

Concepts, Methods, and Measures for Achieving Beneficial Use of Dredged Material, Managing DM for Beneficial Purpose

Coastal Louisiana



Currituck in NJ Inlet

Sonoma County, CA



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DOTS Summer Webinar: Managing Dredged Material for Beneficial Purpose
September 18, 2013



Presentation Objective and Agenda

Objective

Align efforts to achieve sustainable Dredged Material Management Strategies that maintain costs while increasing benefits.

Presentation Agenda

- 1. What is Beneficial Use?**
- 2. DM management strategies**
- 3. A plan to increase BU**
- 4. Discussion**



Pop Quiz

- **What is Beneficial Use?**
 - (a) A Dredged Material Management Strategy
 - (b) Reuse of Dredged Material for Beneficial Purpose;
 - (c) All of the above
- **How do we increase BU of DM?**
 - Regional Sediment Management
 - Engineering with Nature
 - More In-Water Placement
 - All the above



Pop Quiz

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- (c) All of the above

- **How do we increase BU of DM?**

- Regional Sediment Management



- Engineering with Nature

- More In-Water Placement

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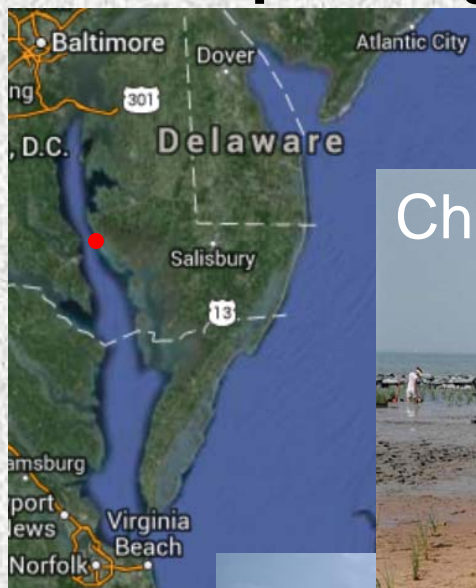
Categories for Beneficial Use of Sediment

1. **Habitat Restoration and Development** using placement of dredged sediments for creation, enhancement, or restoration of ecosystem habitat
2. **Sustainable Regional Sediment Management** by retaining sediment within the natural littoral system to support sediment-based habitats, shorelines, and infrastructure
3. **Beach Nourishment** using dredged material (primarily sandy material) to restore and maintain beaches
4. **Shoreline Stabilization and Erosion Protection** through the placement of dredged material with the intent of maintaining or creating erosion protection
5. **Engineered Capping** of sediment, soils, or waste materials, e.g., landfill cover, reclamation of mining sites, or remediation of contaminated sites.
6. **Aquaculture, Agriculture, Forestry, and Horticulture** involving placement of dredged material to create, maintain, or enhance characteristics of the land.
7. **Recreational Development** through placement of dredged material for the foundation of parks and recreational facilities
8. **Commercial Land Development** (also known as reclamation) placement of dredged sediments to support commercial or industrial development activities
9. **Commercial Product Development** involving the use of dredged material to create marketable products such as construction materials
10. **Mixed** - Combination of beneficial use categories.



Vegetative Plantings for BU Site Stabilization: Barren Island, MD

Building stakeholder good will through vegetative plantings of a BU placement site...



Chesapeake Bay



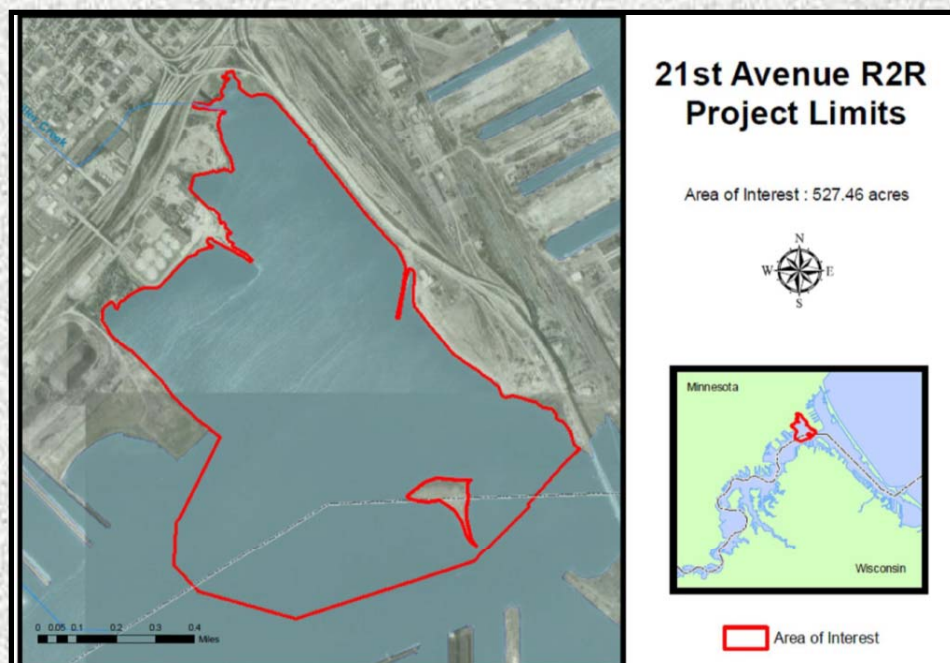
**USACE,
Baltimore
District**



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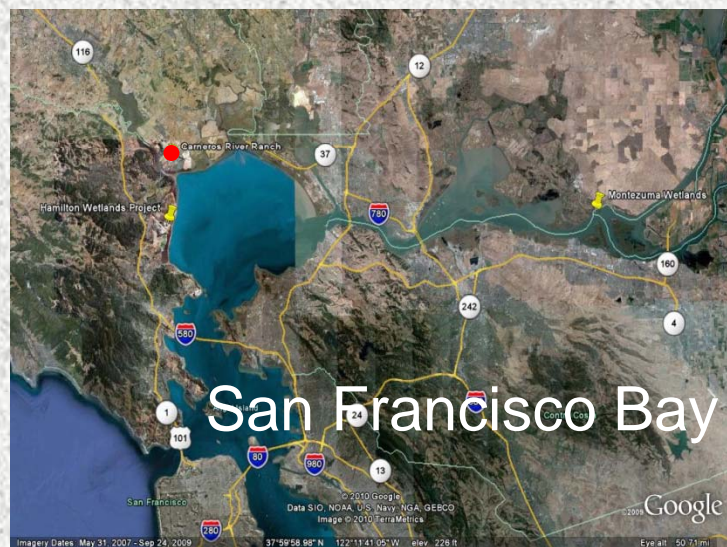
Submersed Aquatic Habitat Creation Duluth Harbor, MN, Great Lakes



