Dredging Is For The Birds

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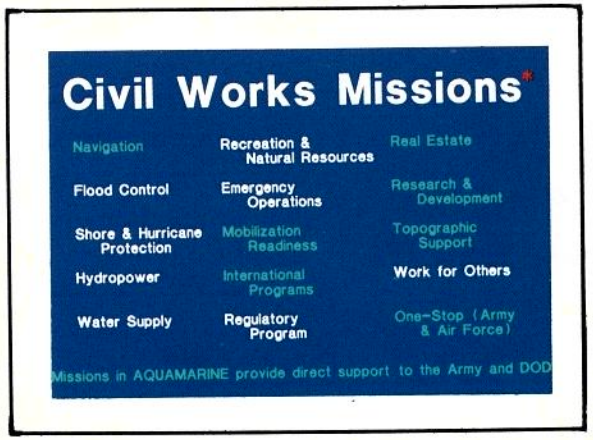
The first legislated water resource assignment of the U.S. Army Corps of Engineers was in the River and Harbor Act of 1824, which directed the Corps to carry out improvements on the Ohio and Mississippi Rivers and at the nation's ports and harbors. Essentially, this meant snagging tree stumps and clearing logjams. Since then, the Corps has become the largest Federal water resource agency with primary missions in navigation and flood control.

The Corps is responsible for the operation and maintenance of more than 400 ports and harbors and 25,000 miles of inland navigable waterways authorized by Congress.

Brown pelicans nest on a Corps-created island on Okracoke Inlet, North Carolina

Dredging plays an important role in nearly all the water resources work performed by the U.S. Army Corps of Engineers. During the last decade, the Corps reevaluated its dredging function to fit in more with the environmental concerns of today. The Corps' program, therefore, has focused on uses of dredged material for productive or beneficial purposes, one of which is creating habitat for wildlife. We can now say dredging is for the birds, especially such endangered species as the whooping crane and the brown pelican.



Since dredging is necessary to provide access for maritime traffic into most of our ports and waterways, it is also essential to the economic well-being of the nation. If we were to stop dredging, there would be severe repercussions on employment and the economy. Waterborne transport costs would increase tremendously with an accompanying decline in exports resulting in an increased trade deficit. Many of the 180,000 people directly employed by the waterway sector would lose their jobs.

The improvement, maintenance, and operation of navigation projects are not the only reasons for dredging. We sometimes dredge to alleviate water stagnation or to control flooding by improving the water flow rate in a stream. Environmentally, dredging is a means to remove sedimented pollutants from our waterways and harbors. Dredging can also play a role in the superfund restoration of water quality at some sites.

The dredge FRY, shown operating in Barnegat Inlet, New Jersey, is one of three sidecasters in the Corps Minimum Fleet

Without dredging, barge traffic on the Mississippi River would be slowed down considerably

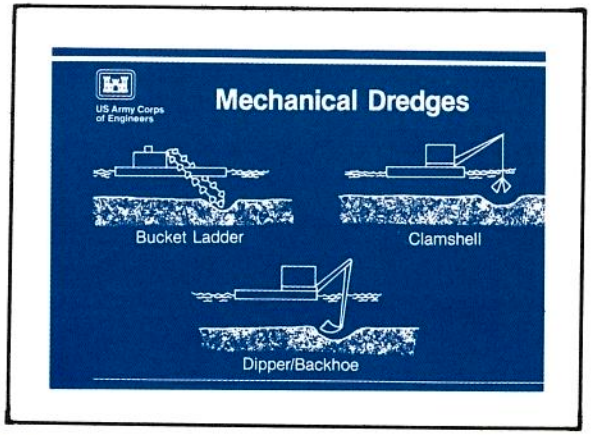
The Corps hopper dredge YAQUINA performs maintenance dredging in Yaquina Bay, Oregon

The dipper dredge GAILLARD, retired in 1982, operated in the Great Lakes region

A wide variety of dredges are used today, each with specific uses and advantages. The two basic types of dredging equipment are mechanical and hydraulic. The material to be dredged, the site and its accessibility, the disposal method, and the wave and weather conditions determine which type is used.

Mechanical dredges include bucket, grab, dipper, backhoe, and scraper dredges. They vary greatly in size and usually operate together with separate transport and disposal vessels such as barges or scows. Mechanical dredges have the advantage of being able to operate in proximity to docks, bulkheads, piers, and other structures.

