2) diversions, and 3) marsh creation.7

1) Shoreline and barrier island protection projects are designed to reverse erosion and resist storm surge and sea-level rise. Several techniques can weaken the destructive force of waves before they reach the shore: terracing, creating marshes (see below), building rocky barriers such as berms, or restoring oyster reefs as natural shoreline protection. Wave-dampening fences can be made of treated lumber and galvanized fencing, or even discarded Christmas trees. On-shore techniques include sand-filled geotextile tubes, sand-trapping fences and marine grass plantings that protect dunes and fight erosion. Dredged material is relocated to build up barrier islands.

2) Diversion projects recreate the natural flow of freshwater in order to decrease saltwater intrusion and re-deposit sediment onto degraded coastal marshes and swamps. To allow nutrients and sediment from a river to flow into and sustain the surrounding wetlands, a crevasse can be cut into an artificial levee. Gates, weirs, or siphons are also used to channel freshwater and enhance sediment delivery. Terraces or other natural structures can help trap sediment to create new marsh land.

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7 These descriptions are culled from (CPRA, 2011).
3) **Dredged material marsh creation** entails excavating sediment from underwater locations and transporting it elsewhere via a barge or pipeline to create marshes. Sediment can be dredged from shipping channels or from strategic “borrow” sites. It is transported to a deteriorated wetland and applied to specific elevations so that marsh plants will grow (CPRA, 2011; Welp & Ray, 2011).

**Major equipment**

Each coastal restoration activity requires a different combination of equipment. Since many projects share similar objectives, types of equipment will frequently overlap. Figure 2 shows the major types of relevant equipment that would likely be deployed for each of the three principal coastal restoration projects—shoreline protection, diversions, and marsh creation.

Figure 2. Major equipment associated with coastal restoration, by project type

<table>
<thead>
<tr>
<th>Coastal Restoration Project</th>
<th>Major Equipment Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoreline Protection</td>
<td>Barges, Crew Boats, Cranes, Airboats, Dredges, *</td>
</tr>
<tr>
<td>Diversions*</td>
<td>Trucks, Pipelines, Quarter Boats, Pumps, Airboats, Dredges, Cranes, Excavators, Push Boats, Barges, Crew Boats, Cranes, Airboats, Dredges, *</td>
</tr>
<tr>
<td>Marsh Creation</td>
<td>Barges, Crew Boats, Cranes, Airboats, Dredges, *</td>
</tr>
</tbody>
</table>

\*Includes uncontrolled sediment diversions, freshwater diversions, water diversions, outfall management and hydraulic restoration.

Source: CGGC based on CWPPRA completion reports (CWPPRA, 2011c)

Restoration projects use three main categories of equipment: 1) marine vessels, 2) mechanical machinery, and 3) hydraulic machinery.

\* For information on materials and products used in restoration projects, see the section, “Value Chain,” beginning on page 3.
Marine vessels

Barges comprise hopper barges to transport materials such as rocks to project sites or to transport sediment from a project borrow site to the placement site; equipment barges to transport heavy machinery or to host mobile trailers used as office or meeting space; and spud barges to provide stability against heavy winds, waves, or tides so that a crane or other equipment can operate. Spud barges have large vertical steel shafts called “spuds” that are lowered and driven into the underwater floor to stabilize the barge. Almost all projects require some type of barge.

Tug/Tow/Push boats transport and guide barges to and from project sites.

Quarter boats provide living quarters for staff and laborers on the project site. They are used on projects that are far from shore, are only accessible by boat, and require that rather than commute each day, laborers stay on the job site.

Crew boats are used as water taxis to transport smaller equipment to the project site, and workers between the various vessels used on the project site.

Airboats are used to travel around very shallow marshlands near a project site that would be too shallow for a typical prop boat to navigate.

1) Mechanical machinery

Amphibious machinery (marsh and cargo buggies) are track-driven machines developed specifically for the marsh environment of the Mississippi Delta, able to float, maneuver over land, or, most important, drive across marsh (see Figure 3). Marsh buggies are pontoons mounted with industrial machinery such as excavators and cranes. They can be used for freshwater diversion projects that require cutting a crevasse in an existing levee, for example, or for marsh creation involving constructing dikes, or for shoreline protection requiring building rock walls. Cargo buggies are mounted with a flat platform to transport materials to and from a project site. They often transport geological soil boring instruments used to inform project planning.

Figure 3. Amphibious equipment: A marsh buggy (left) and a cargo buggy (right)
Mechanical dredges are heavy machinery, such as cranes or excavators, mounted on a barge and equipped with a dredge attachment for digging sediment (see Figure 4). A crane lowers and raises a bucket designed to scoop up the sediment, while an excavator directly shovels it out. In both cases, the sediment is taken from the excavation site and put on a barge to be transported to the placement site (Welp & Ray, 2011).

Figure 4. Mechanical dredges: crane (left) and excavator (right)

Source: USACE & Great Lakes Dredge and Dock

2) **Hydraulic machinery**

Hopper dredges consist of a self-propelled vessel with a centrifugal dredge pump connected to a drag-pipe that sucks sediment slurry and pumps it onboard into a hopper (see Figure 5). The sediment is then transported to the placement site, where it is either unloaded through a pipeline, or by gravity through a split hull or through bottom dump doors. Split hulls, unique to the U.S. fleet, enable vessels to enter shallow waters.

Pipeline dredges also use a centrifugal dredge pump, but instead of storing the sediment in a hopper, they transfer it directly to the placement site via pipeline (using booster pumps for longer distances). Deeper waters usually require a pipeline dredge with an ocean-certified barge. In shallower and hard-to-access areas, a self-propelled, small or mid-sized cutterhead dredge (also called a portable dredge) is ideal (see Figure 6). The cutterhead breaks up sediment into slurry. Whether the dredge is barge-mounted or portable, the discharge pipeline may consist of a floating rubber line, an overland steel or high density polyethylene (HDPE) line, or a combination of all three.

Booster pumps convey dredged sediment over long distances or up steep inclines. Requiring substantial fuel, booster pumps double the sediment transport cost for each four to five miles of pipeline. One or several booster pumps may be used along a pipeline, allowing sediment to be transported up to 40 miles (Dredge Source, 2011; Lopez, 2008).
Figure 5. Hopper dredge

![Hopper dredge](image-url)

Source: USACE

Figure 6. Pipeline dredge: midsize portable dredge (left) and cutter-head attachment (right).

![Pipeline dredge](image-url)

Source: Dredgepoint and Dredge Source
IV. U.S. value chain

Our depiction of the value chain for public projects to restore the Gulf Coast comprises a wide range of materials, equipment and services, along with firms that provide them. This analysis will map out the major players and organize them into eight categories. Before turning to the details of the value chain, however, it is useful to consider the chronology of how a coastal project cycle engages firms.

Coastal project cycle

Each stage of the project cycle for marine construction projects engages firms to varying degrees. A generic depiction of the project cycle is shown in Figure 7 and described below.

