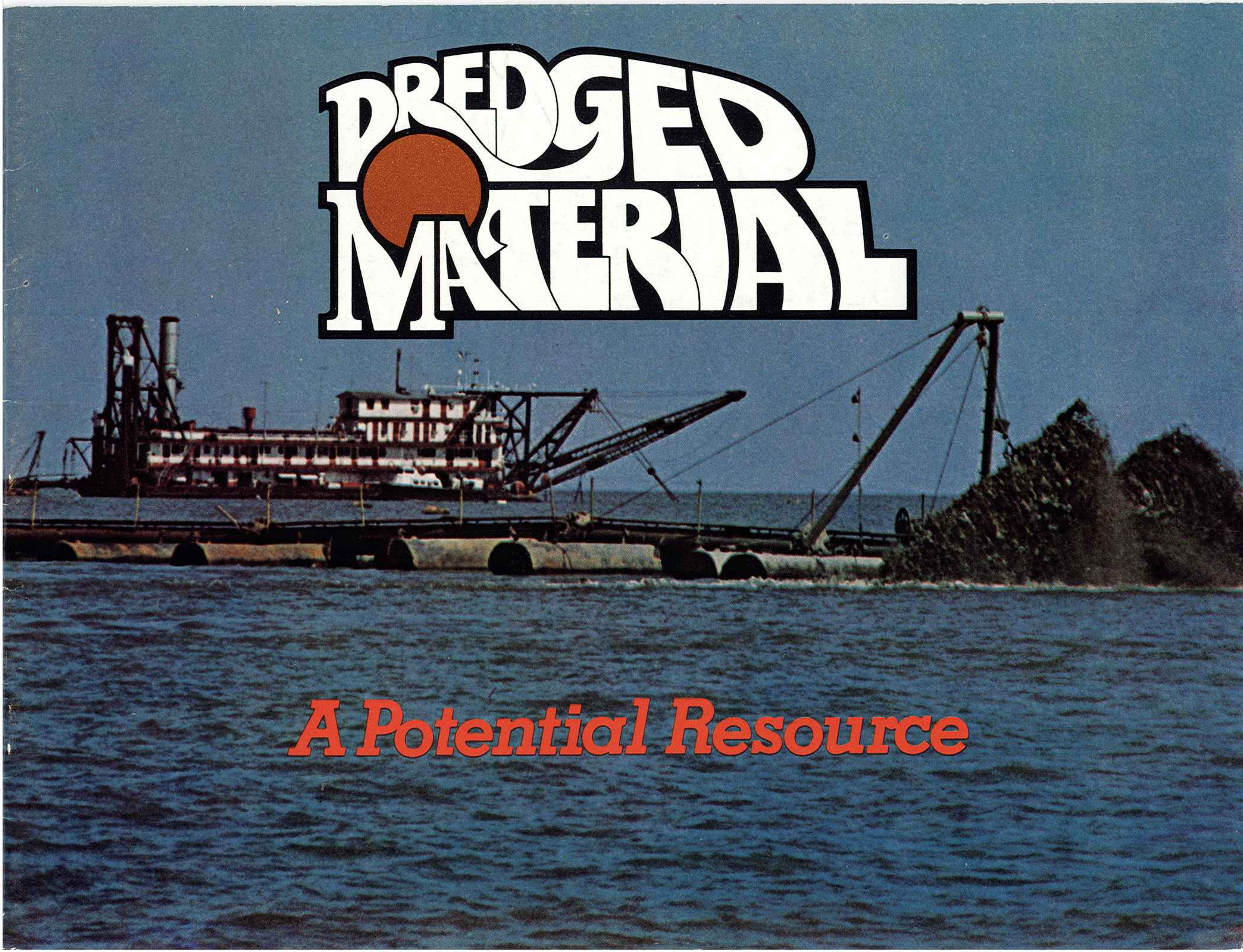
DREDGED MATERIAL

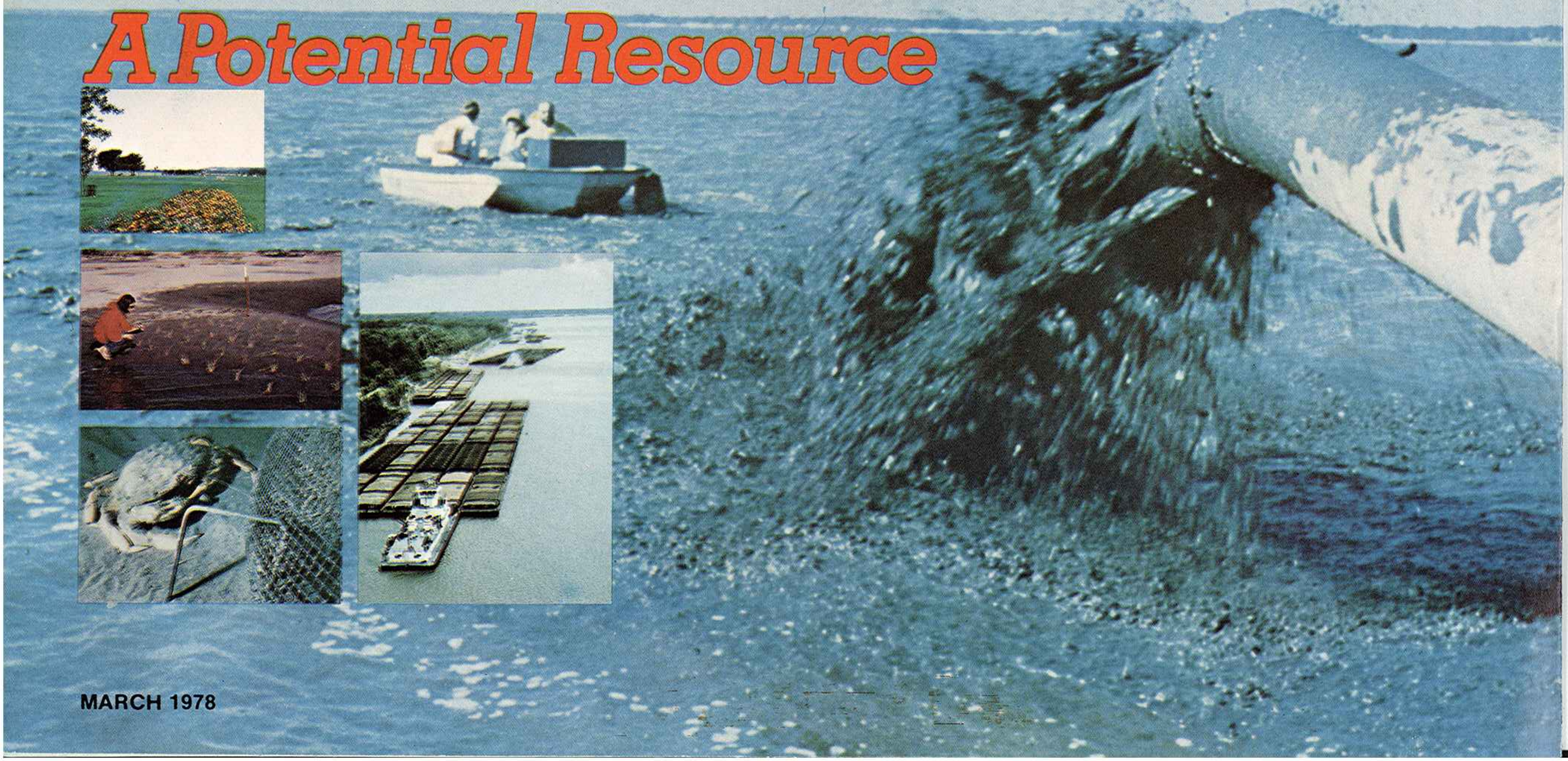
A Potential Resource



DREDGED MATERIAL

Rivers have often been the birthplace of civilizations. Man settled in river valleys to be near a source of transportation and communication. Towns grew up because the waterways made it easy to transport raw materials, manufactured products, people, and livestock. Even now, many of the things we use every day come to us by way of waterborne transportation—things like food, clothes, tools, tobacco, furniture, leather goods, and such crucial items as coal, oil, petroleum, and industrial chemicals. Energy conservation has made waterborne commerce more desirable than ever.