- Low level mercury contamination in water bottom sediments
- Placed relatively less contaminated dredged sediment for capping
- SAV restoration to degraded river flats in natural flood-plain delta
- Increased invertebrates and fisheries ecosystem functionality
- Facilitated ability for open water placement, alleviating traditional upland CDF practice, where 95% capacity currently exhausted



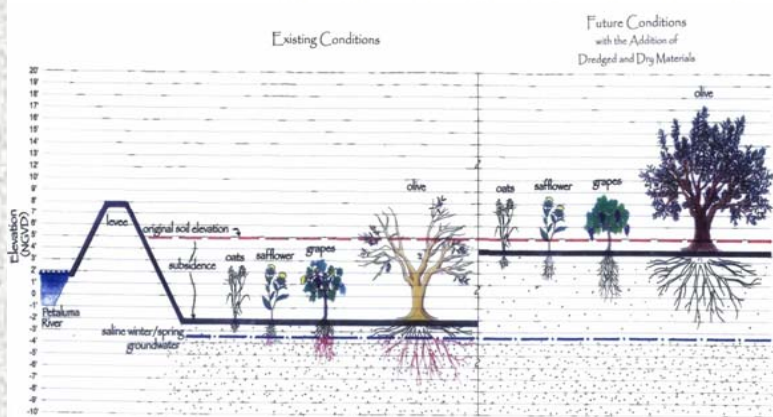
Upland Agriculture BU: Carneros River Ranch, Sonoma County, CA



Improved site conditions
for enhanced growth and
production



USACE-SPN



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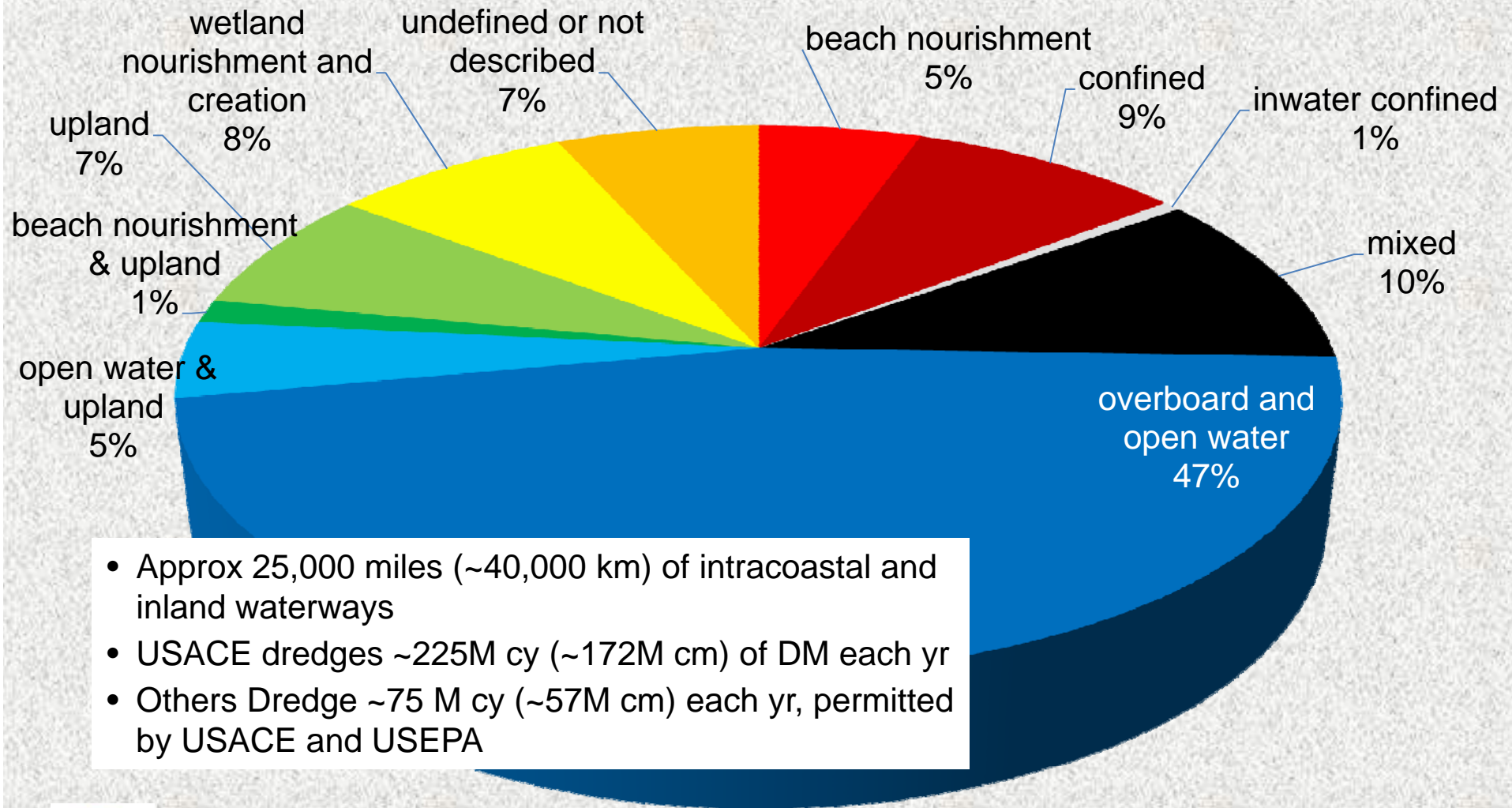


What We Know about DM and BU

- Over the last 15 years ~225,000,000 cy of sediment are dredged annually by corps-owned and contractor-owned dredges; and ~75,000,000 cy dredged by permits
- In 2011, ~228,000,000 cy of sediment were dredged and managed at an approximate average of \$5 to \$6 per cy
- In 2011, ~36,000,000 cy (16% of total) went to ocean disposal
- Over the last 15 years, an estimated 10%+ of sediment is upland confined
- Estimated 50% +/- of DM is used beneficially