Figure 7. How a coastal project cycle engages firms

Notes: Red boxes denote equipment manufacture and repair firms. Blue boxes denote design and construction service firms. Source: CGGC based on CWPPRA completion reports (CWPPRA, 2011c) and industry interviews

The cycle begins when the owner, usually a state or federal agency, solicits bids for a project in two phases: design and build. Upon learning of the first phase, engineering firms design cost-effective, high-quality projects. The owner then approves a design, and construction contractors bid for the opportunity to build the project. Over time, projects of any kind add to the wear and tear of a construction firm’s equipment, which must eventually be repaired or replaced. This creates demand for new equipment manufacturers and repair firms, who must then hire heavy-haul transport firms to deliver large
equipment to the buyer. Coastal restoration work creates demand for materials such as concrete, steel, rocks, pipes, valves, geotextiles, seedlings and cord grasses. These materials, along with the necessary equipment and labor, are then mobilized to the project site, which requires another transport firm. Finally, the construction firm must oversee the day-to-day project operations, observation, and maintenance. If post-project evaluations indicate that modifications are necessary, the cycle begins again.

**Eight value chain categories**

The value chain for coastal restoration projects is found in Figure 8. For this study, we have divided the value chain into two main sections: Materials & Equipment (in red), and Services (in blue). Broadly, the three columns under Materials & Equipment (materials, equipment manufacture, and equipment repair) serve as inputs to the three columns under Services (design, construction, and operations). At the bottom of the chart, spanning both main sections of the value chain, is a seventh category, Transport Services. These consist of Logistics to transport products to buyers, and Mobilization & Demobilization to transport materials, equipment, and labor to and from project sites. The eighth value chain category is Science and Technology R&D. Each category is described below.

Figure 8. U.S. value chain for coastal restoration projects

*Source: CGGC based on CWPPRA completion reports (CWPPRA, 2011c) and industry interviews*
1. Materials
The materials used in coastal restoration projects include natural, manufactured, and cultivated products. Natural materials are mostly derived from quarries such as clay, sand and rocks. Manufactured materials such as cement, asphalt, rebar, pipes, and culverts are used to build levees, floodgates, and other components most frequently used in freshwater diversions. Geotextiles are sewn into large “geo-tubes” filled with sand, which are used to reinforce shorelines. Steel is required for almost all industrial equipment. Fuel is one of the most significant material inputs, and can represent as much as 30 percent of the cost of a dredge project (Hanson, 2011; Wetta, 2011).

Some large construction firms own and operate materials manufacturing facilities. For example, Columbia, Illinois-based Luhr Bros., Inc. owns and operates its own quarries. Baton Rouge, Lousiana-based Shaw Group manufactures much of the high pressure steel pipe used in various industries, including hydraulic dredging (Malbrough, 2011).

Other manufactured items such as fertilizers and chemical oxidants are used only in selected types of restoration and remediation. Firms that provide or manufacture these materials tend to be specialized. Similarly, firms that supply cultivated materials such as marine cord grasses, seeds, and microbes are likely to specialize in remediation rather than supply a variety of project types.

2. Equipment manufacture
Equipment in this study comprises marine vessels, dredges, industrial machinery and amphibious equipment (see descriptions on pages 10-13). The value chain box for each is described below.

Marine vessels refer to barges, tugboats, crew boats, quarter boats, and airboats used in coastal restoration projects. Except for airboats, which are built almost exclusively by specialized firms, these vessels are typically manufactured in shipyards, some of which provide large numbers of well-paying jobs. For instance, marine vessel giant Huntington Ingalls’ New Orleans-based Avondale shipyard employs 4,800 workers, making it the largest private employer in Louisiana (Ratnam, 2011). Other shipyards in the region are BAE Systems Shipyards, Bollinger Shipyards, Crowley, Edison Chouest, Quality Shipyards, and VT Halter Marine.

Dredges come in three categories: mechanical, hopper, and pipeline. Mechanical dredges consist of industrial machinery (cranes, excavators) equipped with mechanical dredge attachments (clamshell buckets, blades) that dig material from the undersea floor. Hopper dredges are large ships equipped with a centrifugal pump and drag-pipe that hangs below to bring sediment slurry onboard into a hopper. The ship then transports the sediment to the placement site. Shipyards manufacture these by building the vessel and then assembling the hydraulic centrifugal pump and drag-head (Welp & Ray, 2011). Although U.S. fleets have added few large-class dredges in recent decades, dredging firm Weeks Marine recently ordered two new large dredges. They will cost $125 million, create 125 jobs,

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9 Avondale Shipyard is scheduled to close in 2013 due to reduced demand for Navy shipbuilding. The state is seeking ways to attract other heavy manufacturing to the site (Ratnam, 2011).
and will be the most advanced U.S. dredges in their category (Dredging News Online, 2011).10 Pipeline dredges, sometimes called cutterhead dredges, convey sediment via a pipeline. While large pipeline dredges may be mounted on a barge, smaller portable dredges are self-propelled. Industry leaders suggest that portable dredge manufacture has the largest potential for future growth because it is versatile, transportable, affordable, and fuel efficient (Hanson, 2011). Leading manufacturers of portable dredges include Dredging Supply Company (DSC), Ellicott Dredges, IMS Dredges, SRS Crisafulli, and VMI.

**Industrial Machinery** refers to pumps, cranes, and excavators. Pumps are used to hydraulically dredge and convey sediment from the underwater floor. When material is conveyed over long distances, booster pumps are used to help push it along. Among the dozens of firms that manufacture various kinds of pumps, those that make pumps used in hydraulic dredging are Metso, Pearce Group, SPI Mobile Pulley, and Weir. Relevant crane and excavator manufacturers are Manitowoc, Terex, Young Corporation, Caterpillar, Deere, Hyundai and Hitachi.

**Amphibious Machinery** consists of marsh buggies and cargo buggies. Manufacturers design each buggy’s pontoons according to the size of platform or excavator that will be mounted on it, with a capacity of four to 45 tons. Once designed, each buggy is patterned, cut and welded together using lightweight steel or aluminum alloy. The ultimate intended use of the machinery determines which material is used. For instance, while most amphibious machinery is made of a lightweight 10-mm steel, machines designed for work in floating marshes are made from a special ultra-light weight alloy (Auten, 2011; Wilson, 2011). Since the manufacture and use of amphibious machinery is unique to the Gulf Coast region, these firms will see considerable benefit from increased coastal restoration activity. Among the manufacturers in the area are Marsh Buggies, Inc., Wilco Marsh Buggies & Draglines, and Wilson Marsh Equipment.

### 3. Equipment repair

Equipment repair plays a crucial role in the coastal restoration value chain. It is often performed by manufacturers. Few firms provide equipment repair exclusively, and those that do cater primarily to the marine vessels industry. More common are firms that manufacture marine vessels, dredges, and industrial or amphibious machinery, and have expanded to provide repair. While some manufacturers limit their repair services to warranty work, others generate more than half their revenue providing equipment repair.

Three related factors contribute to the importance of equipment repair in the value chain: wear, cost and age. Wear from exposure to salt water and from pumping abrasive sediment makes it necessary to replace parts often. The cost of equipment is high; a new 30-inch hopper dredge, for instance, may cost

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10 One, a large hopper dredge, will be built in BAE Shipyards facilities in Mobile, AL (Dredging News Online, 2011). The other, a hydraulic cutter suction dredge, is being built at Corn Island Shipyard in Lamar, Indiana (IDR, 2011).
$60-$80 million (Dredging News Online, 2011; Prine, 2011). For most firms it is economical to operate dredges as long as possible and make repairs as necessary. As a result, nearly all large dredges in the United States are approaching the end of their service life, another cause for higher rates of repair (Prine, 2011). While all of these factors establish considerable value for equipment repair firms, they also suggest promising future demand for new equipment.