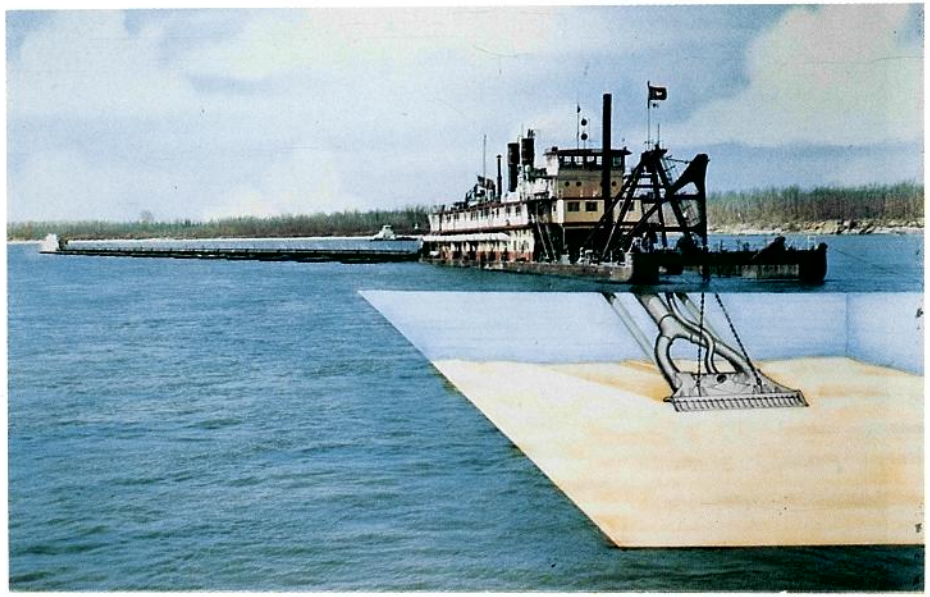
Dredging with the clamshell is a slow process but necessary when removing compact material



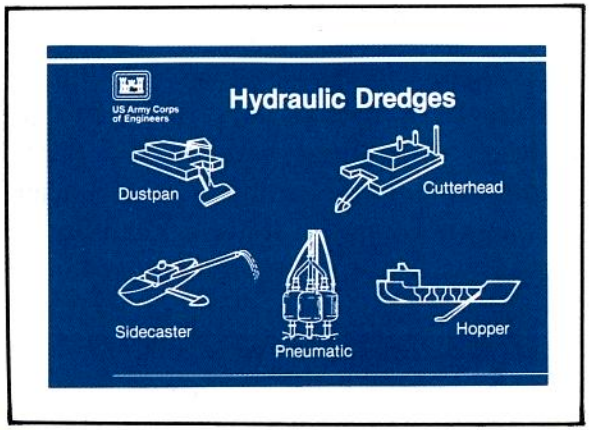
Grab or clamshell dredges have a relatively unlimited dredging depth. Dipper and bucket dredges are the most efficient in the removal of compact material, including rock. The major advantage of mechanical equipment is the high material-to-water ratio, an important factor when hauling the material over long distances or putting it in small diked containment areas. Mechanical dredges have a relatively slow production rate.

Hydraulic dredges use involute centrifugal pumps to remove material from the bottom. The material mixes with water to form a slurry, which is then pumped through a pipeline to the disposal area or, in the case of hopper and sidecaster dredges, unloaded into open-water sites. The basic types of hydraulic equipment include cutterheads, dustpans, sidecasters, and hopper dredges, as well as a unique pneumatic model.

Cutterhead dredges are especially suitable for removing large volumes of consolidated material due to the shearing action of the cutterhead. Because of their versatility, they are the "workhorses" of the industry. Dustpan dredges are a special type of hydraulic dredge invented by the Corps to handle the large volume of sediments removed from the Mississippi River. They use high-pressure water jets to fluidize the bottom materials before the material is transported by centrifugal pumps.

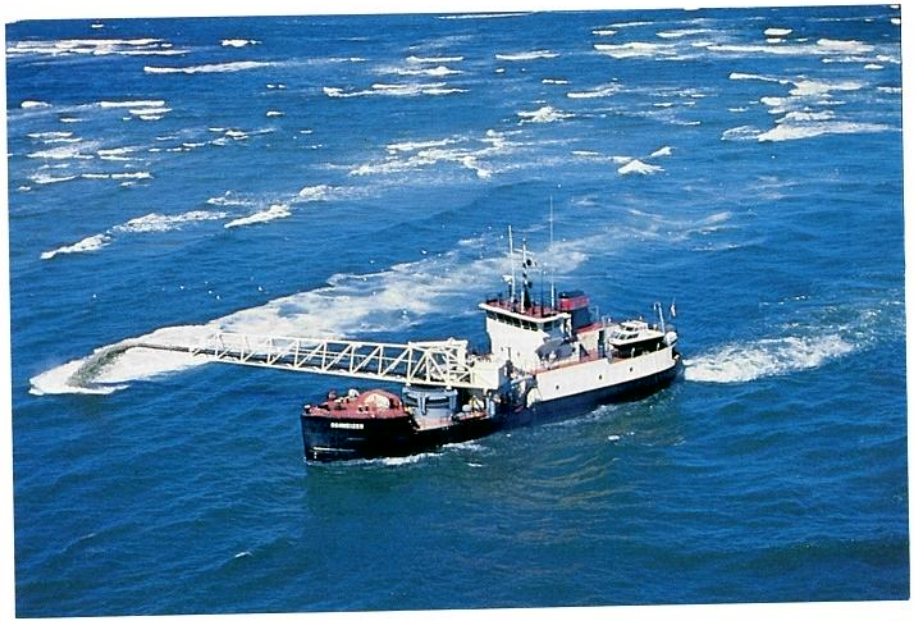


The JADWIN operates on the Mississippi River and is one of three dustpan dredges in the Corps Minimum Fleet