Scope of Dredged Material Management Corps of Engineers

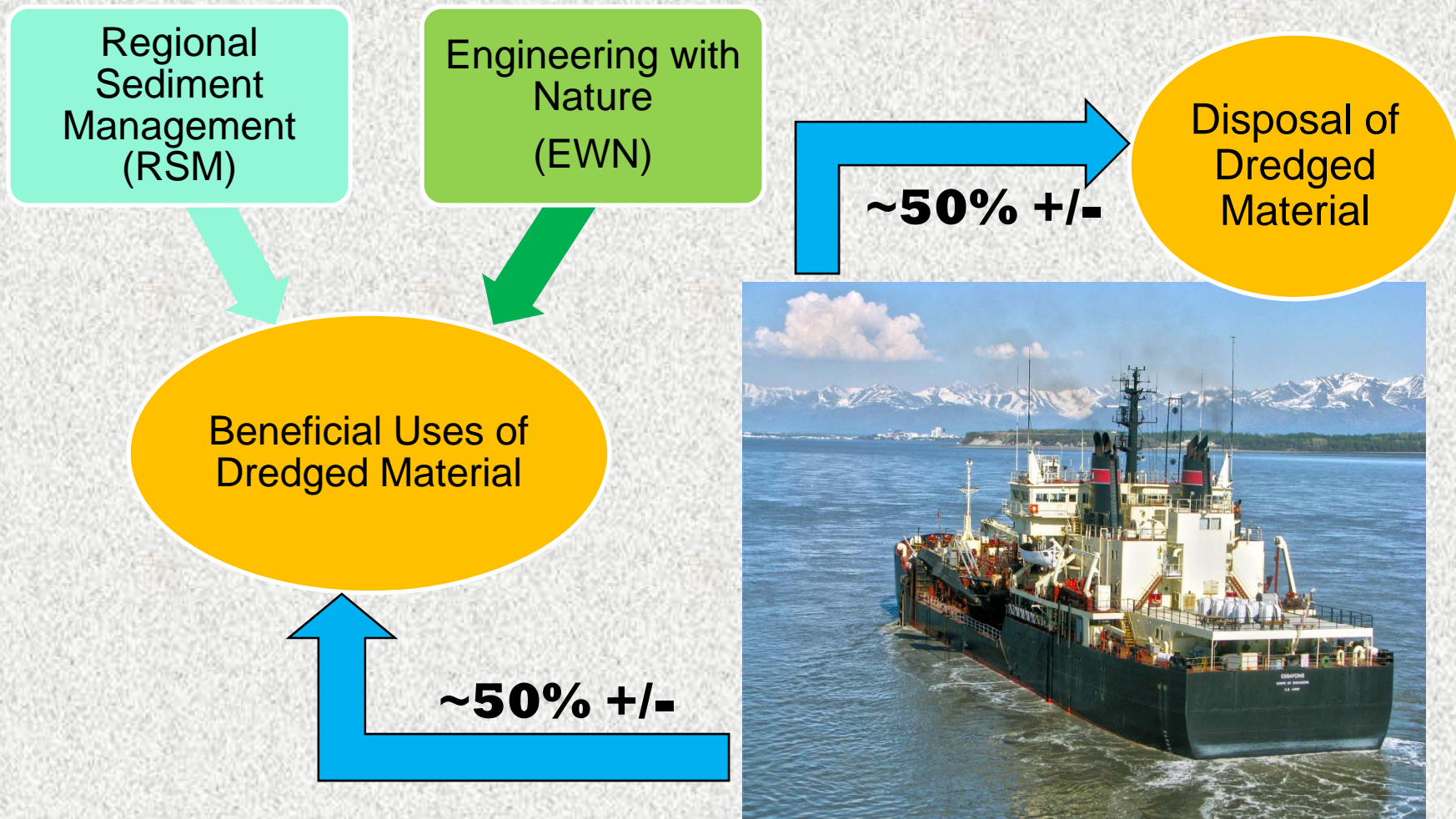


Beneficial use is defined as using dredged sediments as a resource in a productive way, which provide environmental, economic, or social benefits.



BENEFICIAL USE ?

RSM and EWN for Increased BU of DM

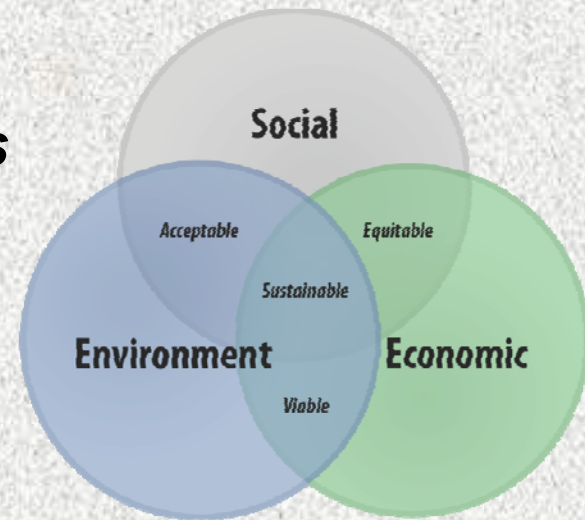


ESSAYONS working in USACE Alaska District



Engineering With Nature...

...the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.



Regional Sediment Management...

Sediment is a Resource. The RSM Program supports initiatives that develop and demonstrate the systematic increase of lifecycle benefits and reduced costs of the USACE navigation, flood risk management, and environmental restoration missions



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National (and International) Emphasis for Increased BU

Increased beneficial use has the following potential advantages:

- Reduce dredged material management life-cycle costs due to less handling or shorter conveyance distance.
- Create opportunity for multi-purpose and joint funded projects that serves two or more Corps missions.
- Preserve or recover capacity of CDFs or other limited dredged material management facilities.
- Utilize dredged material as a resource in an environmentally and socially productive manner.

The American Society of Civil Engineers (ASCE) recognizes sediment as a resource and supports regional sediment management for watershed and coastal zones to ensure ecosystem preservation and sustainable development (ASCE Policy Statement 522).
(<http://www.asce.org/>)

National Dredging Team's Dredged Material Management: Action Agenda for the Next Decade (2003): Beneficial use must become a priority at all levels of management and there must be recognition that dredged material is a valuable resource (EPA 2003).