4. Planning and Design
Planning and designing of coastal restoration projects requires environmental as well as civil engineering. During the planning stage, engineering firms make environmental assessments of the soil, hydrology, bathymetry, waves, wind, and tides (USACE, 1989). Once these environmental assessments are established, engineers then determine the most appropriate structure configuration (dike, rock wall, weir, marsh, diversion, floodgate, etc.), and design it for the specific environment. Tasks such as determining proper cord grass species for marine reforestation, and long-term impact of the structural configuration, require further environmental engineering assessments (NRCS, 1992).

This process requires considerable time and resources. The engineering phase of CWPPRA projects averages 10 percent of total project cost, but it can be as high as 23 percent (CWPPRA, 2011b). Larger projects may take three to four years to engineer, costing millions of dollars (Wingate, 2011). Because the federal bidding process often requires companies to design first, then bid, then build, large firms such as Shaw Group may invest more than $1.5 million and pursue a project for over a year before even bidding (Malbrough, 2011). For all but the largest firms, the process can place large projects out of reach.

5. Construction
Construction firms create much of the direct demand for equipment and services from all other segments of the value chain. The Gulf Coast boasts a very high concentration of construction firms experienced in coastal restoration projects. For this report, we have divided construction firms into two categories: dredging and construction. Dredging refers to moving sediment from a dredge site to a placement site, and may be done through mechanical or hydraulic means. When that sediment is placed strategically to construct a marsh or a series of terraces, the activity becomes construction—a category that can also encompass the building of rock walls, weirs, dikes, and floodgates, and therefore is relevant to all three types of coastal restoration (shoreline protection, diversions, and marsh creation). While several firms are experienced in these types of construction, only a handful are capable of large-scale dredging. The largest are Great Lakes Dredge and Dock, Manson Construction, Mike Hooks, Orion Marine Group, and Weeks Marine.

6. Operations
A variety of auxiliary activities that take place throughout the project can be described as operations requiring restoration, observation, and maintenance. Restoration tasks include soil remediation, seeding, and planting. Observation—the monitoring, evaluation, and reporting of project progress—occurs during construction and after project completion. This area of operations may be most important, since
the oversight allows for continuous improvements of both actual and future projects. Observation results determine any necessary maintenance activities, frequently requiring a return to the project design and construction phases. Many design firms, and some in construction, carry out maintenance activities themselves.

7. Transport
Transport services in this study are divided into two categories: logistics, and mobilization & demobilization. Logistics services are used by manufacturers to deliver materials and equipment to customers for their fleets and ongoing operations. The size of the machinery determines, and sometimes limits, transport options. For instance, marsh buggies 20 tons and smaller can be shipped overseas in containers for about $35,000, while anything larger requires more costly, specialized shipping. Overland logistics prove challenging as well. In Louisiana and Texas, marsh buggies may be transported fully assembled on flatbed trucks, but in surrounding states they must be disassembled into three sections and carried on three trucks (Auten, 2011). Logistics for a landlocked manufacturing facility such as Reserve, LA-based DSC Dredge require all machines to be transportable by truck, as with a 300-foot dredge that required 29 flatbed trucks (Wetta, 2011).

Mobilization & demobilization refers to the transport of materials, equipment, and labor to and from a project site. Typically this is accomplished over water via barges and quarter boats, and over land via flatbed trucks. Cargo buggies can provide “mob & de-mob” service across, land, water, or marsh.

8. Science and technology R&D
Relevant technology includes equipment used to monitor and collect information. Software for hydrodynamic, wave, and sediment transport modeling programs is applied in the engineering and design phases of projects. In the United States, much of this software is developed by universities with dedicated coastal engineering programs. Historically these programs have been concentrated in a few schools such as the University of Delaware, University of Florida, Georgia Tech, Oregon State University, and Texas A&M. In recent years the average size of the programs has dropped considerably (Hanson, 2011). One observer notes that this has compartmentalized research into pockets, as opposed to facilitating a collective exchange of ideas (Srinivas, 2011). Other sources of useful software are the USACE’s Coastal and Hydraulics Laboratory, and marine institutes such as Woods Hole Oceanographic Institute. Private software firms include Aquaveo and Tuflo. Coastal engineering relies on instruments that monitor natural underwater activities such as tidal fluctuations, water flows, and shoaling patterns. Louisiana State University has a well-developed program that deploys and monitors these devices (Luettich, 2011).
V. Firm-level data

This section focuses on the many types of firms that provide equipment or services to coastal restoration projects in the Gulf of Mexico. To construct the list of relevant firms, we reviewed documentation for projects already undertaken or completed to date. Interviews with a number of these firms and their key suppliers identified additional firms throughout the value chain. The data analysis that follows is therefore based on a list that has been “ground-truthed” in order to eliminate a large number of firms that could engage in coastal restoration work because they have the needed capabilities and capacity, but may not have participated to date. Instead, only those for which we found confirmed links to coastal restoration work are included.

Even for our sample of 140 relevant firms, coastal restoration represents only a small business segment, comprising 25 percent or less of overall activity. For the largest, most diversified firms such as Shaw Group or Weeks Marine, the share may be less than five percent. This is not surprising, since to date, the total volume of coastal restoration projects has created a small amount of work at best. Many of the involved firms earn the bulk of their revenues by providing equipment or services to larger markets such as extractive industries, civil construction, navigational dredging, or naval shipbuilding—all of which entail work that requires machinery and capabilities easily transferable to coastal restoration. Restoration projects involve firms of all sizes, but they appear to be particularly important to small and medium-sized firms, providing a valuable stream of work in a fragile economy.

For the complete list of 140 firms and their characteristics, see the Appendix on page 36. Firm-level data derived from this sample yielded useful observations on the following: 1) capabilities of firms across the value chain, 2) size of firms, 3) age of firms, and 4) potential export markets.

Capabilities of firms across the value chain

We placed each firm in the category that corresponds to its primary role in the value chain. However, nearly every firm in the sample has some degree of vertical integration, providing equipment or services across two or more functional categories (see Figure 9). Examples are shipyards (Bollinger) and pump manufacturers (SPI/Mobile Pulley), which provide services for hydraulic dredge repair. Amphibious equipment manufacturers (Wilco Manufacturing, LLC, Marsh Buggies, Inc.) lease, refurbish, and sell used equipment, and manage construction divisions. Perhaps the only category that contains several firms whose role in coastal restoration is limited to a single activity is project design (Anchor, Royal Engineering, Taylor Engineering). In the case of Shaw Group, a Fortune 500 company based in Baton Rouge, LA, one firm’s involvement stretches across the entire value chain.

