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# ***Beneficial Uses of Dredged Material***

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# Dredged Material

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- **What is it?**
  - Toxic sludge?
  - Toxic waste?
  - Spoil?
  - Solid waste?
  - **Displaced soil & sediment?**

*Sources of contamination*



# Beneficial Use

- What is it?
- The use of sediment removed in dredging operations for habitat or land development or as raw material in construction and soil material products.

## DREDGED SPOIL

(A waste, something bad)



## DREDGED SOIL

(A productive resource)



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# **Beneficial Uses of Dredged Material**

***Oldies, New and Innovative***



# Beach Nourishment



Dredged Material Assessment and Management Seminar  
15-17 April 2008, Sacramento, CA



# Construction Fill

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**Dike 10B,  
Cleveland**



# Agriculture



# Recreation





# Wetland Habitat and Shoreline Protection

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# Island Habitat

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# Mineland Reclamation

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# Dredged Material Recycling



Dredged Material Assessment and Management Seminar  
15-17 April 2008, Sacramento, CA



# Construction Materials

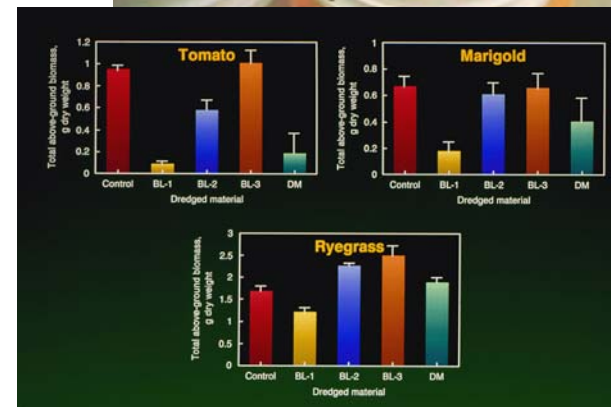
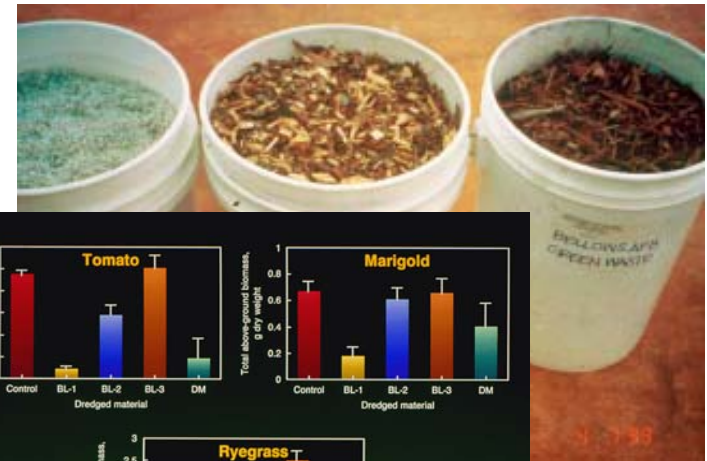
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# Blending for Success



- **Cellulose**
  - Yard wastes, paper wastes
- **Biosolids**
  - Sewage sludge, animal wastes
- **Industrial by-products**
  - Red mud, fly ash



# Dredged Material to Landscapes



# Grand Haven, MI



bottomsUp  
topsoil  
All Dredged Up and Nowhere to Go!  
Call 616-842-1448 for info





# Two Paths for BU

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- **Beneficial use is part of the dredging and placement process**
  - *Regional Sediment Management*
    - *Keeping sediment in the system*
- **Beneficial use is part of the CDF recovery process**
  - *Mining CDFs to reclaim capacity*
  - *Design CDFs for placement & processing*



# What is the Need/Problem?

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- **Regional sediment management**
  - Requires more beneficial use than disposal
  - Cost-sharing for increased expense is an issue
  - Concerns with water quality/ecological impacts
- **Need to reclaim CDF capacity – issues with contaminants**
  - Sand/gravel – generally not a contaminant concern - **resource**
    - Low demand in dredging area
    - Logistics may be cost prohibitive - **partnering**
  - Fine grained – generally a contaminant concern - **spoil**
    - Poor engineering properties - Agronomic value?
    - Uncertainty dealing with contaminated material



# Formula for Success

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- A four-part formula is usually required for success
  - Technical feasibility
  - Legal / regulatory concerns
  - Public support
  - Economics

**Testing**

**DO IT!**



# Bad Press, Big Mess

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## Water board may consider port fine

By Hank Shaw - Record Staff Writer

Published Saturday, January 29, 2005

**After months of delays and excuses from the Port over its sale of toxic dredge spoils to state agencies and area construction firms, the patience of the Central Valley Regional Water Quality Control Board has worn thin. Dredge spoils contaminated with toxic metals were sold to dozens and possibly hundreds of sites across Northern California over the past 14 months.**