A Potential Resource



MARCH 1978

If we are to continue to enjoy the advantages of low cost, energy efficient waterborne transportation, we must care for our waterways. A serious problem is created by nature, when runoff of rainfall or snowmelt washes soil into our rivers. Some of this soil is carried off to the oceans, but much of it remains. As more and more soil is washed into our rivers, it collects on the bottom, making these rivers too shallow for navigation.

Keeping our rivers, canals, and harbors open to navigation is a responsibility of the U. S. Army Corps of Engineers. When the soil begins to collect in our rivers and waterways, it is removed to keep the channel deep enough for navigation. This is called dredging, and the soil removed from the riverbeds is called dredged material.

Over 350 million cubic yards of sediment are dredged annually at a cost of about $200 million. This is enough dredged material to fill five railroad trains stretching from Miami to Seattle.

Dredging helps to solve our water navigation problems, but also creates other problems: where and how to dispose of this huge volume of dredged material to avoid damage to the environment and, ideally, how to turn it into an environmental asset.

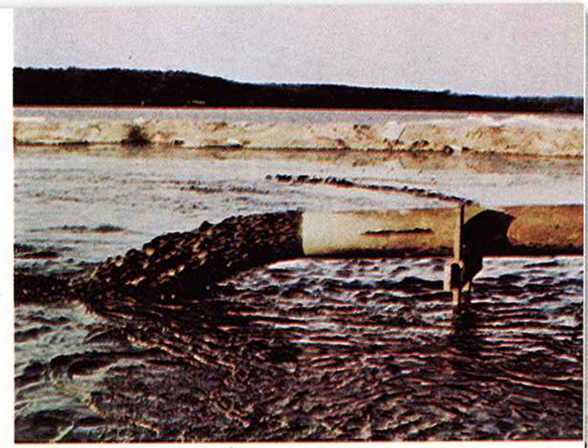
In the past, dredged material was usually disposed of by the most expedient and economical method—dumping in the nearest available space on land, or more often, in the water. But with increased concern for our environment, stringent controls have been placed on the disposal of dredged material. Confining the material in a disposal site on land to prevent the release of any contaminants it might contain

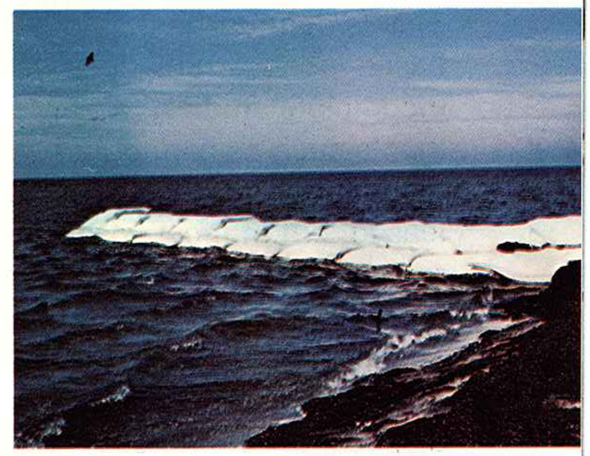
became a widespread practice. Land acquisition, facility construction and maintenance, transportation to the site, and increased handling of the material necessary in this method of disposal sometimes sent dredging and disposal costs soaring to 5 to 10 times the previous costs—even as much as $15 per cubic yard in some areas. Yet there was no conclusive evidence in many of these dredging locations that confinement on land was necessary or even advisable.

Too many questions were unanswered: How does dredged material disposal cause adverse environmental impacts? What constitutes an adverse impact? Are some disposal methods more environmentally acceptable than others? What are alternative disposal methods? Can this material be used as a manageable resource? Isn't there some way the environment and the economy could both live comfortably with dredging?

Seeking a solution to this complex problem, the Corps of Engineers initiated the Dredged Material Research Program (DMRP), a five-year study to discover why and under what circumstances the disposal of dredged material produces adverse environmental impacts. The research program was carried out by the Environmental Laboratory at the U. S. Army Engineer Waterways Experiment Station in Vicksburg, Mississippi.

The outcome of this research was not a single "best" disposal choice or alternative, nor were any alternatives rejected. Rather, information was collected on environmental impacts, and guidelines for planners and design engineers were developed as an aid in how to best evaluate the alternatives for each site; and how to choose a site to provide maximum environmental protection at minimal costs.