Hoppers are also hydraulic dredges. They are distinguished by the shipboard containers (hoppers) that are used to transport the material to open-water or ocean disposal sites. They are especially useful on jobs where distance to the

The ESSAYONS is one of four hopper dredges in the Corps Minimum Fleet



The sidecaster SCHWEIZER was used in Vietnam and now dredges along the East Coast

disposal site or waves make the use of cutterheads or dustpans impractical. They operate while the ship is under way, so these dredges do not obstruct navigation while they are operating. They are used primarily to maintain entrance to the ocean and estuary channels to major ports and waterways.

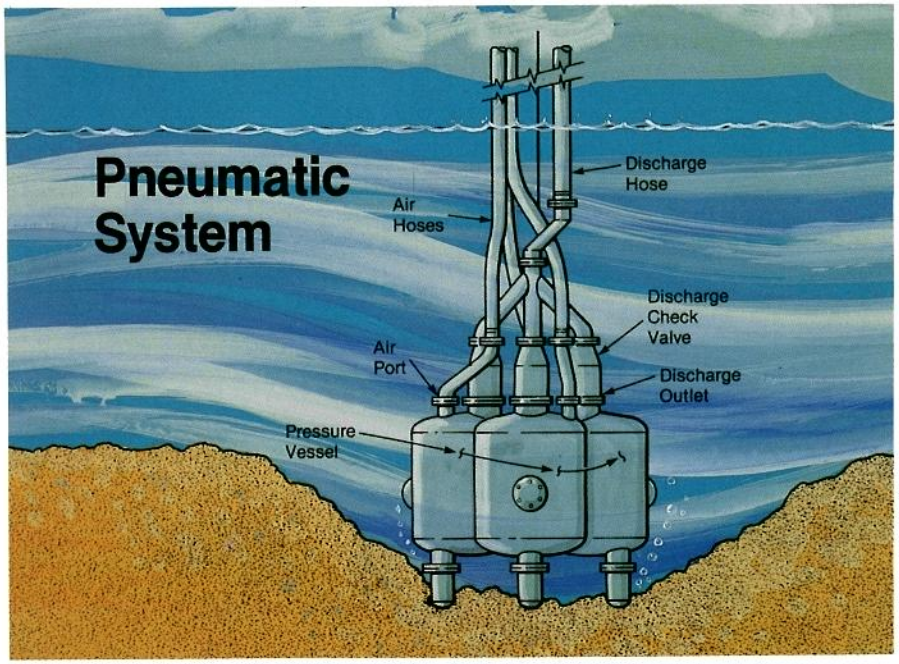
Sidecasters are another type of hydraulic dredge invented by the Corps to operate in shallow ocean inlets. They are self-propelled and similar in configuration to hopper dredges. Instead of having internal storage capacity, they discharge the materials through a boom extending off the side of the dredge. The material is then carried away from the channel by the coastal currents.

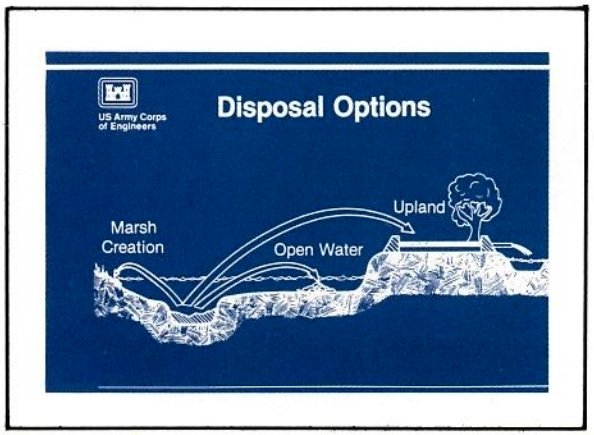
Pneumatic dredges are in a class by themselves. They are hydraulic dredges that utilize compressed air, rather than centrifugal pumps. The intake suction on this type of dredge is created by the pressure differential between the pump chambers and the ambient water head. Sediments are pulled into the chamber by the hydrostatic head and are then forced out the discharge line by high-pressure air. Pneumatic dredges have a relatively low production rate, and they are most efficient

in the removal of soft materials. They minimize agitation at the dredging site, which is important when dredging polluted material.

Until the 1970s, there was limited engineering and scientific information on dredged material characteristics. This is no longer the case. In 1972, Congress enacted Public Law 91-611, which directed the U.S. Army Corps of Engineers to conduct a national program for environmental research on dredged material disposal. Under the Dredged Material Research Program or the DMRP, alternatives for dredged material disposal and their consequences on the environment were examined. Extensive data were compiled which clearly indicate that most of the material (about 90 percent) that we dredge annually in the United States is not polluted.