A Plan to Increase Beneficial Use

- 1. Provide consistent beneficial use terminology and DMM terminology;**
- 2. Track quantities of beneficial use...with DMM**
- 3. Identify funding and collaboration opportunities;**
- 4. Identify dredged material management optimization tools (e.g. Dredged Material Management Decisions);**
- 5. Prepare technical guidelines to evaluate and perform beneficial use projects;**
- 6. Provide a method to quantify the environmental value;**
- 7. Monitor and apply adaptive management to DMM projects for beneficial purpose.**



Terminology Consideration

Dredge Spoils



Terminology Consideration

~~Dredge
Spoils~~

**Dredged
Material**



Terminology Consideration

~~Dredge
Spoils~~

~~Dredged
Material~~

**Dredged
Sediment**



Wetlands creation at
USACE Baltimore District



In-Water and Nearshore DMM Terminology

Aquatic placement of dredged material

- 1. Placement Nearshore for Shoreline Protection or Beach Nourishment:** Placement of DM along the shoreline (coastal and inland) for beneficial purpose. This option includes dredged material placed directly onto the shore for beneficial purpose or placed nearshore in the littoral zone with the intent of most dredged material remaining within the depth of closure or littoral zone (i.e. CWA).
- 2. Placement Nearshore for Ecological Habitat:** Dredged material placed for habitat nourishment or creation. Habitat can include wetland such as bottomland hardwood, salt marsh, swamp, wooded wetland, scrub-shrub, and forested wetland.
- 3. Confined In-water Placement for Beneficial Purpose:** In water placement confined to a defined footprint; such as a nearshore CDF or confined aquatic disposal (CAD) that will support sub-aquatic vegetation, essential fish habitat, or other beneficial purpose.
- 4. Confined In-water Placement for Disposal:** In water confined placement for purposes of disposal; includes nearshore CDF and CAD.
- 5. Unconfined In-water Placement in River, Lake, or Estuary:** Dredged material placed into a river, lake, bay, or estuary, including flow lane placement, side-casting, agitation dredging, and other unconfined open water placement. Includes aquatic placement for future rehandling or transfer. Also includes inland, open-water placement to sustain Regional Sediment Management.
- 6. Island Placement:** Dredged material placed for island creation or island nourishment. Also included in this option are other categories that apply specifically to island placement; such as upland habitat, beach nourishment, nearshore habitat, etc.
- 7. Beneficial Ocean Placement:** Ocean placement of dredged material into designated MPRSA Site, intended for beneficial purposes.
- 8. Ocean Disposal:** Ocean placement of dredged material into designated MPRSA Site, intended for disposal.