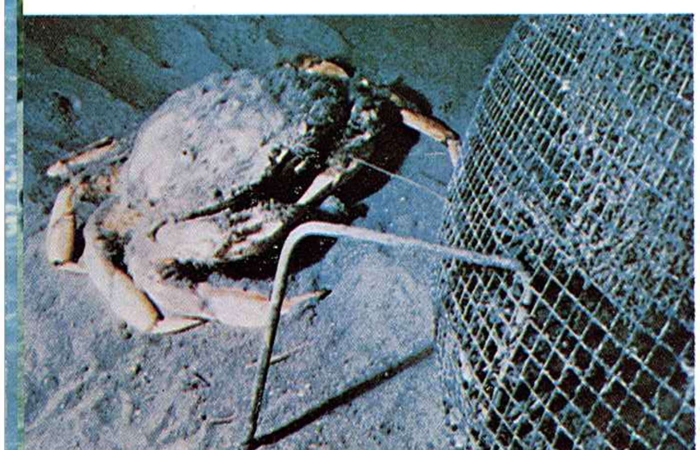


One of the major goals was to establish the effects of open water, land, and wetland disposal on water quality and organisms. Careful and detailed evaluation of several open water disposal sites of dredged material indicated minimal impact on biological activity and a low level of release of contaminants. This is contrary to previous beliefs based mostly on inadequate or incomplete studies. Som contaminants such as ammonium, manganese, and iron may be released, but in most cases, these are rapidly diluted to low concentrations. Nevertheless, adverse impacts could still occur; improper or poorly planned disposal of even uncontaminated material can disrupt the biological communities and natural processes. Problems are most likely to occur where large amounts of material are carelessly discharged into very shallow estuarine waters with poor circulation, and into upland or wetland habitats.

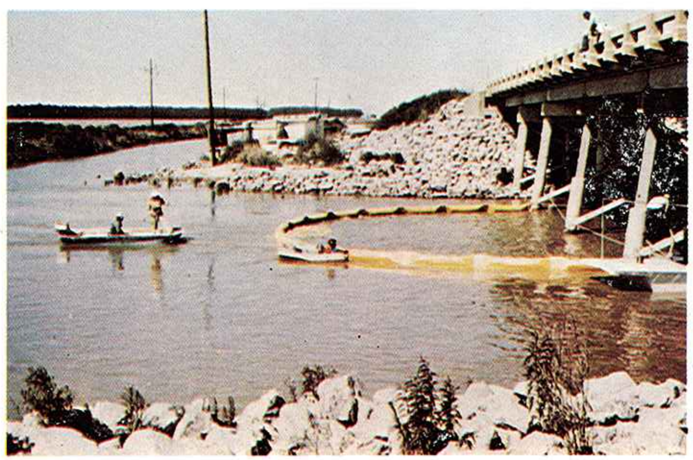
Biological impact studies have indicated that most adult swimming organisms can tolerate much more turbidity than dredging and disposal operations produce. Of course, it is advisable to avoid shellfish beds and to schedule dredging activities to avoid fish migrations or spawning. For use in environmentally sensitive situations, techniques were developed for predicting and controlling the spread of turbid water at the dredging and disposal sites.

But what about the bottom-dwelling organisms that are buried by dredged material disposal? Research revealed that they often recolonize

Chemical studies of open water disposal

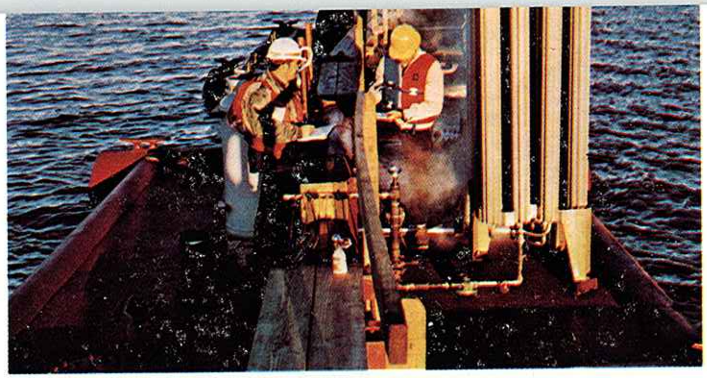


Recolinization by bottom dwelling organisms



Evaluation of silt curtains for controlling turbidity

Laboratory tests conducted under simulated field conditions to expose microscopic organisms to dredged material



Chemical treatment of contaminated dredged material

Sampling sediments from underwater disposal mounds

rapidly by the establishment of new populations, migration of nearby organisms, and survival of some buried organisms. The buried organisms are most likely to recolonize when the dredged material is similar to the natural bottom at the disposal site.