Our DMRP effort began in 1973 as a five-year program at a cost of more than $33 million. Today, our total expenditure for research and development on the effects of dredged material disposal has reached $100 million. We are, therefore, in a good position to select the optimum type of disposal option considering both the technical and environmental aspects.





A major thrust of our research is to develop techniques for safe handling and disposal of that approximately 10 percent of the material we dredge that *IS* contaminated to some degree. Pollutants show up in channels as a result of runoff and indiscriminate dumping. Environmentally appropriate disposal for contaminated dredged materials is still a controversial item.

In some cases, we have used upland disposal areas to isolate the contaminants. Based on a legislative requirement, the Corps has used this method in diked containment areas in the Great Lakes region. However, research now indicates that land-based disposal can be more complex, compared to water-based alternatives, both environmentally and sociologically, and often less desirable.

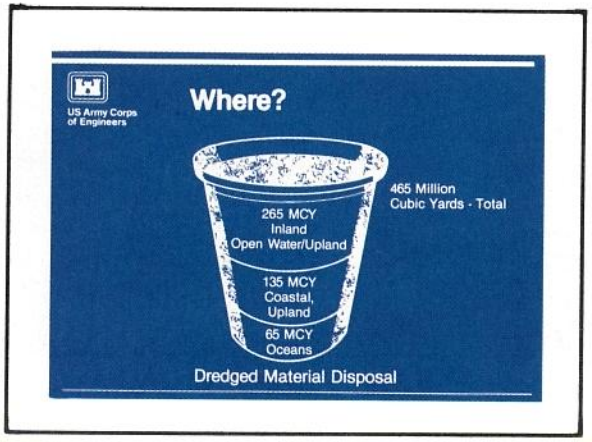
One of two large islands created by the Corps in Tampa Bay, Florida

Most research on dredged material disposal is carried out by our Waterways Experiment Station (WES) in Vicksburg, Mississippi. WES looks at dredged material with an eye to finding what's in it, what the effects of disposing of it are, how to best evaluate the suitability of potential disposal sites, and what beneficial or productive uses we can make of the materials and the disposal sites.

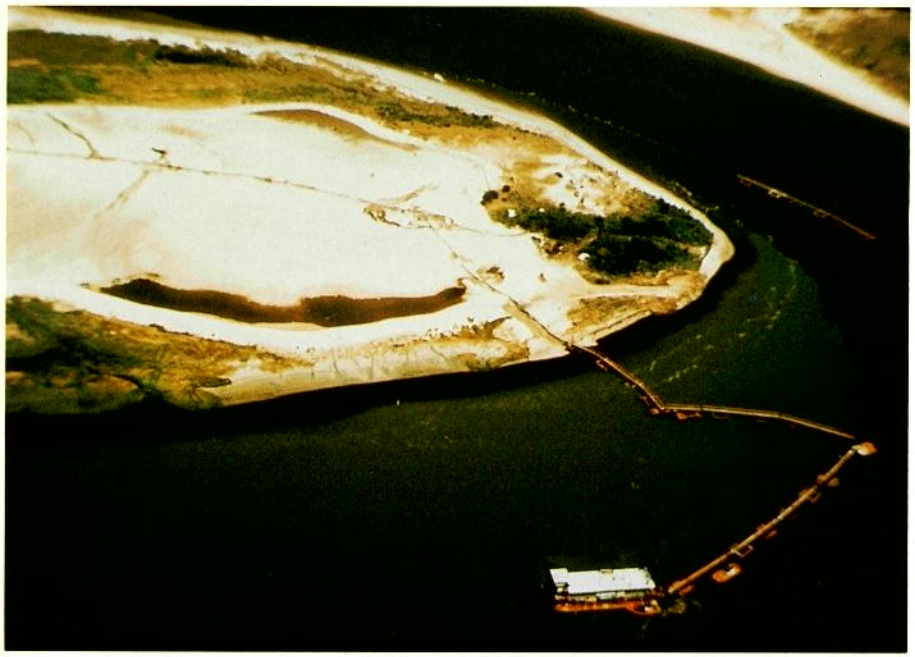
The United States, as a result of this research program, has developed close relationships with other countries having major navigation interests. We exchange scientific and engineering information on dredging and related environmental issues with these countries on a frequent basis. We have especially close working relationships with the Japanese, the Dutch, and the French.

Of the 465 million cubic yards of material dredged in the United States every year, about 65 million cubic yards, or 13 percent of the total, are dumped in ocean waters at 135 sites. Another 135 million cubic yards are dredged each year from coastal waters and disposed of by other means. Most of the 265 million cubic yards dredged from inland waters every year are disposed of either in several thousand diked disposal sites in upland areas or in open waters.