11 Sources: USACE contract award lists (USACE, 2011), CWPPRA project completion reports (CWPPRA, 2011c), information compiled by the OCPR, and company interviews.
Figure 9. Firms’ capabilities across the U.S. coastal restoration value chain

<table>
<thead>
<tr>
<th>Materials</th>
<th>Equipment Manufacture</th>
<th>Equipment Repair</th>
<th>Design</th>
<th>Construction</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertically integrated industrial marine construction</td>
<td></td>
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<tr>
<td>(Shaw Group)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Amphibious machinery engineering &amp; manufacture</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(Frog, Kori Sunland, Marsh Buggles, Inc., Wilko Manufacturing, Wilson Marsh Equipment)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Dredge Services</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(Great Lakes Dredge and Dock, Manson, Mike Hooks, Orlos, Weeks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump Manufacture, repair, and machining</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Georgia Iron Works, Metso Minerals, Pearce Group, SPI/Mobile Pulley, Wacl)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated Coastal Restoration</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(Bertucci, BIS Services, Box Bros., Cajun Construction, Creek Services, Cycle Construction James Construction Group, Phylaway Construction)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small &amp; Mid-sized Dredge Manufacture</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(DSC, Elliott, IMF)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine vessel design &amp; manufacture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Bollinger, Buck Kreith, Edison Chouest Huntington Ingalls, McDonough Marine, Tidewater)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated Coastal Engineering and Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(BCG, BCI, C.F. Bean, Eustis, Moffet &amp; Nicholas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Anchor OEA CSE, DOSI, Royal Engineering, Taylor Engineering)</td>
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<td></td>
</tr>
</tbody>
</table>

Source: CGGC, based on industry interviews, company websites, USACE contract award lists (USACE, 2011), and CWPPRA completion reports (CWPPRA, 2011c).

Size of firms

The majority of firms in our sample are small and medium-sized businesses (see Figure 10). The U.S. Small Business Administration (SBA) provides varying definitions of small businesses according to the characteristics of a given industry. For example, for a heavy civil construction firm to qualify as a small business, its annual income may not exceed $33 million, while that for an engineering services firm may not exceed $4.5 million (SBA, 2011). Over 53 percent of the sample firms meet the SBA’s maximum sales criterion for the firm types studied. Measured by numbers of employees, 67 percent of the firms in our sample qualify as small businesses. Over 42 percent—or 55 of the 129 firms with employment data—have fewer than 100 employees. The incidence of small firms in our sample is in part attributed to relative project size. Many coastal restoration projects to date have been expressly designed to a modest scale. Larger firms with greater capacity maintain a broader scope of work, leading them to prefer larger projects that generate more revenue (Hanson, 2011; Malbrough, 2011).
Figure 10. Distribution of firms by size category, U.S. coastal restoration value chain

The relative sizes of firm categories in our sample are shown in Table 2. Smallest firms include manufacturers of marsh buggies and dredge equipment, as well as services for mobilization, demobilization and equipment repair. Among these firms are family-owned, local businesses as well as dredge manufacturers based outside the Gulf region, many with fewer than 100 employees. Next are medium-sized firms that provide logistics or dredging services, with fewer than 1,000 employees and under $250 million in sales. Larger firms are found among the marine vessel manufacturers and construction and design firms. While on average these have fewer than 10,000 employees and less than $2.5 billion in sales, they encompass such large firms as Shaw Group, a construction firm that spans the entire value chain and has 27,000 employees and $7 billion in sales. Largest are the firms that manufacture cranes, pumps, excavators, and engines. Among these are such giants as Caterpillar, which
Restoring the Gulf Coast

makes many of the excavators used in coastal restoration, with more than 100,000 employees and over $40 billion in annual sales.

Table 2. Average size of firms by activity category, U.S. coastal restoration value chain

<table>
<thead>
<tr>
<th>Type of Firm</th>
<th>Average Total Company Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsh buggies</td>
<td>30</td>
</tr>
<tr>
<td>Hydraulic dredges</td>
<td>50</td>
</tr>
<tr>
<td>Dredge attachments</td>
<td>54</td>
</tr>
<tr>
<td>Mob &amp; de-mob</td>
<td>84</td>
</tr>
<tr>
<td>Repair</td>
<td>136</td>
</tr>
<tr>
<td>Logistics</td>
<td>550</td>
</tr>
<tr>
<td>Dredging</td>
<td>513</td>
</tr>
<tr>
<td>Marine vessels</td>
<td>5,179</td>
</tr>
<tr>
<td>Building</td>
<td>5,697</td>
</tr>
<tr>
<td>Design</td>
<td>7,497</td>
</tr>
<tr>
<td>Cranes</td>
<td>9,750</td>
</tr>
<tr>
<td>Pumps</td>
<td>12,496</td>
</tr>
<tr>
<td>Excavators</td>
<td>13,222</td>
</tr>
<tr>
<td>Engines</td>
<td>20,247</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Firm</th>
<th>Average Total Company Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsh buggies</td>
<td>6,123,333</td>
</tr>
<tr>
<td>Dredge attachments</td>
<td>7,532,000</td>
</tr>
<tr>
<td>Mob &amp; de-mob</td>
<td>8,115,714</td>
</tr>
<tr>
<td>Hydraulic dredges</td>
<td>11,133,333</td>
</tr>
<tr>
<td>Repair</td>
<td>11,162,500</td>
</tr>
<tr>
<td>Logistics</td>
<td>69,964,286</td>
</tr>
<tr>
<td>Dredging</td>
<td>191,587,000</td>
</tr>
<tr>
<td>Building</td>
<td>657,094,783</td>
</tr>
<tr>
<td>Marine vessels</td>
<td>2,135,749,167</td>
</tr>
<tr>
<td>Design</td>
<td>2,281,213,500</td>
</tr>
<tr>
<td>Cranes</td>
<td>2,523,300,000</td>
</tr>
<tr>
<td>Pumps</td>
<td>2,639,511,111</td>
</tr>
<tr>
<td>Excavators</td>
<td>5,621,708,333</td>
</tr>
<tr>
<td>Engines</td>
<td>7,103,333,333</td>
</tr>
</tbody>
</table>

Source: CGGC, based on industry interviews, company websites, Hoover’s database, and OneSource database

Age of firms

Firms identified in this study tend to be well established (see Figure 11). On the whole, equipment manufacturers are relatively old, founded on average 59 years ago, while service firms were founded on average 44 years ago. Many were established to serve growth industries of the 20th century—extractive industries, shipbuilding, and industrial civil construction. In order to remain competitive, they are seeking new markets. In interviews, several firm representatives noted that an increase in coastal restoration work supported by a dedicated funding stream would establish much-needed demand for their business, enabling them to utilize currently under-used resources.
Potential export markets

Interviews with equipment manufacturers indicated an increasing interest in serving export markets. In general, construction equipment manufacturing, like many industries, declined dramatically in the economic crisis of 2008-2009, losing 30 to 50 percent of its business (Leybovich, 2011). With domestic sales continuing to weaken, exports are an important source of new demand (Barbaccia, 2011). Several small and medium-sized firms in our sample are orienting increasingly to foreign markets. Manufacturers of small and mid-size dredge manufacturers, for instance, are responding to demand from foreign governments and private companies. Baltimore, MD-based Ellicott Dredges has arranged the export of several portable dredges, most notably to India (Dredging Today, 2010). Reserve, LA-based DSC Dredge, a 2008 President’s “E” Award winner, has sold dredges in 45 countries. Exports now make up 50% of the company’s annual sales (Wetta, 2011). Similarly, amphibious machinery manufacturers Wilco Manufacturing and Marsh Buggies, Inc. have each established several international clients associated with the oil and gas industry. Depending on the year, exports comprise 30-50 percent of their business (Auten, 2011; Wilson, 2011). These two firms are profiled below.
VI. Case study: Marsh buggies and cargo buggies

Marsh Buggies, Inc. and Wilco Manufacturing are two Louisiana companies that, having once worked solely for the oil and gas industry, now serve a growing share of customers involved in coastal restoration. Each company manufactures “marsh buggies” and “cargo buggies”—amphibious machines developed specifically for the marsh environment of the Mississippi Delta. Ideally suited to the work of restoring wetlands, marsh buggies and cargo buggies have helped local manufacturers faced with a long-time decline in oil and gas pipeline construction diversify their client base.