One cause for concern is that certain aquatic organisms will absorb chemicals from dredged material. As yet, the only effective method of predicting this is to pretest the effects of the material on sample organisms. Although most of these tests are expensive and time consuming, they are necessary for accurate impact predictions.

Diked or confined containment areas for dredged material were also studied extensively. These studies revealed some disadvantages—expense of construction, limited use, potential physical change of the landscape—but in some situations, confining highly contaminated material on land or in shallow water can be an environmentally sound alternative.


Odor control tests

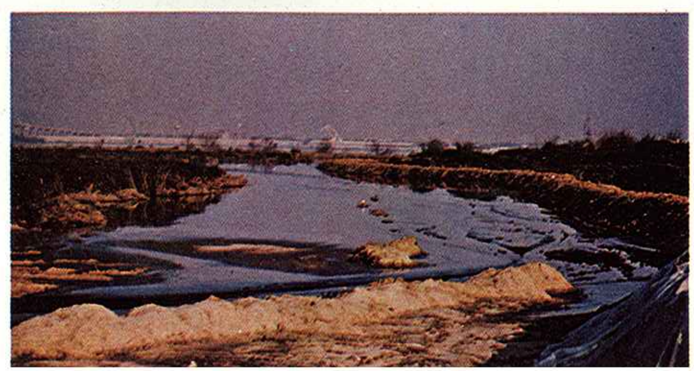
To make it even more sound, methods were developed for treating the runoff from diked areas.

Diked containment areas should be planned to yield maximum capacity and satisfactory quality of runoff water. Guidelines were developed for designing and operating containment areas and for controlling problems such as mosquitoes and odor.

Perhaps the most expensive aspect of confined containment areas is land acquisition. A solution to this problem would be to increase storage capacity of existing sites or make them reusable. Most dredged material is at least 80% water when it is placed in a disposal site. Field tests of several methods of removing this water to increase storage capacity were very successful.


Diked disposal area, Mobile River


Field tests of chemical methods for removing solids


Confined containment of dredged material

Filtering runoff

Disposal area reuse

Riverine Utility Craft

A modified Marine Corps vehicle called the Riverine Utility Craft proved to be an inexpensive and effective way of creating trenches to provide natural drainage.

In addition to increasing storage capacity, dewatering also improves the engineering value of dredged material. The consolidated material can be used within the site for dike raising or haul roads, or offsite for landfill or construction. Every cubic yard removed is a cubic yard of space to be reused.

Dredged material can also be used to establish or improve wildlife habitats. Once an occasional, desirable accident, marsh creation is now a proven alternative; it can be designed and implemented with no more difficulty than many other alternatives. Although marsh development is not satisfactory for all locations, it is not restricted to coastal zones. Marshes can be developed in lake areas and along river systems as well.

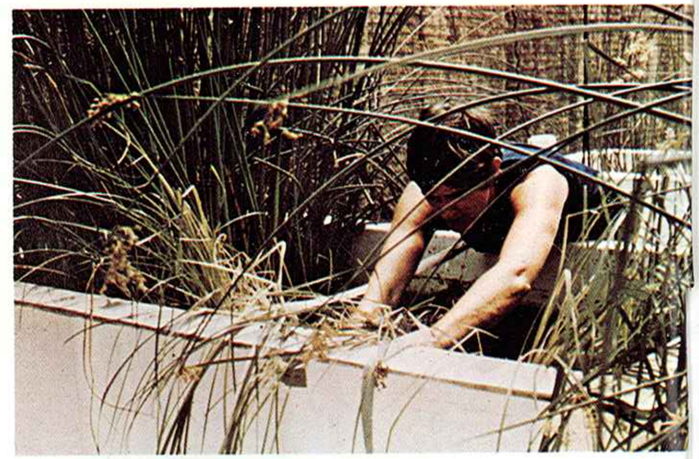
Upland habitat development is a similar alternative, using dredged material to develop areas of food and cover for mammals, and nesting, resting, and feeding areas for waterfowl. Many existing disposal sites require only the application of agricultural and wildlife management techniques to become upland habitats. Development can be relatively inexpensive and is not difficult. Hundreds of disposal sites could benefit from this alternative.