A Japanese dredge removing contaminated material from Tokyo Bay



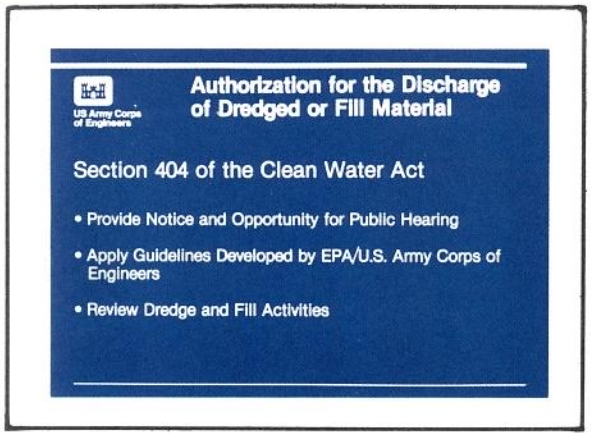
Confining dredged material in diked containment areas can offer good environmental protection, but it is not an alternative without problems and it is not always beneficial. The properties of dredged material can change when the material is placed in an upland site and oxidizes as it dries. In these cases, the chemical composition of the dredged material changes and results in the release of contaminants. Impervious liners are used to prevent any contaminants from leaching into the ground water or being released through the dike weirs into the runoff water, but suitable upland disposal sites are costly when they are available at all. Therefore, optimal use of open water and ocean areas for dredged material disposal is necessary.



Disposal area near Masonboro Inlet, North Carolina, shows one solution to the disposal of dredged material

The most significant conclusion from our research is that no single disposal alternative is a panacea for the disposal of dredged material. The key to sound environmental management is case-by-case evaluation of the site conditions and the environmental aspects.

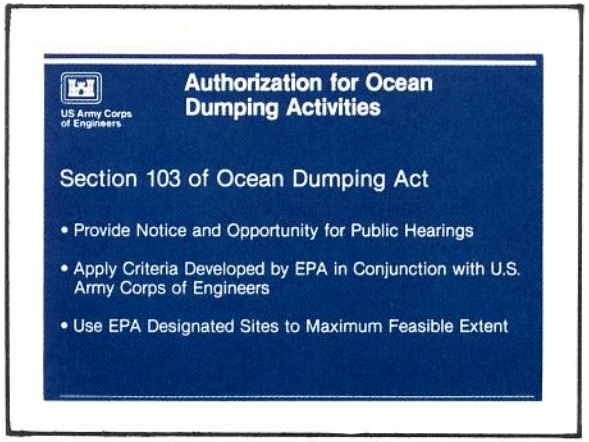
Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act give the Corps legal authority to regulate dredging and the disposal of dredged material in inland waterways, wetlands, and the ocean out to the 3-mile limit. Under those authorities, work done in the waters of the United States, including dredge and fill operations, usually requires a permit from the Corps. This often means public hearings and extensive coordination with Federal and state agencies while the appropriate environmental documentation is being prepared.



A diked containment area on the Maumee River in the Great Lakes

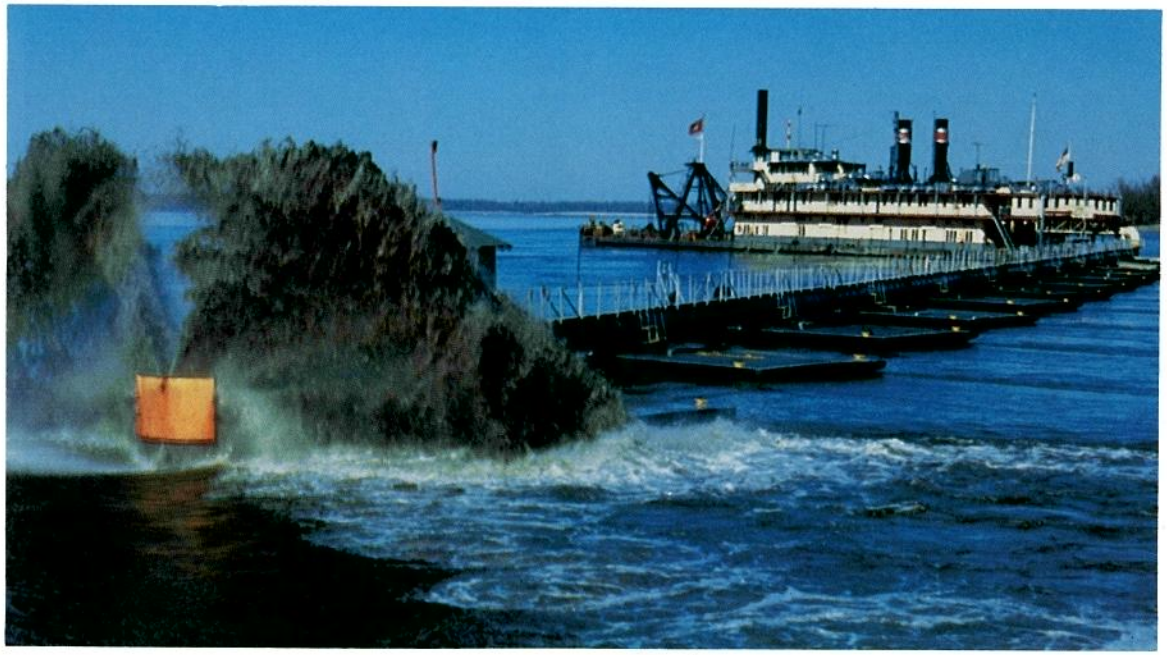
Section 103 of the Marine Protection, Research, and Sanctuaries Act, often referred to as the Ocean Dumping Act, governs disposal of dredged material in ocean waters. Proposals for ocean dumping follow much the same process, except that the authority for selection of recommended disposal sites is shared by the Corps and the Environmental Protection Agency.

