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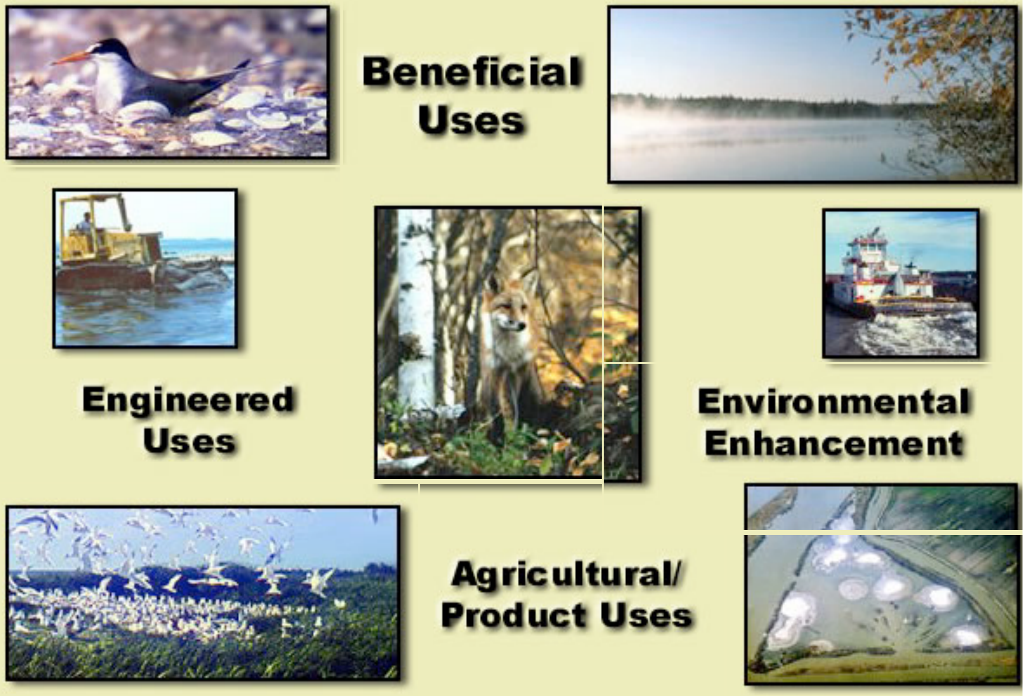

Most dredged material can be a valuable resource and should be considered for beneficial uses. The purpose of this site is to demonstrate potential beneficial uses of dredged materia by presenting existing case studies as examples. Category descriptions, procedural outlines and reference resources are also provided.

This site is a collaborative effort between U.S. Environmental Protection Agency and U.S. Army Corps of Engineers

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Introduction

Definition: Utilizing dredged sediments as resource materials in productive ways.

Introduction: Several hundred million cubic yards of sediment must be dredged from United States ports, harbors, and waterways each year to maintain and improve the nation's navigation system for commercial, national defense, and recreational purposes. Traditional dredging methods discharge sediment into confined disposal facilities or waters of oceans, rivers, lakes, wetlands, and estuaries. Dredged material containment facilities currently in use in the United States are nearing or are already full to capacity with material. Identifying new containment sites poses difficulties due to conflicting land uses, potential environmental impacts, and high value of near-water real estate.

Due to growing scientific knowledge and public awareness of using dredged material as a valuable resource, beneficial use of dredged material has become a viable option to traditional "dredge and dispose" methods for many projects. Prior to 1970, beneficial uses of dredged material were primarily to build or expand land for airports, ports, residential, or commercial development. Dredged material is now used beneficially for many more projects and purposes.

Beneficial uses of dredged material have been classified, for the purpose of these discussions, into three broad categories: engineered uses, agricultural and product uses, and environmental enhancement. Specific beneficial use examples are listed for each category and case study projects are provided. Some beneficial uses could have been placed into more than one category. For example, beach nourishment is placed under engineered uses, although it also enhances the environment.

The composition and grain size distribution of dredged material is important in matching the material with the intended beneficial use. For simplification, dredged material is characterized as one of five sediment types: rock; gravel and sand; consolidated clay; silt/soft clay; and mixture (rock/sand/silt/soft clay). Numerous other factors must be evaluated when considering beneficial use options for dredged materials such as: contaminant status of materials; site selection; technical feasibility; environmental acceptability; cost/benefit; and legal constraints.