A marsh buggy is essentially a self-propelled platform on pontoons, upon which a machine is mounted, such as an excavator, for digging sediment. A set of moving steel tracks enables the marsh buggy to crawl tank-like through mud and marshes. To get to a project site, the marsh buggy is thus able to move across water, but then proceed across difficult, marshy terrain to do its work. A cargo buggy is similar to the marsh buggy, but its platform is used primarily for transporting materials and equipment. Marsh buggies and cargo buggies are capable of serving areas that are often not accessible with traditional equipment (see Figure 3 on page 11).

Marsh buggies played an integral role during the construction boom for oil and gas pipelines. Manufacturers provided not only the machines, but also the trench digging services necessary to put pipeline in place. For years, demand for this work was steady. Over time, however, pipeline expansion and repair declined along with U.S. oil production, which peaked in 1970 (Sorrell et al., 2009). Demand subsided and became more volatile, fluctuating with the global price of oil.

By the 1980s, awareness of Mississippi Delta wetland degradation emerged as a serious concern, and state agencies began working with engineers to design coastal restoration projects. They quickly recognized the usefulness of amphibious machinery. Marsh buggies are now used to build rock walls to control erosion, tear down levees to divert sediment, build terraces to protect barrier islands, assemble dikes to contain sediment for marsh creation, and move existing oil and gas pipelines. Cargo buggies transport materials to project sites and carry equipment, including soil boring tools used by geological teams during project design and evaluation.

Marsh Buggies, Inc. and Wilco Manufacturing each have a decades-long history and a business profile that encompasses contract construction and equipment rental and leasing (see Figure 12). Over the years, each firm has proven adept at identifying new markets and diversifying operations. In addition to pipeline and coastal restoration work, marsh buggies are used to install and maintain power lines over previously inaccessible marsh; to perform EPA remediation of superfund sites, and to do U.S. Navy environmental cleanup.
Looking ahead, both firms aim to identify opportunities to find new domestic and export markets. In the United States, coastal restoration is needed not just in the Mississippi Delta region but also in California, Florida, the Pacific Northwest and the Great Lakes. If U.S. markets expand, the firms that serve them will be well positioned to sell to international markets as they develop in the future. For example, several countries in Asia are developing integrated coastal management programs, and recently India, Bangladesh, Indonesia, and Vietnam have undertaken hundreds of millions of dollars’ worth of coastal restoration projects. These efforts could signal emerging export opportunities for Marsh Buggies Inc. and Wilco. Each company already exports machines to China, Indonesia, Peru, Russia, Nigeria, and others (selling primarily to pipeline construction firms). If international coastal restoration efforts expand in the future, they could represent an additional export market, enabling manufacturers to diversify beyond their customers in the petroleum industry, as they have in the United States.

VII. Coastal restoration and jobs

This study has laid out the value chain for coastal restoration work as a foundation for understanding the potential to create and save jobs. Rather than counting jobs, the analysis is intended to gain an understanding of the scope and nature of employment involved in coastal restoration projects. This

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section will address the following: 1) types of jobs; 2) geographic distribution of jobs; and 3) future jobs in the coastal restoration value chain.

**Types of jobs**

The firms described in this study represent a large number of occupations, the most important of which are listed in Table 3. Median wages in selected relevant occupations range from $57.34 per hour for engineering managers, to $32.80 for biological scientists, to $8.98 for nursery workers who plant trees and marsh grass. A number of engineering skills—mechanical, civil, electrical, environmental—are needed in equipment manufacture and repair, or in services, or both.

Table 3. U.S. median wages of important occupations linked to coastal restoration work

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Median Hourly Wage ($US)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equipment Manufacture and Repair</strong></td>
<td></td>
</tr>
<tr>
<td>Electrical Engineers</td>
<td>40.65</td>
</tr>
<tr>
<td>Mechanical Engineers</td>
<td>37.58</td>
</tr>
<tr>
<td>First-Line Supervisors</td>
<td>28.44</td>
</tr>
<tr>
<td>Mechanical Engineering Technicians</td>
<td>24.09</td>
</tr>
<tr>
<td>Mechanical Drafters</td>
<td>23.46</td>
</tr>
<tr>
<td>Electricians</td>
<td>23.20</td>
</tr>
<tr>
<td>Pipefitters</td>
<td>22.43</td>
</tr>
<tr>
<td>Mobile Heavy Equipment Mechanics</td>
<td>21.55</td>
</tr>
<tr>
<td>Painters, Transportation Equipment</td>
<td>18.77</td>
</tr>
<tr>
<td>Machinists</td>
<td>18.52</td>
</tr>
<tr>
<td>Patternmakers, Metal and Plastic</td>
<td>17.88</td>
</tr>
<tr>
<td>Welders, Cutters, Solderers, and Brazers</td>
<td>17.04</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td></td>
</tr>
<tr>
<td>Engineering Managers</td>
<td>57.34</td>
</tr>
<tr>
<td>Construction Managers</td>
<td>40.32</td>
</tr>
<tr>
<td>Environmental Engineers</td>
<td>37.86</td>
</tr>
<tr>
<td>Civil Engineers</td>
<td>37.29</td>
</tr>
<tr>
<td>Hydrologists</td>
<td>36.39</td>
</tr>
<tr>
<td>Health &amp; Safety Engineers</td>
<td>36.26</td>
</tr>
<tr>
<td>Biological Scientists</td>
<td>32.80</td>
</tr>
<tr>
<td>Cost Estimators</td>
<td>27.82</td>
</tr>
<tr>
<td>Zoologists and Wildlife Biologists</td>
<td>27.61</td>
</tr>
<tr>
<td>Construction Equipment Operators</td>
<td>19.42</td>
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<tr>
<td>Surveying and Mapping Technicians</td>
<td>18.22</td>
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<td>Construction and Related Workers</td>
<td>16.59</td>
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<td>Dredge Operators</td>
<td>16.42</td>
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<tr>
<td>Forestry Workers</td>
<td>9.44</td>
</tr>
<tr>
<td>Nursery Workers</td>
<td>8.98</td>
</tr>
</tbody>
</table>

*Source: (BLS, 2010)*

In equipment, important occupations include skilled trades such as pipefitters, mechanics, machinists, patternmakers and welders. Interviews with equipment firms noted that it is increasingly difficult to find
truly skilled craftsmen. One concern is that many qualified welders will retire in the next 5-10 years, and training programs are needed in order to ensure a supply of skilled people to replace them.