Long-range disposal management plans are critical for many coastal projects. Several Corps coastal offices, such as the New England Division and New York, Mobile, Norfolk, and Seattle Districts, are working on long-range disposal plans for ports and harbors in their jurisdictions.



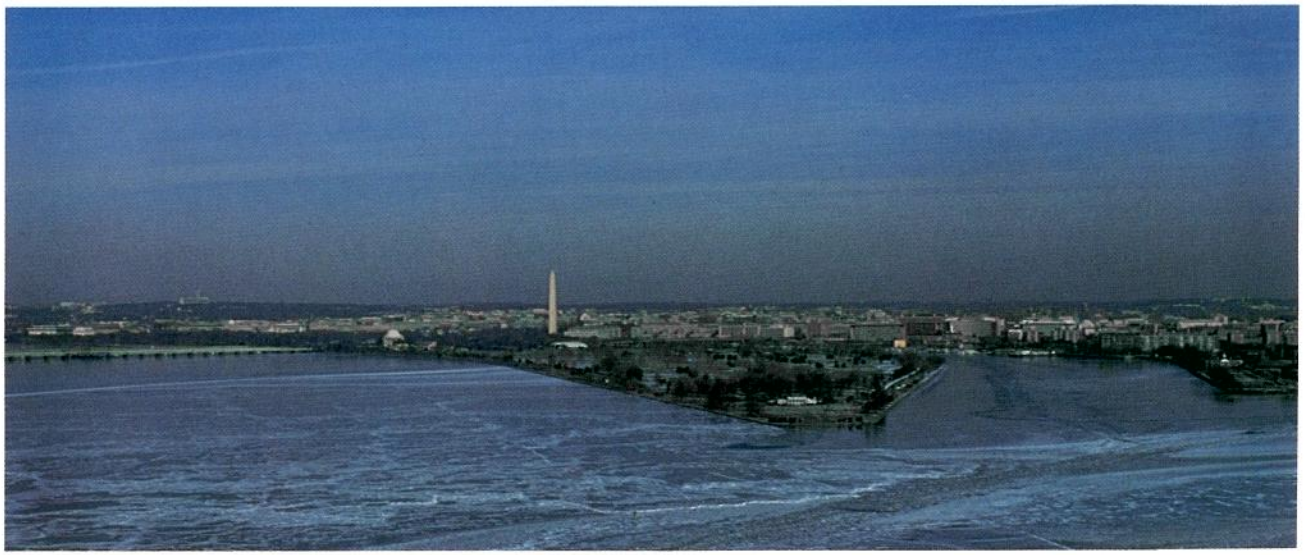
White ibis nesting on a Corps-created island on the Cape Fear River, North Carolina

Even after more than a decade of regulatory experience and the Corps' research and development efforts, we don't pretend to have all the answers, and new questions and issues come up frequently. One of the major problems we face is terminology. Dredging involves moving sands, silts, and clays from underwater, where they present a hazard to navigation, to suitable disposal areas. Commonly used terms for dredged material such as "spoil" and "sludge" are, in most cases, misnomers. The engineering and scientific information we have accumulated since the enactment of the National Environmental Policy Act of 1969 bears this out.



Working on the lower Mississippi River, the dredge JADWIN demonstrates temporary dredging generated turbidity

It is most important that the various factors related to dredging operations be carefully reviewed to determine the effects on the environment that will result from a specific dredging operation. The primary environmental impact with disposal is physical. You would expect this in view of the hundreds of millions of cubic yards of sediments we excavate annually. The major physical impacts include habitat alterations and the submergence of organisms that live on the water's bottom. Except in certain cases, such as in coral areas and during fish migration periods, dredging-generated



Hains Point Park, a popular recreational area in Washington, D.C., was created during the dredging of the Potomac River

National Airport, Washington, D.C., is a good example of an industrial use of dredged material

turbidity is more likely to be an aesthetic rather than a biological problem.

About 90 percent of the material we dredge is not contaminated and is a "resource" that, placed in proper locations, can be put to productive use. Our research has focused on finding beneficial uses for disposal sites as well as for the material itself. Washington's National Airport, as well as many others, was built on what was then known as "reclaimed land." Riverside parks have always been popular uses of disposal sites. Hains Point Park, in Washington, D.C., was created during dredging of the Potomac River.