The disposal of dredged material is managed and conducted by Federal, state, and local governments: private entities; and semi-private entities, such as port authorities. The U.S. Army Corps of Engineers issues permits for the disposal of dredged material, while the role of the U.S. Environmental Protection Agency is to provide oversight in the permitting process.

Beneficial uses of dredged material may make traditional disposal of dredged material unnecessary or at least reduce the level of disposal. Economic, social, and other benefits can be derived from the productive use of dredged material. However, monitoring of the dredged material placement sites is critical for measuring success. Continued development of applications to utilize dredged material for beneficial uses is necessary.

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Benefical Uses of Dredged Material

Authorities

- **Working with the Corps**
- **A guide to community assistance and cost-sharing programs**
- **Federal Programs Offering Non-Structural Flood Recovery and Floodplain Management Alternatives**
- **Explanation of Water Resources Development Act**
- **US Code Title 33 - Navigation and Navigable Waters**
  - **Title 33/Chapter 36 - Water Resources Devlopment**
  - **Title 33/Chapter 36/Section 2326 - Beneficial uses of dredged material**
  - **Title 33/Chapter 36/Section 2326a - Dredged material disposal facility partnerships**
  - **Title 33/Chapter 36/Section 2326b - Sediment management**
  - **Title 33/Chapter 36/Section 2326c - Dredged material marketing and recycling**
- **Code of federal regulations (CFR) - Title 33 Navigation and Navigable Waters**
  - **CFR Title 33/Chapter II/Parts 203-384 - Corps of Enginners, Department of the Army**
  - **CFR Title 33/Chapter II/Part 337 - Practice and Procedure**

Benefical Uses of Dredged Material

Decision Process

Contaminant Status of Materials
Evaluating the contaminant status of the dredged material is the first step to determine if the material is acceptable for beneficial use. Contaminant issues will not be addressed in any detail here but must be considered in every decision process for beneficial uses. In general, highly contaminated sediments will not normally be suitable for most proposed beneficial use applications and particularly for proposed wildlife habitat development projects. However, after appropriate examination, testing, and treatment, the material may be classified as suitable. Dredged material from ongoing activities (maintenance dredging) should be reevaluated periodically to ensure that the sediment contamination level has not worsened since the last dredging cycle. Guidance for evaluating the contaminant status of dredged material can be obtained from local, state, or national regulatory agencies and key references listed.

Site Selection
The choice of a beneficial use and site selection are interdependent decision processes. Dredged material may have multiple beneficial use options and involve different potential placement sites. When a potential use and site have been identified, then various implications should be assessed such as technical feasibility, environmental acceptability, physical alterations, cost/benefits, and legal constraints.

Technical Feasibility
The technical feasibility of implementing a particular beneficial use at a designated site must be evaluated. Various constraints must be considered, such as pumping distance, water depth, access, etc. If technical feasibility constraints will not allow the proposed beneficial use and/or selected site, then alternate disposal options must be pursued.

Environmental Acceptability
Before any substantial work can be undertaken, the environmental impact of the proposed work must be investigated during and subsequent to construction. An Environmental Impact Assessment (EIA) should be performed on all projects. Major projects will also require an Environmental Impact Statement (EIS). An EIA is generally a qualitative evaluation document of potential environmental impacts, whereas an EIS is more rigorous and quantitative, based on significant sampling and testing. Permission may be denied if the proposed work is likely to have any significant adverse environmental effects. The chosen beneficial use options may be pursued, if it is concluded that the environmental effects will not be significantly harmful.

Cost/Benefit
When one or more potential beneficial use options have been identified and the engineering methods have been defined, estimated costs and benefits should be analyzed. These costs are usually estimated by

standard methods. Options for beneficial use may lower the cost for disposal of dredged material in many instances, but increase costs in other scenarios. Costs are frequently lower when distances from dredging site to disposal site are reduced. In cases with higher costs, the increase may be more than offset by the value of the benefits. Although difficult to quantify, intangible benefits should always be taken into account when assessing overall costs and benefits. These benefits may include improved environment, esthetic enhancement, a more viable local community, or other benefits.

Legal Constraints
Early and concentrated coordination between permitting agencies, local interests, and environmental protection agencies is mandatory. Some beneficial use options or sites selected may be prohibited or rendered inappropriate by law or regulation. However, some beneficial uses may actually be encouraged through grants or subsidies by governmental or private organizations. Guidance for legal policy and regulations can be obtained from local, state, or national regulatory agencies and key references listed.