**Geographic distribution of jobs**

Maps of U.S. employee locations for firms involved in coastal restoration are found in Figure 13. The total number of firms identified is 140, each with one company headquarters. Adding locations for equipment manufacturing and repair (132) and those for design, construction or transport services (177) brings the total number of “unique” U.S. locations to 391, distributed across 37 states.\(^{13}\)

Figure 13. Relevant U.S. employee locations of firms linked to Gulf Coast restoration projects

\[^{13}\text{A number of firms in the equipment manufacture and repair category perform these activities at the firm’s headquarters location. For this reason, our “unique” count is lower than the sum of the three location categories.}\]
Restoring the Gulf Coast

Gulf Coast States

Total Locations: 287
Unique Locations: 261
- Headquarters: 77
- Equipment Manufacture and/or Repair: 63
- Design, Construction, or Transport Services: 147

Mississippi Delta
Total Locations: 184
Unique Locations: 161

Louisiana

Total Locations: 140
Unique Locations: 122
- Headquarters: 56
- Equipment Manufacture and/or Repair: 37
- Design, Construction, or Transport Services: 47

New Orleans
Total Locations: 46
Unique Locations: 37

Source: CGGC, based on industry interviews, company websites, Hoover’s database, and OneSource database.
As noted earlier, this analysis includes only firms confirmed to be linked to Gulf Coast restoration work in current and past projects. It is thus no surprise that the heaviest concentration of overall locations is in the Gulf Coast region. Of the total 391 locations nationwide, 261 locations, or 67 percent, are in the five Gulf states of Texas, Louisiana, Mississippi, Alabama and Florida. Additional, though smaller, concentrations of firms are found in the Pacific Coast (32 locations) and the Midwest (25 locations).

Within the Gulf Coast region, Louisiana stands out clearly in all three location categories (headquarters, equipment and services). Louisiana has the highest concentration of headquarters, with 56 sites, or 41 percent of the national total. Among the state’s identified locations, the New Orleans area alone has 11 manufacturing sites and 16 services sites.

The distribution of location types yields the following observations, as shown in Table 4:

**Headquarters.** The 140 identified firms are divided relatively evenly between equipment firms and service firms. Each firm has one headquarters, with 66 headquarters for the equipment category and 74 headquarters for the service category. The highest regional concentration for total headquarters is the Gulf Coast (77 locations), with smaller concentrations in the Midwest (21), Northeast (14), and Pacific Coast (9). Top states are Louisiana (56), Florida (9), Illinois (9), New York (5), Washington (5), and Wisconsin (5). Top cities include the greater New Orleans area, LA (21), Baton Rouge, LA (5), and Seattle, WA (4).

**Equipment Manufacture and/or Repair.** The 132 identified manufacturing and repair locations appear across 30 states. The highest concentration is in the Gulf Coast (63), with smaller regional concentrations in the Pacific Coast (16) and Northeast (11). Top states are Louisiana (37), Mississippi (10), Washington (9), Georgia (7), and Wisconsin (7). Top cities include greater New Orleans (11) and San Diego, CA (4).

**Design, Construction or Transport Services.** The 177 identified service locations are less dispersed than equipment facilities, concentrating in only 18 states. The highest concentration is in the Gulf Coast (147), with much smaller concentrations in the Northeast (13) and Pacific Coast (10). Top states are Louisiana (47), Florida (44), and Texas (36).
Future jobs

As in any industry, job creation in coastal restoration is tied to demand for the product. But unlike most industries, demand for coastal restoration work comes entirely from government-funded projects. One overarching theme observed in interviews with our sample firms is the unsteady nature of this demand—in part because of uncertainties and delays in funding mechanisms, and in part because the overall volume of funding falls well below the level needed to adequately restore and protect the Gulf Coast.

Federal funding for coastal restoration in the Mississippi Delta to date has consisted of four major programs, each of which has been marked by delays and uncertainty, and only two of which have funded actual projects to date.

1. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), established in 1991. CWPPRA has provided $30 - $80 million annually and completed over 151 projects...
Although CWPPRA has proved to be the most effective model for implementing coastal restoration projects in Louisiana, its continued funding is not guaranteed.

2. Coastal Impact Assistance Program (CIAP), a four-year program (2008-2012) intended to contribute funds totaling $496 million from the offshore oil and gas industry. Much of the program period has already elapsed, but only a fraction of the funds have been distributed. Even though CIAP was established to compensate for the petroleum industry’s negative impact on the coast, the funds may also be used to build infrastructure such as new roads that may provide access to refineries (CIAP, 2011).

3. Gulf of Mexico Energy Security Act (GOMESA), passed in 2006. GOMESA is intended to share revenues with the four oil-producing Gulf States by taking a share of federal taxes on offshore oil and gas and diverting them to the relevant states. Phase I of the program started small in 2008, funding Alabama, Louisiana, Mississippi, and Texas a combined $29 million in the period 2008-2010 (BOEMRE, 2011). Anticipated total payments under Phase 2, scheduled to begin in 2017, are expected to increase to an estimated $200 million annually for the first 10 years and up to a cap of $500 million annually for the following 10 years—again, to be distributed among all four states (GAO, 2007).

4. Louisiana Coastal Area (LCA) program, established in 2003 to fortify CWPPRA’s work. LCA relies on Water Resources Development Act (WRDA) funding, which must be authorized by Congress (USACE, 2004). Although LCA has approved six project designs, Congress has yet to allocate WRDA funding sufficient to carry out the construction (Peyronnin, 2011).

With so much delay and uncertainty in these four programs, funding continues to fall significantly short of what is needed. According to the 2007 Louisiana Master Plan, based on years of coastal research and lessons learned from Katrina and other hurricanes, preventing further rapid land loss along the Louisiana coast will cost more than $50 billion over three decades (GAO, 2007). Clearly, even full funding from the four federal programs in place today will not be adequate.

The 2010 BP oil disaster in the Gulf of Mexico may result in two new potential sources of funding. First, under the Natural Resource Damage Assessment (NRDA) process, BP and other responsible parties are required to pay monetary damages to the U.S. and state governments for the direct damage to natural resources. These monetary damages will provide funding for projects to restore the ecosystem to its state before the oil spill. Second, for each barrel of oil spilled, BP and others will pay fines under the Clean Water Act—fines that could total from $5 to $21 billion (Robertson, 2011). Legislation introduced by bipartisan Congressional leaders in the House and Senate would put the Clean Water Act fines into a trust fund dedicated to Gulf restoration. Of these two potential sources of oil-spill-related

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14 $29 million figure reflects the total allocations from 2008 ($25.2 million), 2009 ($2.7 million), and 2010 ($8.7 million) documented in each of the annual “GOMESA Revenue-Sharing Allocations” fiscal year reports; see BOEMRE, 2011.
funding, only the first category—the natural resource damages—will clearly be devoted to ecosystem restoration. How much funding this represents is yet to be determined. As for the second category of potential funding, the Clean Water Act fines, several uncertainties remain: how much the total dollar amount of fines will be, what portion would be dedicated to a trust fund for restoration, and whether Congress will in fact pass legislation to do so. If this critical bi-partisan bill is indeed signed into law, important restoration projects already identified across the Gulf region will be able to move forward.

In any case, restoring the Gulf Coast will require not just a one-time infusion of significant funding, but rather a higher volume of continuous, steady funding from a source that is not vulnerable to the delays and uncertainty that have plagued the effort to date. If an appropriate dedicated funding source is established—perhaps with the oil spill penalties as a start—restoration can proceed on the scale required to save wetlands and the benefits they provide to the regional and national economy. This, according to many of the firms interviewed for this study, is also critical for building a job-creating coastal restoration industry.

VIII. Conclusion

Gulf Coast wetlands provide habitat for commercial fish and shellfish, protect against flooding, bring revenue from recreation and tourism, and provide an important reservoir of soil carbon. Restoring wetlands is therefore critical not just to the environment but also to the regional and national economy.