# EPA/CE Guidance

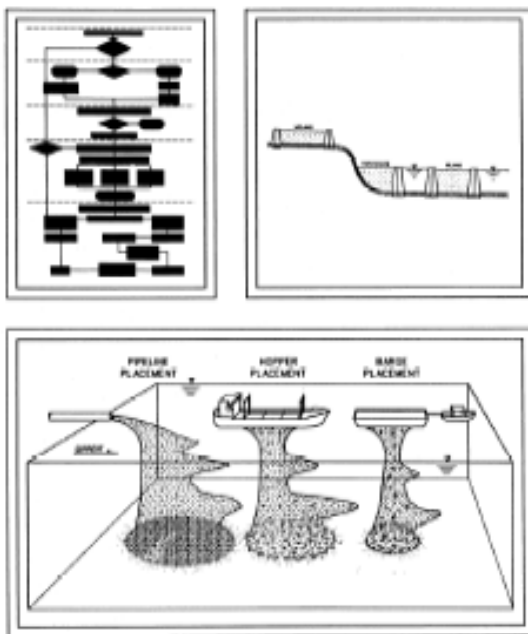


United States  
Environmental Protection  
Agency

Department of the Army  
U.S. Army Corps of Engineers

EP4042-B-02-008  
Revised May 2004

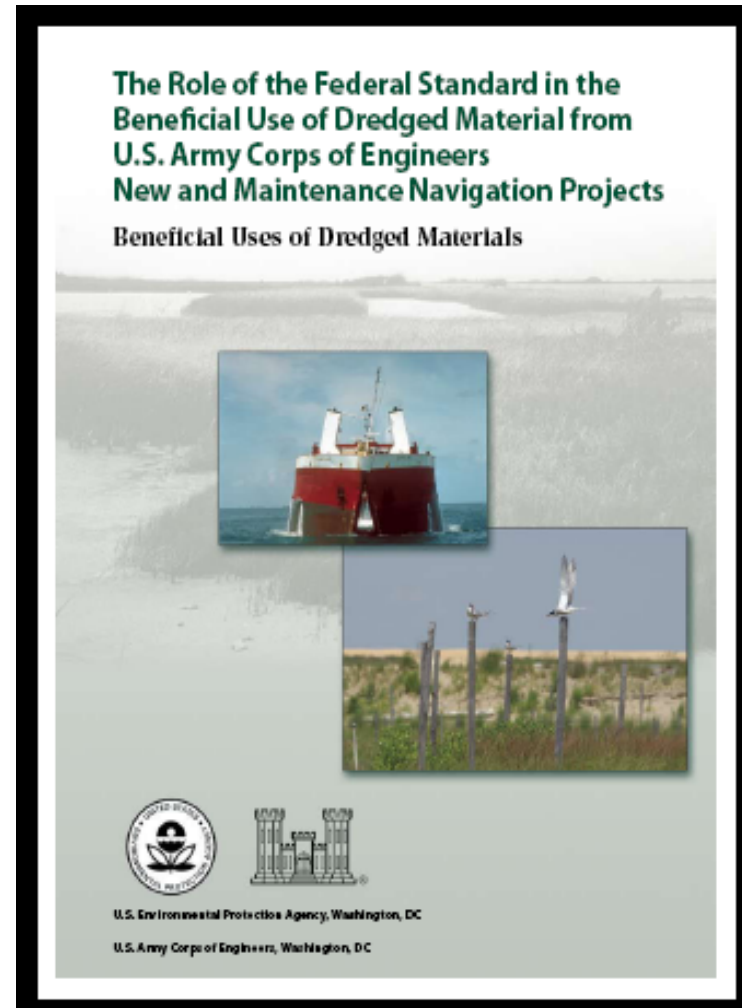
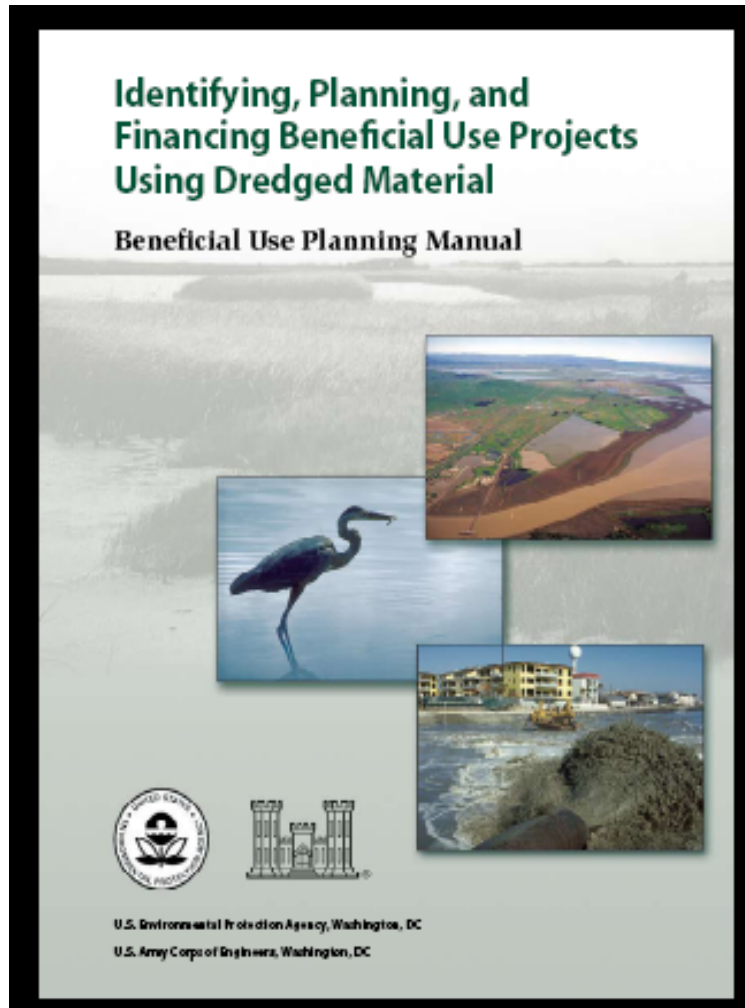
## Evaluating Environmental Effects of Dredged Material Management Alternatives— A Technical Framework