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Sediment Types

Rock

Rock may vary from soft marl via weak rocks (for example, sandstone and coral) to hard rocks (suc as granite and basalt). Rock may also vary in size from large to small, depending on the dredging equipment used and the type of material. Rock may also result from blasting, cutting, or ripping a is seldom of only one material type. Whether the rock can be used economically depends on its quantity and size. Rock is a valuable construction material and may be used for both terrestrial and aquatic habitat enhancement. Usually, dredged rock is not contaminated.

Gravel and Sand

Gravel and sand (granular) are generally considered the most valuable materials from a dredging project. Gravel and sand are suitable for most engineering uses without processing. Some additior processing (such as freshwater washing) may be needed for certain agricultural or product uses. Granular material can be used for beach nourishment, parks, turtle nesting beaches, bird nesting islands, wetlands restoration and establishment, and many other applications. Granular material i usually not contaminated.

Consolidated Clay

Consolidated clay varies from hard to soft clay and is material obtained from capital dredging. The material may occur as lumps or as a homogeneous mixture of water and clay, depending on the material type and dredging equipment used. If the water content is high, dredged clay may have to dewatered before being transported. Possible uses of consolidated clay include products, such as bricks and ceramics, and engineered uses in dikes and berms. Consolidated clay is not usually contaminated.

Silt/Soft Clay

Silt and soft clay are the most common materials acquired from maintenance dredging in rivers, canals, and ports. These materials are most suitable for agricultural purposes (such as topsoil) and all forms of wildlife habitat development. Depending on national regulations and laws, mildly contaminated silt and soft clay may be used for some engineered uses or product uses such as brick tiles, and ceramics. Because of the high water content, silt and soft clay must be dewatered for any product use. Dewatering can require months or years and, depending on the draining process used, can require temporary storage.

Mixture (rock/sand/silt/soft clay)

Capital dredged material usually occurs in layers as deposited from some past hydraulic process an may require the use of different dredging methods. Maintenance dredged material is usually a mixtu of materials such as boulders, lumps of clay, gravel, organic matter, and shells, with varying densities. Even though engineered and product uses will be somewhat restricted because of the mixture, mixed material may be used for a wide range of beneficial uses, such as filling, land improvement, and topsoil.

	Dredged Material Sediment Type				
Beneficial Use Options	Rock	Gravel & Sand	Consolidated Clay	Silt/Soft Clay	Mixture
Engineered Uses					
Land creation	x	x	x	x	x
Land improvement	x	x	x	x	x
Berm creation	x	x	x		x
Shore protection	x	x	x		
Replacement fill	x	x			x
Beach nourishment		x			
Capping		x	x		x

Agricultural/Product Uses					
Construction materials	x	x	x	x	x
Aquaculture			x	x	x
Topsoil				x	x
Environmental Enhancements					
Wildlife habitats	x	x	x	x	x
Fisheries improvement	x	x	x	x	x
Wetland restoration			x	x	x

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Beach Nourishment

Description

The influences of waves and tidal currents keep beach material in continuous motion. Where the prevailing wave direction is at an angle to the beach of less than 90 deg, some material will be moved along the beach or foreshore or even offshore in a process called littoral transport. This movement is most rapid under storm conditions. If the moved material is not replaced, the beach and eventually the shoreline will erode. If lost beach material is not replaced naturally, beach nourishment may be necessary to enhance the beach profile and moderate the wave climate at the shoreline. In addition to the improvement of beaches for coast protection, improvement may also be required for recreation beaches. Recreation beaches may be improved or new beaches may be created. Dredging can supply the required large quantities of sand and gravel-sized material for beach nourishment. A life span of 10 years is a common design target for many beach nourishment schemes but a shorter life may be acceptable, particularly where the cost of nourishment material is low.

Recommended Sediment Types

- Gravel and sand

References

- Francingues, N.R. McLellan, T.N., Hopman, R.J. Vann, R.G., and Woodward, T.D. (2000.) "Innovations in dredging technology: equipment, operations and management," DOER Technical Notes Collection (ERDC TN-DOER-T1), U.S. Army Research and Development Center.
- National Oceanic Atmospheric Administration (2000.) "State, Territory, and Commonwealth Beach Nourishment Programs: A National Overview," Office of Ocean & Coastal Resource Management Program Series Technical Document No. 00-01, Washington, DC.
- Nelson, D. A., and Pullen, E. J. (1990.) "Environmental Considerations in Using Beach Nourishment for Dredged Material Placement," pp. 113-128. In: R. L. Lazor and R. Medina (eds.) Beneficial Uses of Dredged Material. Technical Report D-90-3, U.S. Army Engineer Research Waterways Experiment Station, Vicksburg, MS.