Small islands created by dredged material disposal are a special type of upland habitat. Many of the 2000 dredged material islands in inland waterways, coastal bays, and estuaries have become valuable wildlife habitats with seagulls, terns, and herons depending on them for nesting and roosting sites.

Cordgrass marsh at Apalachicola, Florida

Marsh establishment in intertidal zone, Miller Sands, Oregon

Barley grown for wildlife food on Oregon disposal site



Greenhouse testing of marsh development

Miller Sands Island, Columbia River

Marsh recovery studies

There is widespread belief that once an island is created and inhabited by wildlife, it can never again be used as a disposal site. On the contrary, studies have shown that unless natural growth is controlled, the islands usually revegetate extensively and cannot be used by terns and other birds that depend on bare sand for nesting. Periodically depositing a new layer of dredged material will prevent excessive vegetation and preserve the island for the desired species. Guidance has been developed on coordinating continued disposal and best use by specific wildlife.

Other non-wildlife-oriented uses for dredged material were also studied. Some concepts are limited by the variation in the quality and supply of dredged material. However, shrimp raised in ponds and sustained by the nutrients in one foot of dredged material on the bottom grew to be larger than those in similar ponds with no dredged material. On the basis of these tests, shrimp farming was attempted at a conventional disposal site and proved to be feasible.


Dredged material being removed to use for landfill cover


Port Center Development, Portland, Oregon


Strip mine reclamation


Beach park at Oakland, California, made with dredged material

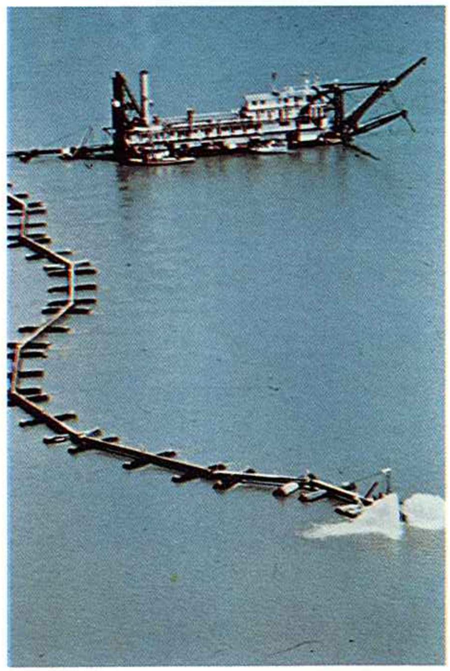

Shrimp farming in a disposal site

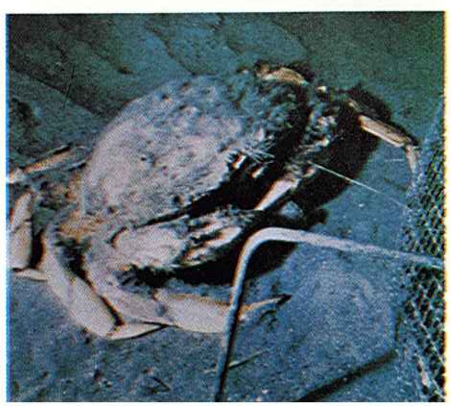

Agricultural production using dredged material

Opportunities for productive uses are more promising in inland areas. With this in mind, studies were made of long distance transportation of dredged material and the costs involved. If dredged material can be moved economically over several miles, it could perhaps be used to improve agricultural soils, to fill abandoned pits and quarries, and to reclaim stripmined lands.

East Potomac Park in Washington, D. C., built on dredged material

Intensive research of dredged material during the period March 1973 to March 1978 has proven that, with proper management, dredging can serve the environment as well as the economy. There are disposal alternatives that are safe for the environment that can be established at reasonable cost. The key lies in using dredged material as a natural resource.





Practices and procedures developed by the DMRP are explained in detail in published reports.
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