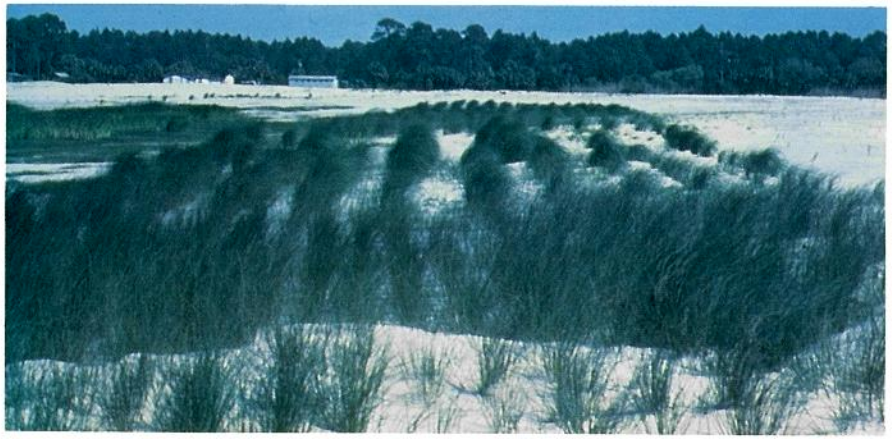
Marsh loss due to subsidence and erosion has become very serious along the southern coasts. There's now an extensive proposal to create and rehabilitate marshes in Louisiana, using the large amount of dredged material which would come from a proposed deepening project at New Orleans. On the South Atlantic and Gulf Coasts, the Corps has used dredged material to create a string of artificial islands and set them aside as wildlife refuges. The Corps has had tremendous success in using these areas both as nesting sites and as stopovers and wintering areas for migratory waterfowl.

This man-made island on the Alafia River in Florida is one of many Audubon Society refuges used extensively by wildlife

Corps-planted marshes such as this one become invaluable nurseries for fish and shellfish

Dewatering or trenching to encourage runoff is a technique used to extend the life of many disposal sites

This disposal site on the Columbia River near Portland, Oregon, has been successfully transformed into an industrial area

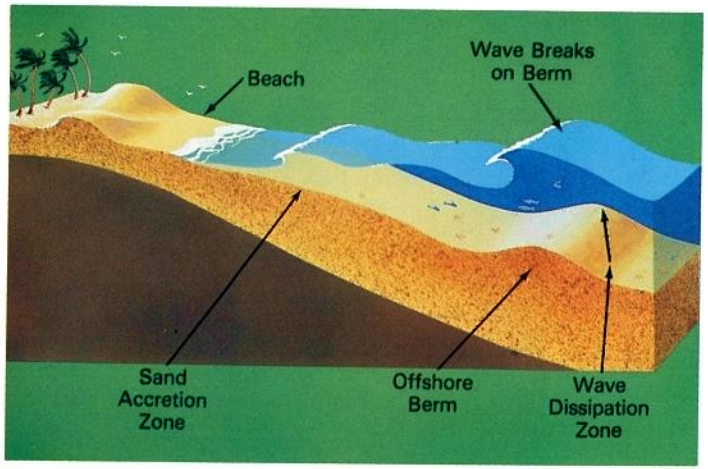


Dunes built from dredged material help to provide protection from hurricanes

New management techniques have extended the life span of Craney Island in Norfolk, Virginia

Some disposal areas have been leased to farmers, who have been successful in using them as crop and pasture lands. While sites in or near cities have been used as industrial sites and parking lots, the Corps is also working on better ways to manage upland disposal sites for maximum use and to extend the lives of these areas. Once the site is filled, potential uses for the land area are increased through a better load-bearing capacity of the dewatered dredged material. Craney Island, a large containment facility in Norfolk, known as a haven for wildlife, is an example. Extensive dewatering and other site management techniques were recently used there, and the useful life of the site as a disposal area was increased by over 30 years.

Material dredged from this project at Minneapolis, Minnesota, is used to sand down city streets in the winter



Placing dredged material in the coastal zone may reduce wave energy along the coastline and provide fish habitat

In addition to uses for disposal sites, the Corps has found creative uses for the material itself. Much of the material we remove as we deepen harbors is coarse-grained sand, which is in demand in some areas for beach nourishment and for construction aggregates. Beach nourishment, or the placing of dredged material along the coast to replace sand washed away by erosion, is routinely done by the Corps at Rockaway Beach, New York, Miami Beach, Florida, and other beaches. Material dredged from projects in the North is used to sand down city streets in the winter. Another use being considered for the material is to place it along the coastline in the form of an underwater berm to reduce wave energy and provide

Before After

Rockaway Beach, New York, is one of many beaches routinely nourished using dredged material as a beneficial resource