Case Studies

- Brazos-Santiago Pass, TX
- Fire Island, NY
- Grays Harbor, WA
- Green Bay Harbor, Milwaukee, WI

- Homer, AK
- Lake Vancouver, Vancouver, WA
- Long Branch, NJ
- Miami Beach, FL
- Mobile Bay Berm, AL
- Morro Bay, CA
- New River, NC
- Ninilchick, AK
- Sand Island Bar, AL
- Shamrock Island, TX
- Silver Strand, CA
- Upper Newport Bay Ecosystem Restoration Project Orange County, California

Benefical Uses of Dredged Material

Berm Creation

Description

Dredged material may be used for creating berms or embankments to modify shoreline wave climate and thus improve beach stability. The berm may also be designed to alter wave direction and modify the rate or direction of local sediment transport. Generally the berm is aligned roughly parallel to the beach, but the optimum alignment at a specific site will be determined by the direction of the most destructive wave climate.

The formation of berms may provide a particularly attractive use for a wide range of dredged material. Because the berm is generally a submerged formation, most or all of the formation usually can be created by the bottom discharge of dredged material from hoppers. Berms may gradually erode and be dispersed, but the dispersed material will probably benefit the local coastal regime, either through beach feeding or by increasing foreshore levels.

Modification of the wave climate by berms may also improve recreational opportunities for surfing, swimming, sailing, and other activities. Care must be taken in placement of the berm to avoid interference with other users such as fisheries, ports, harbors, outfalls, and intakes.

Recommended Sediment Types

- Rock
- Gravel and sand
- Consolidated clay
- Mixture

References

- McLellan, T.N., Kraus, N.C., and Burke, C.E. (1990.) "Interim Design for Nearshore Berm Construction," Dredging Research Technical Notes (DRP-5-02), U. S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Smith, E.R., and Gailani, J.Z. (2005.) "Nearshore Placed Mound Physical Model Experiment," DOER Technical Notes Collection (ERDC TN-DOER-D3), U.S. Army Engineer Research and Development Center, Vicksburg, MS.
- U.S. Army Engineer Waterways Experiment Station (1988.) "Considerations for Planning and Managing Nearshore Placement of Mixed Dredged Sediments," Technical Note DOER-N3, Vicksburg, MS.

Case Studies

- Brazos-Santiago Pass, TX
- Breton Island, LA
- Fire Island, NY
- Grays Harbor, WA
- Green Bay Harbor, Milwaukee, WI
- Marina Del Rey, CA
- Mobile Bay Berm, AL
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Shore Protection

Description

Shore protection methods include dike construction as well as beach nourishment and underwater berms, which were discussed earlier. Dike construction may use dredged material in the form of a pumped sand, directly dredged clay material, or rock. Rock produced by dredging may be used as riprap slope protection, armor stone, groins, or breakwater core material. Dredging does not usually produce large quantities of rock, but where it does, a range of useful engineering applications exists.

Recommended Sediment Types

- Rock
- Gravel and sand
- Consolidated clay

References

- Comoss, E. J., Kelly, D. A., and Leslie, H. Z. (2002.) "Innovative Erosion Control Involving the Beneficial Use of Dredged Material, Indigenous Vegetation and Landscaping Along the Lake Erie Shoreline," *Ecological Engineering*, Vol. 19, p. 203-210

Case Studies

- Aransas National Wildlife Refuge, TX
- Barataria Bay Waterway, Grand Terre, LA
- Bayou des Glaises, LA
- Kelly Island, DE
- Marina Del Rey, CA
- Miller Sands Island, OR
- Mobile Outer Mound, AL
- Morehead City Nearshore Placement Area, NC
- Pointe Mouillee CDF, MI
- Santa Barbara Harbor, CA
- Shamrock Island, TX
- West Bay, TX

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Wetland Restoration

Description

Dredged material has been extensively used to restore and establish wetlands. Where proper sites can be located and government and private agency cooperation can be coordinated, wetlands restoration is a relatively common and technically feasible use of dredged material.