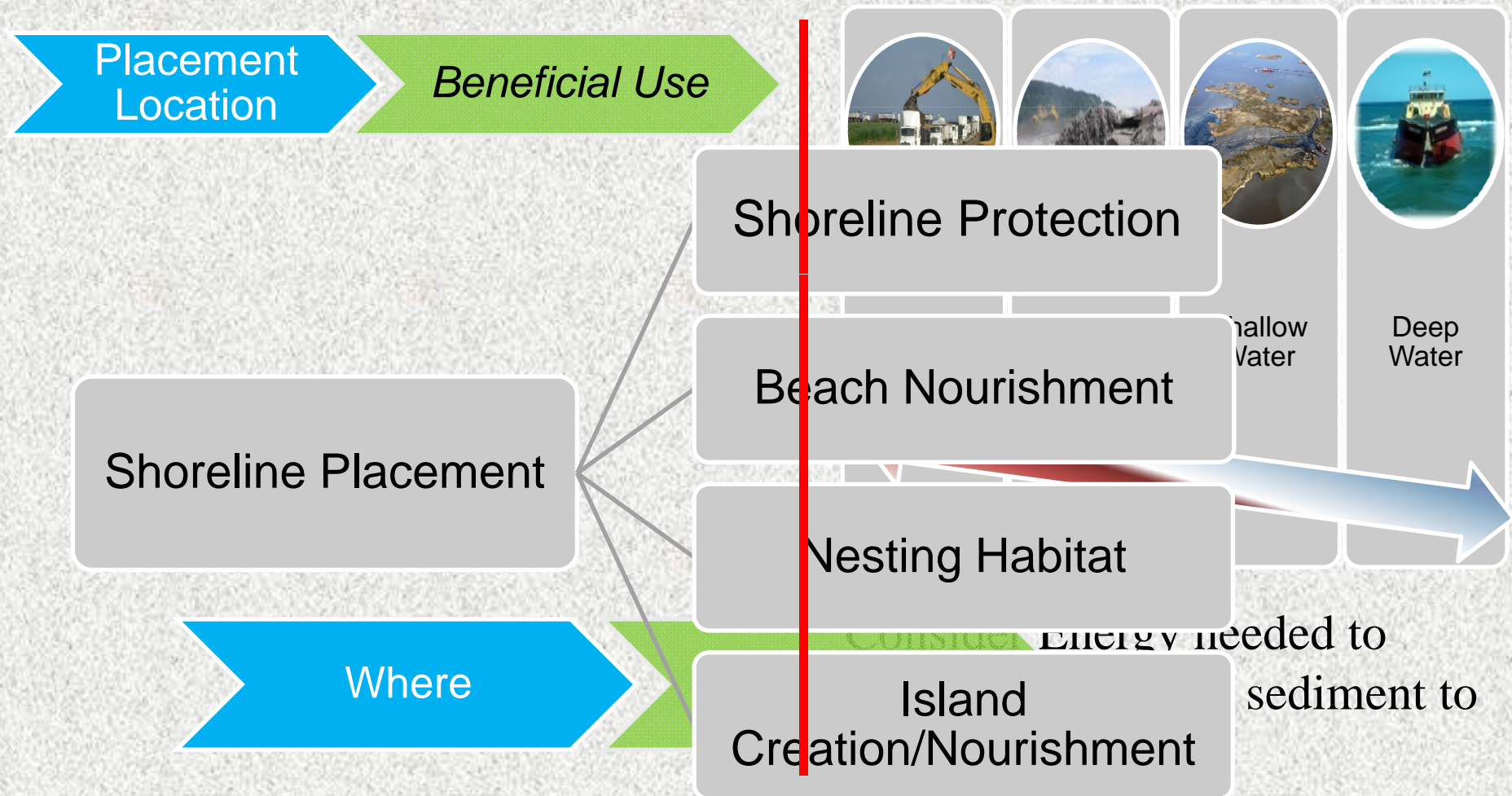
Upland DMM Terminology

Dredged material placed upland with/without return water

- 1. Upland Placement for Land Development:** DM placed upland for land development; including commercial, agriculture, recreation, or other land type.
- 2. Upland Placement for Ecological Habitat:** DM placed above littoral zone for upland habitat; such as forest, bird, or other upland habitat.
- 3. Upland Placement for Reuse:** DM placed in an upland CDF with the intention of reusing a portion of the dredged sediment for beneficial purpose; such as landfill cover or construction fill.
- 4. Upland Placement for Disposal:** DM placed in an upland CDF for disposal with no intention of beneficial purpose. This option includes rehandling for disposal into a landfill, but does not include reclamation uses, such as daily landfill cover.



DM Management Options



DM Management and Technical Considerations for BU

Material Suitability	Site Selection	Placement Logistics	Management
<ul style="list-style-type: none">• Physical• Chemical• Biological• Dredge configuration• Environmental Function	<ul style="list-style-type: none">• Sediment volumes• Transport distances• Site topo/bathy• Land/Water features and function• Placement accessibility• Slope stability (living shoreline potential)• Vegetation	<ul style="list-style-type: none">• Geomorphology• Hydrodynamics• Sediment processes• Dredge compatibility• Production rate• Site stability• Effluent routing• Consolidation• Desired Environmental Function	<ul style="list-style-type: none">• Policy, authority, regulatory, and funding• Sponsor, stakeholder engagement• Engineering and planning tools• Vegetation wrt elevation-- Wetland and aquatic flora• Monitoring and Adaptive Mgmt



Technical Guidance for Management of Dredged Sediment

USEPA and USACE 2004
Evaluating Environmental Effects of DM
Management Alternatives
(A Technical Framework)

USEPA/USACE 1991

**Marine Protection
Research and
Sanctuaries Act
Ocean Testing
Manual**

USEPA/USACE 1998

**Clean Water Act
Inland Testing
Manual**

USACE 2003

**Five Risk Pathways
for CDFs
Upland Testing
Manual**



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Technical Guidance for Management of Dredged Sediment

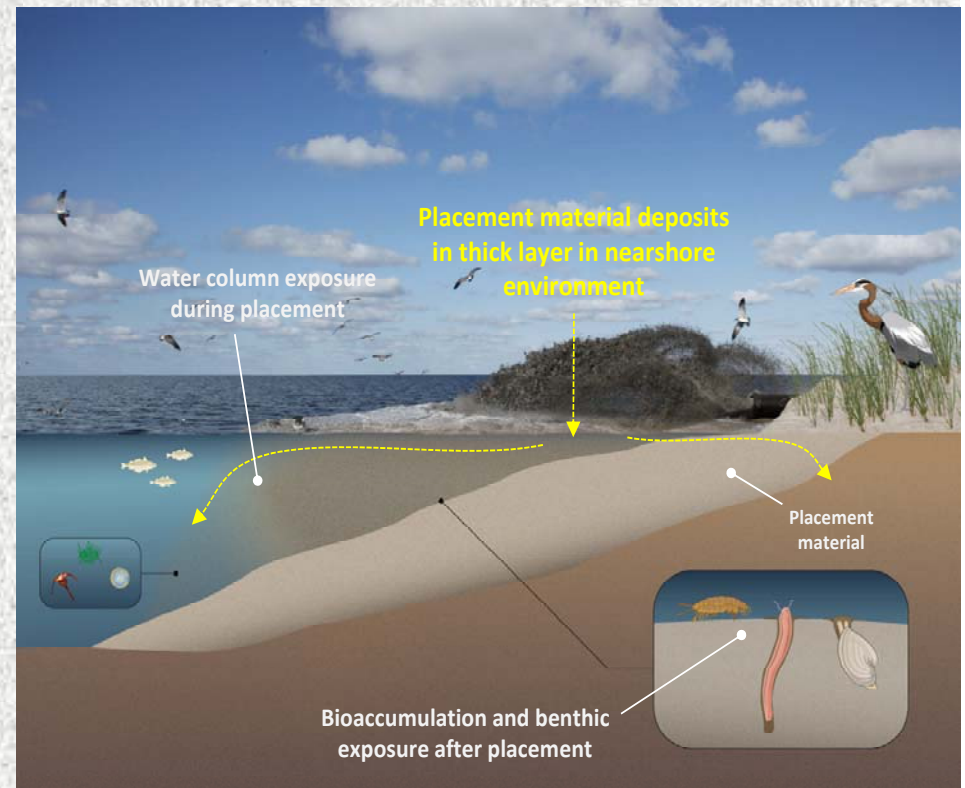
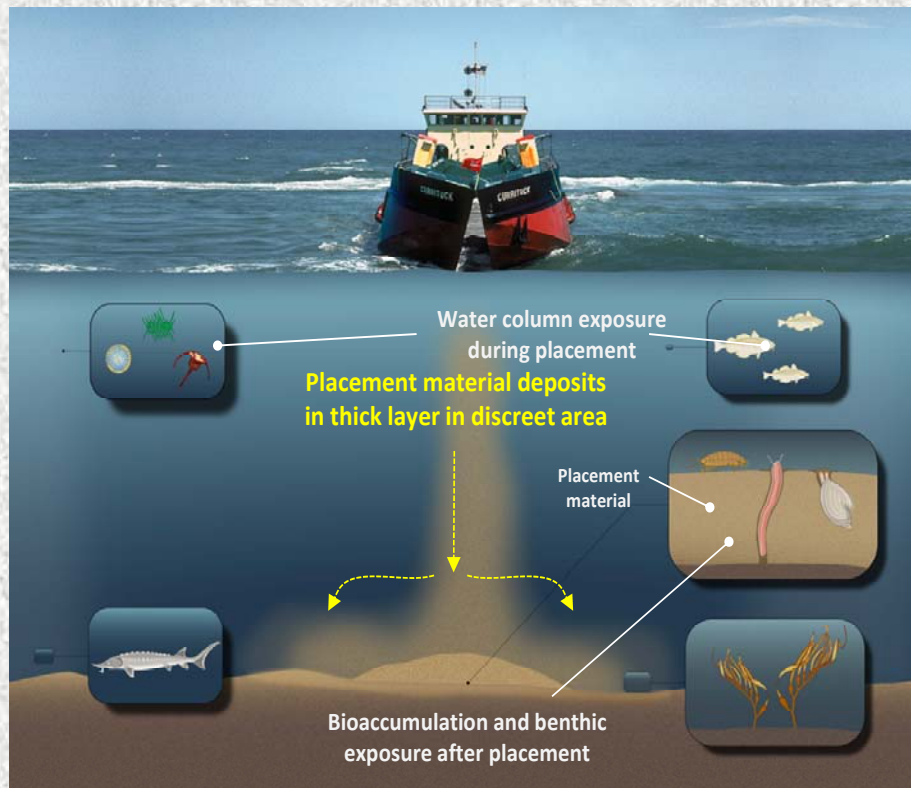
USEPA and USACE 2004
Evaluating Environmental Effects of DM
Management Alternatives
(A Technical Framework)