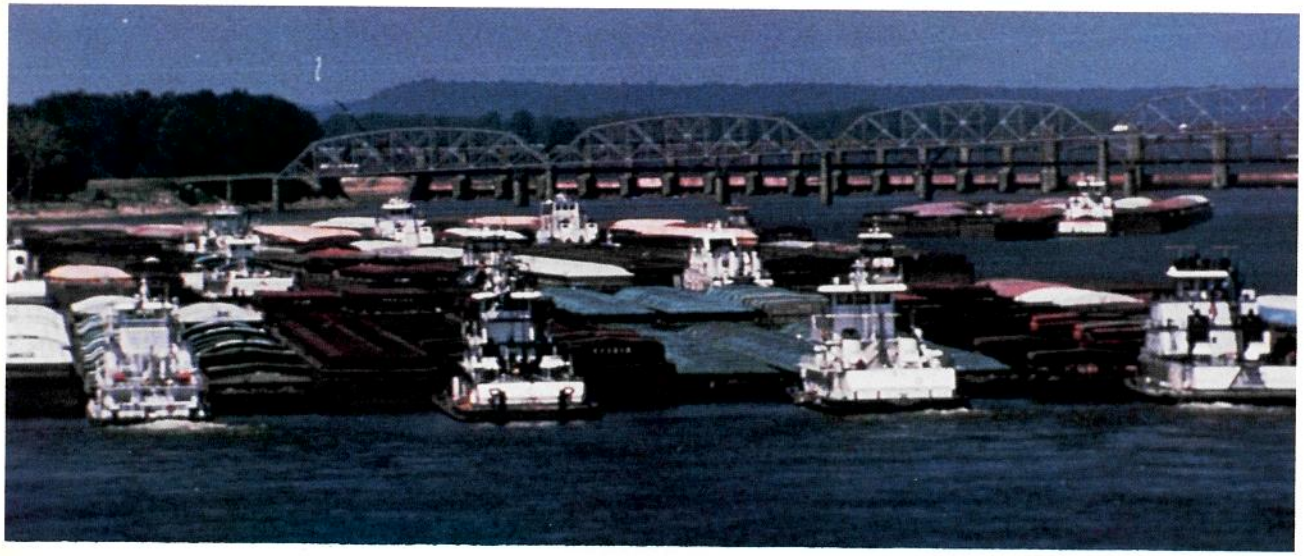
fish habitat. Material from dredging operations is also used to build dikes, levees, and dunes to provide a measure of hurricane protection along the shoreline as well as for concrete mix and land reclamation.

One of the most pressing issues receiving more and more attention from the administration and Congress is the improvement of our nation's transportation infrastructure. Most of our waterway projects were constructed before and during World War II and are not adequate for today's navigation demands. The river traffic congestion at Lock & Dam 26 on the Mississippi River is a good case in point.

Much of the world's commerce, especially in coal and oil, is now carried in "superships" that require harbor depths of 50 feet or more. Since none of our East or

The Port of Oakland, California, is one of many U.S. ports requiring routine dredging to maintain navigation

This port in Philadelphia, Pennsylvania, needs to be dredged to accommodate the larger ships transporting coal and oil today

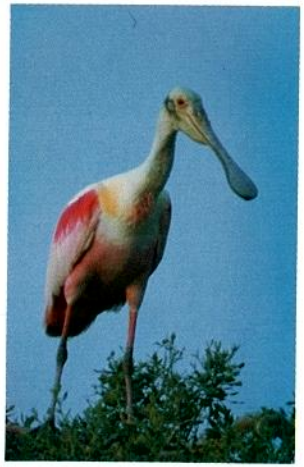


River traffic at Lock & Dam 26 on the Mississippi River

Gulf Coast ports and only two of our West Coast ports have channels this deep, there have been several Congressional proposals made for major deepening projects. Dredging deeper channels would open the harbors to the superships.

The excavated materials would be virgin materials, so we do not anticipate problems with contaminated sediments, but the large volumes of material to be disposed of will call for considerable innovation and thought. One solution would be to create dredge islands as bird habitat and shallow spawning and feeding grounds for fish and shellfish, producing a minimum

Royal terns colonize on a dredged material island at Cape Hatteras, North Carolina



One of many roseate spoonbills nesting on an island in the Houston Ship Channel

impact on the environment. Another would be to replenish already existing dredge islands, most of which are generally eroding, with new deposits. These man-made islands have been the salvation of many bird populations, including roseate spoonbills, terns, and ibises.

When we consider potential dredging projects, we should balance the benefits with the risks to provide the maximum benefit to people — in terms of quality of life through recreational and environmental opportunities as well as in economic opportunities. If we examine the record, our dredging program stacks up well on all counts. Although we dredge primarily for people, we also dredge "for the birds."

Aerial view of Drake Wilson Island in Apalachicola Bay, Florida, before habitat development

Baby royal terns and brown pelicans coexist peacefully on a Corps-created island on the Cape Fear River, North Carolina