Wetlands restoration or rehabilitation using dredged material is usually a more acceptable alternative to creation of a new wetland. Many of the world's natural wetlands are degraded or impacted, or have been destroyed, and the recovery of these wetlands is more important than creation of new ones. Most former wetlands still have hydric soils, even though the hydrologic characteristics of the site may have been altered. When a new wetland is created, hydric soil conditions, appropriate hydrologic conditions, and wetland vegetation must all be introduced to the site. Creation of a new wetland would also mean replacing one habitat type with another, which is not always desirable. Long-term planning, design, maintenance, and management are necessary to maintain a created wetland.

Wetland restoration using dredged material can be accomplished in several ways. For example, dredged material can be applied in thin layers to bring degraded wetlands up to an intertidal elevation, as has been done extensively in south Louisiana. Dewatered dredged material can be used in wind and wave barriers to allow native vegetation to regrow and restore the viability of a wetland. Dredged material sediment can be used to stabilize eroding natural wetland shorelines or nourish subsiding wetlands. Dewatered dredged material can also be used to construct erosion barriers and other structures that aid in restoring a degraded or impacted wetland.

Recommended Sediment Types

- Consolidated clay
- Silt/soft clay
- Mixture

Case Studies

- Apalachicola Bay, FL
- Aransas National Wildlife Refuge, TX
- Armand Bayou, TX
- Atchafalaya River Delta, LA
- Atkinson Island, TX
- Baptiste Collette, LA
- Barataria Bay Waterway, Grand Terre, LA
- Barren Island, MD
- Bayou DuPont, LA
- Bayou La Branche, LA
- Big Island Mining, LA

- Bodkin Island, MD
- Bolivar Peninsula, TX
- Bolivar Sandbag Marsh, TX
- Brown Lake, LA
- Buttermilk Sound, GA
- Claremont Channel, NJ
- Clear Creek, TX
- Coffee Island, AL
- Commencement Bay, WA
- Donlin Island, CA
- Eastern Neck National Wildlife Refuge, MD
- Fina la Terre, LA
- Goglihite, WA
- Harkers Island, NC
- Hillsborough Bay CDF, FL
- Houston/Galveston Channel, TX
- Jetty Island, WA
- Kelly Island, DE
- Kenilworth, MD
- Lake of the Woods, Warroad, MN
- Lake Salvador, LA
- Miller Sands Island, OR
- Mission Bay, San Diego, CA
- Mississippi River Gulf Outlet, LA
- Mitchell Energy Corporation Sites, TX
- Muzzi Marsh, CA
- Pointe Mouillee CDF, MI
- Potters Marsh, IL
- Queen Bess Island, LA
- Sabine National Wildlife Refuge, LA
- San Francisco Bay Salt Pond #3, CA
- Shamrock Island, TX
- Snow's Cut, NC
- Sonoma Baylands, LA
- Southwest Pass, LA
- St. Johns River, FL
- Tennessee-Tombigbee Waterway, MS, AL
- Texas City Dike, TX
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- Windmill Point, VA
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Fish and Wildlife Habitats

Description

Dredged material can be used beneficially to enhance or create various wildlife habitats. This may be either incidental to the project purpose or planned. For example, nesting meadows and habitat for large and small mammals and songbirds have been developed on upland or floodplain (seasonally flooded) dredged material placement sites. Numerous examples are available where dredged material has been used to create nesting islands for waterbirds and waterfowl.

Many technical considerations are necessary for the creation of nesting islands. An island can be built where none existed, and vegetation states (bare ground versus sparse herb cover versus tree/shrub habitat) can be managed using periodic dredged material applications. The types of dredged material can be manipulated to provide proper substrates for nests; that is, softer silts and clays can be capped with sand, shell, and cobbles. The placement of the dredged material can be manipulated to provide the most acceptable habitat characteristics.

Upland wildlife habitats are typically dredged material containment areas that are no longer used or have long periods between maintenance dredged material placement. This allows native vegetation to grow and provide food and cover for wildlife. Site management is minimal, but can be intensified to provide special food crops, overwintering waterfowl feeding areas, and numerous other natural resource opportunities.

Recommended Sediment Types

- Rock
- Gravel and sand
- Consolidated clay
- Silt/soft clay
- Mixture

References

- Allen, H. H., and Shirley, S. O. (1988.) "Wetlands Created for Dredged Material Stabilization and Wildlife Habitat in Moderate to High-Energy Environments," Environmental Effects of Dredging Technical Notes EEDP-07-2, U.S. Army Engineer Research Waterways Experiment Station, Vicksburg, MS.