USEPA and USACE 2013
Aquatic Placement of Dredged
Material: Testing, Assessment,
and Management Manual

USACE 2003
Five Risk Pathways
for CDFs
Upland Testing
Manual



Dredged Sediment Management Conceptual Operational Model



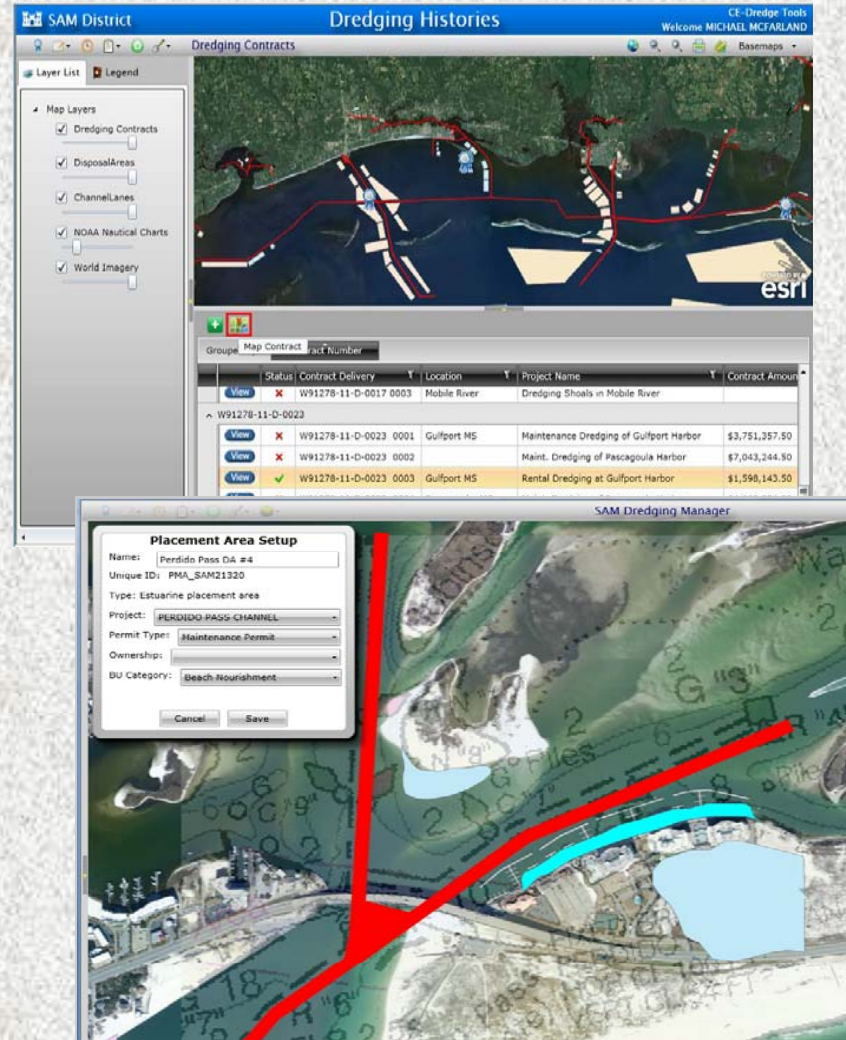
Funding Challenges and Opportunities

- 1. Collaboration and partnering between missions and other stakeholders is encouraged to optimize beneficial use of navigational dredged material.**
- 2. incremental cost above the base plan for dredging and placing dredged material, as defined by the Federal Standard in 33CFR335.7.**
- 3. Section 204 of the WRDA of 1992, as amended, provides programmatic authority that allows aquatic restoration or environmental shoreline erosion benefits for authorized projects when they are not the least costly method for dredged material management. The incremental cost is shared, with a non-Federal sponsor (USEPA/USACE 2007).**
- 4. Critical to achieving collaboration among agencies, sponsors, etc., is scheduling; specifically, providing as much advance notice as possible on when dredging will be done to allow permits and additional funding to be secured.**



Tracking BU with DMM (work in progress)

- Use Dredging Manager to review historical projects
- Use e-hydro with channel framework to view shoaling areas in CE Dredge
- Use NCDB to ID potential placement areas
- ID potential ecosystem restoration or flood control sites
- Use optimization tools (e.g.: D2M2) for analysis