Undertaking coastal restoration on the scale needed to reverse decades of wetlands loss presents a challenge and an opportunity. The challenge is to make an adequate funding commitment. Realizing the many projects that have already been identified requires steady resources, without which the agencies and firms charged with carrying out the work cannot achieve the stability they need in order to be effective. Strategic plans have already been made and federal programs established, but these need to be integrated and fully funded in the short term, as well as for decades to come.

The opportunity posed by coastal restoration is to grow an important segment of the marine construction industry at a time when its traditional markets are declining or undependable. Restoring wetlands can provide an alternative for well-established firms, including many small businesses, to save and create jobs by diversifying into an activity that protects the environment, benefits other industries and represents a critical investment in the future.

The Mississippi River Delta is unique in combining one of the world’s largest and most productive river deltas with the most industrialized economy. The Gulf region, having experienced the potentially destructive effects of development on the very ecosystems that feed its economy, may have lessons for similar delta regions in Asia, Africa, and Latin America. U.S. agencies and firms are developing techniques and products that may be in increasing demand in the future. In the long term, as countries face threats to their wetlands from development and from sea level rise, the Gulf region’s evolving capabilities in coastal restoration could make it a future leader in similar efforts in the world’s threatened coastal regions.
## Appendix: Full set of firm-level data

<table>
<thead>
<tr>
<th>Employees</th>
<th>U.S. Headquarters</th>
<th>Relevant U.S. Manufacturing Locations</th>
<th>Company Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-100</td>
<td>Arlington, VA</td>
<td>Mobile, AL; San Diego, CA; San Francisco, CA; Jacksonville, FL; Pearl Harbor, HI; Moss Point, MS; Norfolk, VA</td>
<td>$</td>
</tr>
<tr>
<td>101-500</td>
<td>Bath, ME</td>
<td>Mobile, AL; San Diego, CA; Washington, DC; Mayport, FL; Pearl Harbor, HI; Bath, ME; Pascagoula, MS; Norfolk, VA; Everett, WA</td>
<td>$$</td>
</tr>
<tr>
<td>501-1500</td>
<td>Lockport, LA</td>
<td>Amelia, LA; Golden Meadow, LA; Harvey, LA; Larose, LA; Lockport, LA; Mathews*, LA; New Orleans, LA; St. Rose*, LA; Sulphur, LA; Texas City, TX</td>
<td>$$$</td>
</tr>
<tr>
<td>1501-10000</td>
<td></td>
<td></td>
<td>$$$$</td>
</tr>
<tr>
<td>10000+</td>
<td></td>
<td></td>
<td>$$$$$$$</td>
</tr>
</tbody>
</table>

Employees

- 1-100: 0 - 33: $
- 101-500: 33 - 100: $$
- 501-1500: 100 - 500: $$$
- 1501-10000: 500 - 1,000: $$$$$
- 10000+: 1,000 - 10,000: $$$$$$
- 10,000+: 10,000+: $$$$$$$
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<thead>
<tr>
<th>Company Name</th>
<th>U.S. Headquarters</th>
<th>Relevant U.S. Manufacturing Locations</th>
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<td>Conrad Industries</td>
<td>Morgan City</td>
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<tr>
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<td>Bridgeport CT, Dania FL, Mamaroneck NY</td>
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<tr>
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<td></td>
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<tr>
<td>Edison Chouest</td>
<td>Cut Off LA</td>
<td>Tampa FL, Cut Off LA, Fourchon LA, Gulfport LA, Houma LA, Larose LA, Leesville LA, Mandeville LA, Schriever MS, Houston TX</td>
<td>$$</td>
</tr>
<tr>
<td>1960</td>
<td></td>
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<tr>
<td>Fincanteiri Marine Group (Italy)</td>
<td>Marinette WI</td>
<td>Green Bay WI, Marinette WI, Sturgeon Bay WI</td>
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<td>1968</td>
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<td>Huntington Ingalls Industries</td>
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<td>San Diego CA, Avondale LA, New Orleans LA, Gulfport MS, Pascagoula MS, Newport News VA, Virginia Beach VA</td>
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<td>1996</td>
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<td>Main Iron Works</td>
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<tr>
<td>Tidewater, Inc.</td>
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<td>Oxnard CA, Amelia LA, Houma LA, Houston TX</td>
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<td>1956</td>
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### Marine Vessel Manufacture (cont’d)

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<td>Portland OR</td>
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<td></td>
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<td>Bremerton WA</td>
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<td></td>
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<td>Everett WA</td>
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<td></td>
<td></td>
<td>Port Angeles WA</td>
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<tr>
<td></td>
<td></td>
<td>Seattle WA</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Tacoma WA</td>
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<tr>
<td>VT Halter Marine 2002</td>
<td>Pascagoula MS</td>
<td>Escatawpa MS</td>
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<tr>
<td></td>
<td></td>
<td>Moss Point MS</td>
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</tr>
<tr>
<td></td>
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<td>Pascagoula MS</td>
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### Dredge Attachments

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<th>Relevant U.S. Manufacturing Locations</th>
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</thead>
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<tr>
<td>Anvil Attachments 1969</td>
<td>Slaughter LA</td>
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<tr>
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<tr>
<td>Caterpillar (See Excavators)</td>
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</tr>
<tr>
<td>Deere-Hitachi Construction Machinery Corporation (See Excavators)</td>
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</tr>
<tr>
<td>Gensco Equipment (Canada) 1987</td>
<td>Decatur GA</td>
<td>Decatur GA</td>
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<td>Gradall (See Excavators)</td>
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<tr>
<td>Heiden Inc. 1958</td>
<td>Manitowoc WI</td>
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<td>Theodore AL</td>
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<td>PSM, LLC 1984</td>
<td>Woodinville WA</td>
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<td>Company Name</td>
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<td><strong>Dredge Attachments (cont’d)</strong></td>
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<td><strong>Cutterhead/Pipeline Dredges</strong></td>
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<tr>
<td>SRS Crisafulli</td>
<td>Glendive</td>
<td>MT</td>
<td>☹ $</td>
</tr>
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<td><strong>Excavators</strong></td>
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<td>Badger Equipment Company</td>
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<tr>
<td>(See Cranes)</td>
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<tr>
<td><strong>Caterpillar</strong></td>
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<td>☺ ☺ ☺ ☺ ☺ $$$$$$</td>
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<td>Peoria</td>
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<td><strong>CNH America</strong></td>
<td>Carol Stream</td>
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<td>1966</td>
<td>Calhoun</td>
<td>GA</td>
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<td></td>
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<td>IA</td>
<td>☼ ☼ ☼ ☼ ☼ $$$$</td>
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<td><strong>Deere-Hitachi Construction Machinery Corporation</strong></td>
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<td>(U.S. - South Korea)</td>
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<td><strong>Hyundai Construction Equipment</strong></td>
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<td>(South Korea)</td>
<td>Norcross</td>
<td>GA</td>
<td>☼ ☼ ☼ ☼ ☼ $$$$</td>
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<td></td>
<td>Elk Grove Village</td>
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## Excavators (cont’d)