- Coastal Zone Resources Division (1978.) "Handbook for Terrestrial Wildlife Habitat Development on Dredged Material," Technical Report D-78-37, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

- Landin, M. C. (1986.) "Building, Developing, and Managing Dredged Material Islands for Bird Habitat," Environmental

Effects of Dredging Technical Notes EEDP-07-1, U.S. Army Engineer Research Waterways Experiment Station, Vicksburg, MS

- Miller, A. C. (1988.) "Construction of a Shallow-Water Gravel Bar Habitat Using Dredged Material," Environmental Effects of Dredging Technical Notes EEDP-07-4, U.S. Army Engineer Research Waterways Experiment Station, Vicksburg, MS.
- Miller, A. C. (1988.) "Construction of a Submerged Gravel Bar Habitat Using Dredged Material ," Environmental Effects of Dredging Technical Notes EEDP-07-3, U.S. Army Engineer Research Waterways Experiment Station, Vicksburg, MS.
- Payne, B. S. and Tippit, R. (1989.) "The Value of Gravel Disposal in River Side Channels for Freshwater Mussels," Environmental Effects of Dredging Technical Notes EEDP-07-5, U.S. Army Engineer Research Waterways Experiment Station, Vicksburg, MS.

Links

- USACE New York District DMMP Beneficial Uses of Dredged Material: Habitat Creation and Restoration

Case Studies

- Aransas National Wildlife Refuge, TX
- Armand Bayou, TX
- Atchafalaya River Delta, LA
- Atlantic Intracoastal Waterway
- Baptiste Collette, LA
- Bark Camp Run Demo, PA
- Barren Island, MD
- Big Island Mining, LA
- Bolivar Sandbag Marsh, TX
- Bussey Lake, IA
- Columbia River Islands, OR
- Commencement Bay, WA
- Core Sound Islands, NC
- Craney Island CDF, VA
- Folly Island, SC
- Gaillard Island CDF, AL
- Great Lakes Islands
- Gulf Coast Intracoastal Waterway
- Hart-Miller Island CDF, MD
- Hillsborough Bay CDF, FL
- Houston/Galveston Channel, TX
- Jetty Island, WA
- Mitchell Energy Corporation Sites, TX
- Mobile, AL (Thin Layer Disposal)
- Mott Island, Columbia River, Oregon
- Muzzi Marsh, CA
- Nott Island, CT
- Pacific Coast Islands
- Pointe Mouillee CDF, MI
- Polander Lake, MN
- Potters Marsh, IL

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Fisheries Improvement

Description

Appropriate placement of dredged material can improve ecological functions of fishery habitat. Fishery resource improvement can be demonstrated in several ways. Bottom relief created by mounding of dredged material may provide refuge habitat for fish. Fine-grained sediment transport can be stabilized by planting seagrasses or capping with shell or other coarse dredged material. The seagrasses or shell caps additionally improve fishery habitat.

Recommended Sediment Types

- Rock
- Gravel and sand
- Consolidated clay
- Silt/soft clay
- Mixture

Case Studies

- Bussey Lake, IA
- Donlin Island, CA
- Mobile Outer Mound, AL
- Polander Lake, MN
- Port of Los Angeles Channel Deepening Project Los Angeles County, California
- Potters Marsh, IL
- Slaughter Creek, MD
- Texas City Dike, TX

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Capping

Description

Capping involves the placement of clean dredged material over a deposit of contaminated dredged material in open-water or upland locations as a means of isolating the contaminated sediment from the surrounding environment. Open-water caps provide a wave-and current-resistant layer on top of previously deposited contaminated materials. Sand, clay, or mixed materials may be used for open-water capping, whereas clay is usually most suitable for upland locations.