Quantification of Benefits

Ecologists/Economists/Engineers

Examples of “Ecosystem Goods and Services” OR “Function” from sediments

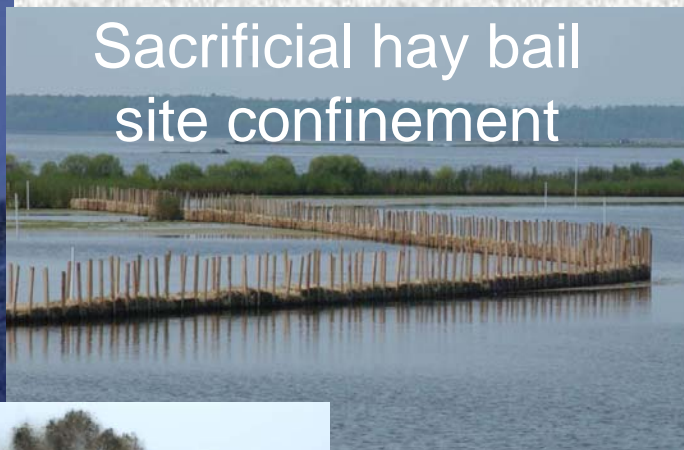
- **Ecosystem Sustainability**
- **Water Supply & Regulation**
- **Natural Hazard Mitigation, Property & Infrastructure Protection, Human Safety**
- **Navigation**
- **Recreation**
- **Cultural, Spiritual & Educational Support**
- **Aesthetics**
- **Food Provisioning**
- **Raw Goods & Materials Provisioning**
- **Water Purification & Waste Treatment**
- **Climate Regulation, Carbon Sequestration**
- **Human Health**



Designing BU Placements into the Natural Setting: Blackwater National Wildlife Refuge, MD



Sacrificial hay bail
site confinement



Naturally-vegetated
sediment stabilization
and BU site functionality



Site filling





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Baltimore
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Example Beneficial Use Projects Descriptions and Lessons Learned

Beneficial Uses of Dredged Material

INSERT CASE STUDY

Insert short summary of the project including beneficial use, problem description, project purpose, site description, and project features.

Insert before beneficial use implementation picture below

Insert before beneficial use implementation picture below

Beneficial Use(s): Select a beneficial use category from the following drop down box: Shoreline Stabilization and Erosion Protection. Description of each category is shown in the appendix. If mixed is selected, please specify.

Dredged Material Management Alternative(s): Select a dredged material management alternative from the following drop down box: Placement Nearshore for Shoreline Protection or Beach Nourishment. A definition of each alternative is shown in the appendix.

District: Insert lead district.

Project Location: Include description of project location. The city, county, and state must be included. Insert project coordinates.

Volume of Dredged Material: Include volume of dredged material used for beneficial purpose.

Project and Site Description: Insert name of the site, site conditions, and benefits gained by using dredged sediment. Site description can include size of footprint, site conditions (e.g.: erosion rates, wind/wave energy, open ocean, currents, tides, etc.), and benefits gained using dredged sediment (e.g.: type of ecological habitat created or importance of beach nourishment).

Other Programs or Agencies: Insert other programs, such as ecosystem restoration or flood control, and/or other agencies involved in the project.

Design Factors: Describe noteworthy design processes and/or factors (e.g. slope requirements, energy regime, bench-scale studies, pilot-scale studies, modeling, etc.).

Sediment Type: Description of dredged material used for beneficial use, such as particle size distribution or qualitative description (e.g.: sand, silt, clay, mixture).



Placement Method: Description of technology used to place the dredged material (hydraulic pipeline, barge or hopper, thin layer placement, trucks or other mechanical equipment).

Project Timeline: Insert Project start and end dates, or approximate material placement days.

Costs: Insert approximate project cost by cubic yard or weekly construction costs for placement.

Monitoring: State whether or not the monitoring occurred and briefly describe.

USACE-ERDC
Dredging Operations and Environmental Research Program

Beneficial Uses of Dredged Material Factsheet

SUSQUEHANNA RIVER: BATTERY ISLAND RESTORATION

Beneficial Use(s): Habitat Restoration and Development.

Dredged Material Management Alternative(s): Unconfined In-water Placement in River, Lake, or Estuary. (Island Placement was also used in this project).

Volume of Dredged Material: 200,000 cubic yards

District: Baltimore District

Program Mission(s) and Other Agencies or Stakeholders: Navigation and ecosystem restoration, habitat development. Other agencies: US Fish and Wildlife Service, US National Park Service, the City of Havre de Grace.

Sediment Type: 97% medium/fine grain sand, remaining 3% fine material

Project Timeline: Dredging and placement began 19 February 2013 and ended 18 March 2013. Planting began in April 2013 and will be completed in the fall of 2013.

Project Location: Material was dredged from the Susquehanna federal channel at the mouth of the Susquehanna River as it empties into the Chesapeake Bay next to the city of Havre De Grace in Harford County, MD. The project provides for a channel 200 feet wide and 15 feet deep from that depth in Chesapeake Bay to Havre de Grace. The project length is 4 miles.

Placement Method: Material was placed unconfined hydraulically with a diffuser. Dozers were on Battery Island to contour material to the correct specifications laid out in the contract.

Project and Site Description: Battery Island is located in a high energy system in the Susquehanna Flats where the Susquehanna River meets the Chesapeake Bay. Battery Island, part of the USFWS Susquehanna Wildlife Refuge, was chosen as a placement site due to the fact that the island had all but eroded away. The island would be restored to approximately 11 acres in size to support black duck and tern habitat. Intertidal marsh, transitional, and upland areas were created to support a variety of habitats and plant species. Plant species included: *Peltandra virginica*, *Scirpus pungens*, *Schoenoplectus tabernaemontani*, and *Gaillardia occidentalis* in the tidal marsh area; *Panicum virgatum*, *Schizachyrium scoparium*, *Solidago sempervirens*, and *Baccharis halimifolia* in the marsh transition area; *Morella pensylvanica*, *Campsis radicans*, and *Rhus romatica* in the upland area; and *Spartina alterniflora* on the outside slope.

The tidal range in this area is 2.1 feet. To compensate for the tidal changes the island was created to a height of 7 feet above mean low water (MLLW). The island was restored to a width of 125 feet across with a 3:1 slope on the interior and a natural repose on the outside. The sandy material that was used allows for unconfined placement and easy contouring to the proper specifications.

Costs: \$3.12 per cubic yard. Total original contract amount: \$1,944,945.20

Monitoring: No monitoring was completed by USACE since it was not included in the price of the contract. USFWS patrolled Battery Island once dredging and plantings were completed to keep the public off throughout the summer of 2013 while plantings were in the early stages to ensure proper growth.