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<th>Relevant U.S. Manufacturing Locations</th>
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<td>Calhoun GA</td>
<td>Calhoun GA</td>
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<tr>
<td>Komatsu America Corp. (Japan) 1970</td>
<td>Rolling Meadows IL</td>
<td>Newberry SC, Chattanooga TN</td>
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<td>Link-Belt Construction Equipment Company (Japan) 1974</td>
<td>Lexington KY</td>
<td>Lexington KY</td>
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<td>Liebherr Mining and Construction Company (See Cranes)</td>
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<td>Terex Corporation (See Cranes)</td>
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</tr>
<tr>
<td>Volvo Construction Equipment, North America (Sweden) 1984</td>
<td>Asheville NC</td>
<td>Shippensburg ** PA</td>
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<tr>
<td>Young Corporation 1902</td>
<td>Seattle WA</td>
<td>Seattle WA</td>
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## Cranes

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<tr>
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<tr>
<td>Badger Equipment 1945</td>
<td>Winona MN</td>
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<tr>
<td>Caterpillar (See Excavators)</td>
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<tr>
<td>Komatsu America Corp. (See Excavators)</td>
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<td>Liebherr Mining and Construction Company (Switzerland) 1970</td>
<td>Newport News VA</td>
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<tr>
<td>Link Belt Construction Equipment Company (See Excavators)</td>
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<tr>
<td>Manitowoc Company, Inc 1902</td>
<td>Manitowoc WI</td>
<td>Shady Grove PA, Manitowoc WI</td>
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<tr>
<td>Terex Corporation</td>
<td>Westport CT</td>
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## Pumps

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<tr>
<td>Ellicott Dredges (See Dredges)</td>
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<td>Georgia Iron Works (GIW)</td>
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<tr>
<td>SRS Crisafulli (See Dredges)</td>
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<td>John Deer (See Excavators)</td>
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<td>Griffin, GA</td>
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<tr>
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<td>Marsh Buggies, Inc. 1969</td>
<td>Belle Chasse, LA</td>
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<td>Wetland Equipment Company 2002</td>
<td>Thibodaux, LA</td>
<td>Thibodaux, LA</td>
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<td>Wilco Marsh Buggies 1974</td>
<td>Harvey, LA</td>
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<td>Wilson Marsh Equipment 1989</td>
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### Repair

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<td>BAE Systems <em>(See Marine Vessels)</em></td>
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<td>B&amp;A Marine 1966</td>
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<td>Buck Kreihs 1993</td>
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<td>Cashman Equipment Company <em>(See Mobilization &amp; Demobilization)</em></td>
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<td>Conrad Industries <em>(See Marine Vessels)</em></td>
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<td>Cross Group Inc. <em>(See Mobilization &amp; Demobilization)</em></td>
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<td>Derecktor Shipyards <em>(See Marine Vessels)</em></td>
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<td>Edison Chouest, LLC <em>(See Marine Vessels)</em></td>
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<td>Fincantieri Marine Group (FMG) <em>(See Marine Vessels)</em></td>
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<td>Huntington Ingalls Industries <em>(See Marine Vessels)</em></td>
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<td>J.R Grey Barge Inc. <em>(See Mobilization &amp; Demobilization)</em></td>
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<td>LEEVAC Industries LLC <em>(See Marine Vessels)</em></td>
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<td>Main Iron Works LLC <em>(See Marine Vessels)</em></td>
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<td>North Florida Shipyards 1970</td>
<td>Jacksonville, FL</td>
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### Repair (cont’d)

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<tbody>
<tr>
<td>Pierce Pump Supply, Inc. (<em>See Pumps</em>)</td>
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<tr>
<td>Southern Services &amp; Equipment, Inc. (<em>See Construction</em>)</td>
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<tr>
<td>Signal Ship Repair 2010</td>
<td>Mobile</td>
<td>AL</td>
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<td>Tidewater, Inc. (<em>See Marine Vessels</em>)</td>
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<td>Vigor Industrial LLC (<em>See Marine Vessels</em>)</td>
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### Services

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<td>ABMB Services 1985</td>
<td>Baton Rouge</td>
<td>LA</td>
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<tr>
<td>AECOM Technology Corporation 1980</td>
<td>Los Angeles</td>
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<tr>
<td>Jackson MS</td>
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<tr>
<td>Madison MS</td>
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<tr>
<td>Vicksburg MS</td>
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| Birmingham AL                               |                                                                  |
| Huntsville AL                               |                                                                  |
| Saint Petersburg FL                         |                                                                  |
| Tampa FL                                    |                                                                  |
| New Orleans LA                              |                                                                  |
| Houston TX                                  |                                                                  |

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<th>Company Name</th>
<th>U.S. Headquarters</th>
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<tr>
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<td>Highlands Ranch CO</td>
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<td>Company Name</td>
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<td>BCG Engineering &amp; Consulting, Inc.</td>
<td>Metairie</td>
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<td>BCI Engineers and Scientists</td>
<td>Lakeland</td>
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<td>Bechtel 1898</td>
<td>San Francisco</td>
<td>CA</td>
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<td>Black &amp; Veatch 1915</td>
<td>Overland Park</td>
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<td>Biohabitats, Inc. 1982</td>
<td>Baltimore</td>
<td>MD</td>
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<td>C.F. Bean, LLC (See Construction)</td>
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<td>CH2M Hill 1946</td>
<td>Englewood</td>
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<td>Covington, LA</td>
<td>New Orleans, LA; Stennis Space Center, MS</td>
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<td>Eustis Engineering 1946</td>
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<td>GOTECH, Inc. 1981</td>
<td>Baton Rouge, LA</td>
<td>Athens, AL; Fort Myers, FL; Niceville, FL; Pensacola, FL; Sarasota, FL; Tampa, FL; Lafayette, LA; Metairie, LA; Corpus Christi, TX; Dickinson, TX; Houston, TX</td>
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<td>HDR, Inc. 1917</td>
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<td>Ft. Lauderdale, FL</td>
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<td>Moffatt &amp; Nichol 1945</td>
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<td>Odebrecht (See Construction)</td>
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<td>Royal Haskoning (The Netherlands) 1980</td>
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<td>Jay Cashman, Inc. (Cashman)</td>
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<td>ABMB Services <em>(See Design)</em></td>
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<td>Southern Services 1996</td>
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<td>Vistas Construction of Illinois 2000</td>
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## Construction (cont’d)

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<td>Weston Solutions</td>
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<td>WRS Infrastructure &amp; Development, Inc.</td>
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## Logistics

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<td>Syracuse</td>
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<td>Tango Transport</td>
<td>Shreveport</td>
<td>West Memphis AR Sibley LA</td>
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<td>Abbeville</td>
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<td>Central Boat Rentals</td>
<td>Berwick</td>
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<td>Cross Group Inc.</td>
<td>Houma</td>
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<td>Company Name</td>
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<td>J.R Grey Barge Inc. 1940</td>
<td>Houma</td>
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<td>Lafayette Workboat Rentals 2006</td>
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<td>Magnolia Quarterbarges Inc.</td>
<td>Saint Rose</td>
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<td>McDonough Marine Service 1945</td>
<td>Metairie</td>
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<td>Zito Co., LLC 1980</td>
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<td>LA</td>
<td>😊😊 $</td>
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</table>

*Logistic/support and R&D locations
**To be open in 2014
IX. References cited


Peyronnin, Steven. (2011). Executive Director, Coalition to Restore Coastal Louisiana. Personal communication with CGGC research staff. August 9, 2011.


http://www.ukerc.ac.uk/support/Global%20Oil%20Depletion.