Recommended Sediment Types

- Gravel and sand
- Consolidated clay
- Mixture

References

- Palermo, M.R., Clausner, J.E., Rollings, M.P., Williams, G.L., Myers, T.E., Fredette, T.J., and Randall, R.E. (1998.) "Guidance for Subaqueous Dredged Material Capping," DOER Technical Report (DOER-1), U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Case Studies

- Buzzards Bay, MA
- Georgia Pacific Log Pond, WA
- Historical Area Remediation Site (HARS), New Jersey
- Mobile, AL (Landfill Cover)
- Mobile, AL (Thin Layer Disposal)
- Palos Verdes Shelf Pilot Capping Project Los Angeles County, California
- Port of Los Beach Channel Deepening Project Los Angeles County, California

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Construction Materials

Description
Some dredged material can be used as construction material. In some parts of the world, dredging to obtain construction material is a common practice. Because of the growing demand for construction materials and dwindling inland resources, this may be an important beneficial use. In many cases, dredged material consists of a mixture of sand and clay fractions, which requires some type of separation process. Dewatering may also be required because of high water content.

Depending on the sediment type and processing requirements, dredged material may be used as: concrete aggregates (sand and gravel); backfill material or in the production of bituminous mixtures and mortar (sand); raw material for brick manufacturing (clay with less than 30 per cent sand); ceramics, such as tile (clay) pellets for insulation or lightweight backfill or aggregate (clay); raw material for the production of riprap or blocks for the protection of dikes and slopes against erosion (rock, mixture); and raw material for the production of compressed blocks for security walls at military installations and for gated communities and home subdivisions.

Recommended Sediment Types

- Rock
- Gravel
- Sand
- Silt
- Clay
- Mixtures

Links

- The Benefical Reuse of Dredged Matetrial for Upland Disposal

Case Studies

- Claremont Channel, NJ
- Duluth CDF, MN
- Mayport, FL
- New York/New Jersey Harbor Demonstration, NY
- Ninilchick, AK
- Palmyra Cove Demonstration Project, NJ
- Savannah Brick Production, GA
- Sediment Decontamination Demo, New Jersey
- Sediment Processing Facility, New Jersey

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Land Creation

Description

Land creation using dredged material includes filling, raising, and protecting an area that is otherwise periodically or permanently submerged. The creation of coastal land may also involve constructing a perimeter enclosure for protection against erosion by waves and currents. This may not be necessary in estuarine waters or in other sheltered coastal locations that have a small tidal range.

Coarse or fine dredged material may be used in land creation. The suitability of a particular dredged material for land creation will depend largely on the intended use of the land. Material from maintenance dredging is usually silt or sand, while material from capital dredging may be of almost any kind or may be mixed. Sometimes the fine-grained material may be separated from the coarse material and the two resulting materials used in different ways.

Fine material will require a long time to drain and consolidate; therefore, the strength achieved may be low. Land created using these fine-grained materials may be limited to recreational uses, such as parks, or uses where the imposed loads will be small. If land must be created rapidly, material from capital dredging are primarily used. Where longer development times are acceptable, materials from maintenance dredging may also be used. Land created for industrial development or to accommodate roads or railways normally requires only sand or coarser material.

Often the constraints of time and the availability of suitable material limit the use of dredged material in land creation. Such constraints may be overcome by long-term planning, which provides for land creation over extended periods. Land creation may also be constrained by compelling environmental considerations.

Recommended Sediment Types

- Rock
- Gravel and sand
- Consolidated clay
- Silt/soft clay
- Mixture

References

- Coastal Zone Resources Division (1978.) "Handbook for Terrestrial Wildlife Habitat Development on Dredged Material," Technical Report D-78-37, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Case Studies

- Atlantic Intracoastal Waterway
- Baptiste Collette, LA
- Barataria Bay Waterway, Grand Terre, LA
- Barren Island, MD
- Big Island Mining, LA
- Brown Lake, LA
- Columbia River Islands, OR
- Core Sound Islands, NC
- Gaillard Island CDF, AL
- Galbraith Golf Course, Oakland, CA
- Great Lakes Islands
- Gulf Coast Intracoastal Waterway
- Hart-Miller Island CDF, MD
- Jetty Island, WA
- Lake Vancouver, Vancouver, WA
- Mission Bay, San Diego, CA
- Nott Island, CT
- Pacific Coast Islands
- Polander Lake, MN
- Tennessee-Tombigbee Waterway, MS, AL

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Land Improvement

Description

Dredged material may be used for land improvement when the quality of existing land is not adequate for a planned use or where the elevation of the land is too low to prevent occasional flooding. As with land creation, the suitability of a particular dredged material for land improvement will depend largely on the intended use of the improved land.

Proven methods have been developed for land improvement by filling with the fine material, such as silts and clays, produced by maintenance dredging. Various dewatering techniques may be utilized, such as: subdividing the placement area to allow filling to a limited depth on a rotational basis; reworking the filled area with low ground-pressure agricultural or earth-moving equipment; and mixing coarse-grained material with the fine-grained upper layer.