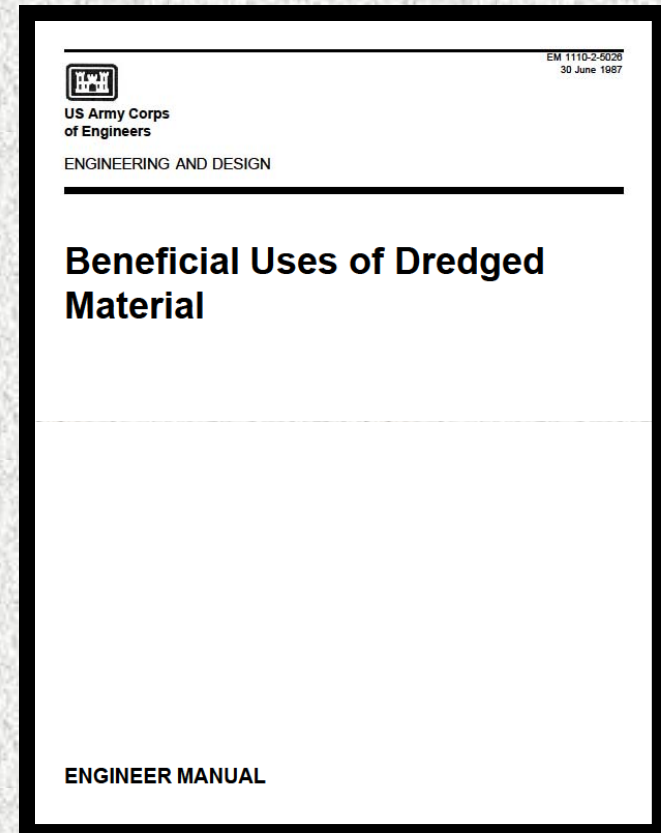
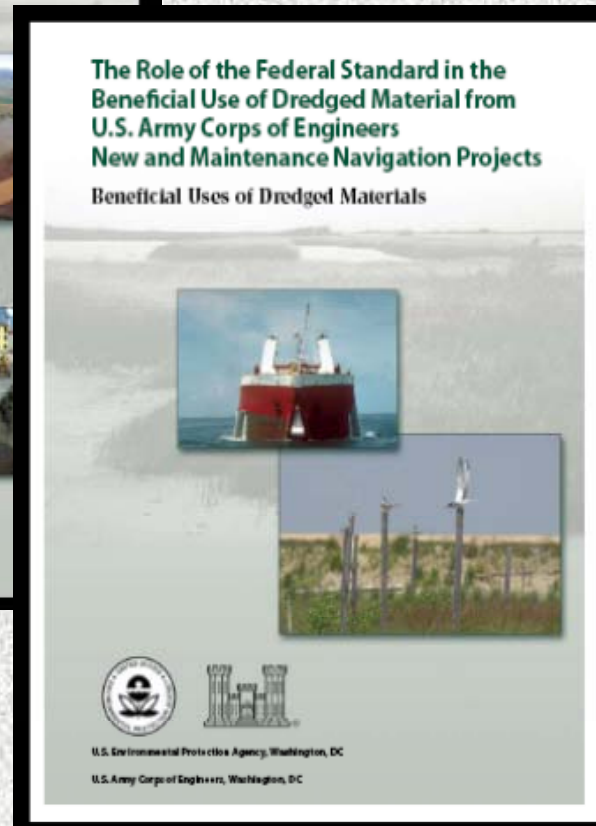
USACE-ERDC
Dredging Operations and Environmental Research Program



Guidance on Planning/Funding/Authorities



2007



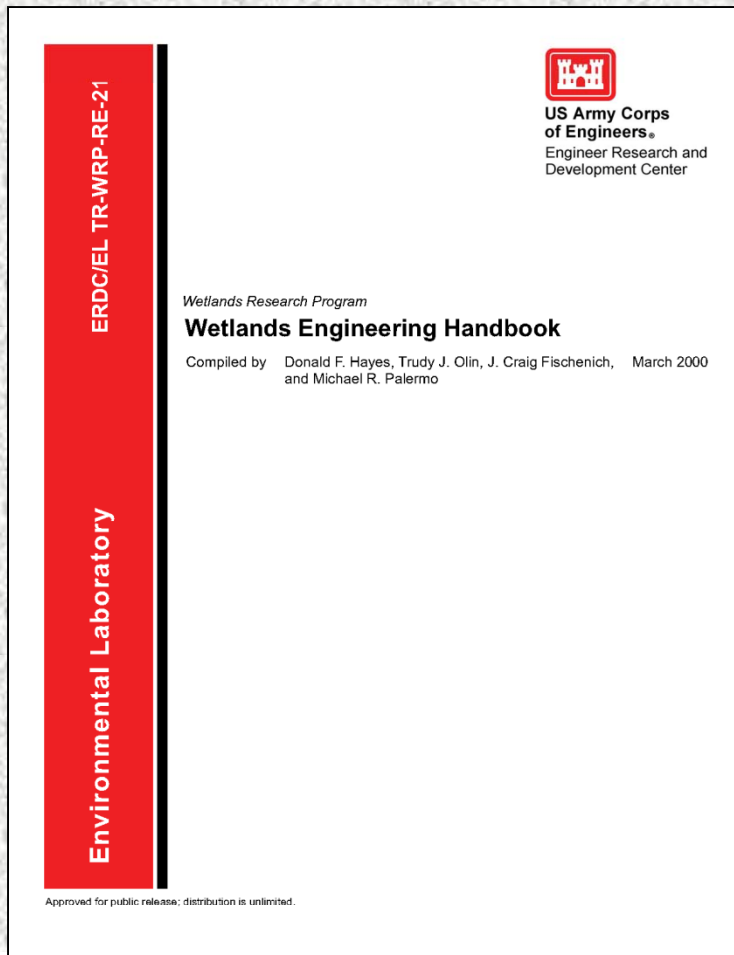
http://140.194.76.129/publications/engine-manuals/EM_1110-2-5026/EM_1110-2-5026.pdf



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Additional Guidance



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BU Websites

- <http://el.erdcl.usace.army.mil/dots/budm/budm.cfm>
- http://140.194.76.129/publications/engine-manuals/EM_1110-2-5026/EM_1110-2-5026.pdf
- <http://el.erdcl.usace.army.mil/dots/budm/budm.cfm>
- <http://el.erdcl.usace.army.mil/odd/>
- <http://www.navigationdatacenter.us/dredge/dredge.htm>
- <http://el.erdcl.usace.army.mil/dots/>



Discussion



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