Dredged material of fluvial origin is primarily eroded topsoils and organic matter that may be used on land of poor agricultural quality to improve the soil structure. Even material dredged from a saline environment may, after treatment, be suitable for use as topsoil. Mildly contaminated soils can be used for nonconsumptive land uses. Land improved using fine material is generally of lower strength than land improved using coarse-grained material. Potential applications include dairy and arable farming, recreation areas, playing fields, golf course, parks, light residential development or light commercial storage areas.

Recommended Sediment Types

- Rock
- Gravel and sand
- Consolidated clay
- silt/soft clay
- Mixture

References

- Harrison, W., and Luik, A. (1980.) "Suitability of Dredged Material for Reclamation of Surface-mined Land, Ottawa, Illinois, Demonstration Project," Technical Report EL-80-7, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

- Perrier, E., Liopis, J., and Spaine, P. (1980.) "Area Strip Mine Reclamation Using Dredged Material A Field Demonstration," Technical Report EL-80-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

- Spaine, P. A., Liopis, J. L., and Perrier, E. R. (1978.) "Guidance for Land Improvement Using Dredged Material Synthesis Report," Technical Report DS-78-21, U.S. Army Engineer

Research Waterways Experiment Station, Vicksburg, MS.

Case Studies

- Bark Camp Run Demo, PA
- Bayou La Branche, LA
- Bodkin Island, MD
- Claremont Channel, NJ
- Dillingham, AK
- Folly Island, SC
- Galbraith Golf Course, Oakland, CA
- Mission Bay, San Diego, CA
- Palmyra Cove Demonstration Project, NJ
- Patriots Point Park, SC
- San Francisco Bay Salt Pond #3, CA
- Southwest Pass, LA
- Wine Island, LA

Benefical Uses of Dredged Material

Topsoil

Description

Maintenance dredging in harbors, access channels, and rivers produces mixtures of sand, silt, clay and organic matter that can be excellent ingredients for topsoil. Some dredged materials may be excellent topsoil as is. Other dredged material may require blending with other residual materials such as organic matter (yardwaste, wastepaper, storm debris, etc.) and biosolids (human sewage sludge or animal manure) to manufacture enhanced fertile topsoil. The dredged material may be used to improve soil structure for agricultural purposes. For production of food, uncontaminated material must be used. For other uses, the allowed contaminant level will depend on the use of the topsoil. In some cases, suitable material may be placed in a thin layer directly by pumping. After dewatering, the material is suitable topsoil for seeding and planting.

Dewatering may require several years, depending on the granular texture of the dredged material and is influenced by additional substances or by the type of dewatering process. Dredged material from coastal or tidal areas will require special attention to salinity, since most agricultural species can not tolerate and grow in salty soil. Salinity may be reduced naturally by rain or by the dewatering process. Other uses of topsoil might include using dredged material to cap poor soils or to cover a fill of coarse material (e.g., urban or industrial waste sites).

Dredged material can also be used in the manufacture of blended artificial topsoil products. The blended topsoil can be used for athletic fields such as soccerfields and ball fields, home landscaping, golf courses, parks, brownfield redevelopment, etc. Required topsoil specifications for a specific use can be met through blending appropriate materials together in specific amounts.

Recommended Sediment Types

- Sand
- Silt
- Clay
- Mixtures

Links

- Proceedings: International Workshop on Dredged Material Benefical Uses, 28 July - 1 August 1997, Baltimore, MD
- The Benefical Reuse of Dredged Matetrial for Upland Disposal

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- Bronx, NY
- Ft. Drum, NY
- Green Bay Harbor, Milwaukee, WI

- Hamlet City Lake, NC
- Herbert Hoover Dike, FL
- Jacksonville Harbor, FL
- Lake Vancouver, Vancouver, WA
- Mobile River and Harbor, AL
- Mobile, AL (Landfill Cover)
- New York/New Jersey Harbor Demonstration, NY
- Palmyra Cove Demonstration Project, NJ
- Sediment Decontamination Demo, New Jersey
- Sediment Processing Facility, New Jersey
- Toledo Harbor, OH
- Vintondale, PA (Athletic Fields)
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- Upper Newport Bay Ecosystem Restoration Project Orange County, California
- Warm Springs, CA