- BU opportunities
- Physical suitability
- Logistics & Mgt needs
- Environmental suitability – no testing methods specified
  - State/Fed screening criteria
  - Physical & biological tests



# New USEPA/USACE Guidance



# Regional Guidance

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September, 2004  
Second Edition

With references to:  
Upland Beneficial Use of Dredged Material Testing and Evaluation  
Annotated Bibliography



# State Regulations

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STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



RULES AND REGULATIONS FOR DREDGING AND THE  
MANAGEMENT OF DREDGED MATERIAL

February 2003

Regulation # DEM-OWR-DR-02-03





# Comparison of State Criteria for Beneficial Use of Dredged Material Industrial Use

Contaminant	IL <sup>a</sup>	IN <sup>b</sup>	MI	MN <sup>c</sup>	NY <sup>d</sup>	OH <sup>e</sup>	PA	WI <sup>f</sup>
Arsenic	0.05*	20		25	14.5	41		0.042
Lead	0.0075*	230		700	150	300		50
Zinc	7,500	10000		70000	2,480	2,800		4,700
PCBs	1	5.3		8	10	--		--
Benzo(a)pyrene	0.8	1.5		4	0.061	--		0.0088
Benzene	0.03	0.67		4	0.06	--		--
Criteria Source	Cleanup – industrial	Cleanup – Industrial		Cleanup – Industrial	Reuse – Specific	Sludge rules		Reuse – general

All units are in milligrams per kilogram (mg/Kg) of material except \* in milligrams per liter (mg/L) of leachate.

a: Illinois values are based on the most restrictive exposure route for that contaminant from the TACO Tier 1 industrial tables.<sup>73</sup> For ionizable contaminants, a soil pH of 7.0 is assumed for the groundwater ingestion route.

b: Indiana values are based on the RISC tables for an industrial soil.<sup>74</sup>

c: Minnesota criteria are based on SRV Tier 2 chronic industrial standards.<sup>96</sup>

d: New York metal criteria are based on Suggested Metals Limits for General Reuse Options,<sup>97</sup> category A; surficial use of contaminated material prohibited. Organic criteria based on DER TAGM 4046.<sup>98</sup>

e: Ohio values are based on monthly average limits contained in Ohio's sewage sludge rules.<sup>22</sup> There are additional limits for a single application and a total lifetime loading limit.

f: Wisconsin criteria are based on NR 538, Appendix 1, Table 1B. These criteria qualify the material as Category 1, allowing its application in nearly all beneficial uses. Less restrictive criteria may be applicable following evaluation by the WDNR.



# Comparison of State Criteria for Beneficial Use of Dredged Material Compost or Topsoil, Unrestricted Use

Contaminant	IL <sup>a</sup>	IN <sup>b</sup>	MI <sup>c</sup>	MN <sup>d</sup>	NY <sup>e</sup>	OH <sup>f</sup>	PA	WI <sup>g</sup>
Arsenic	0.05*	3.9	7.6	10	7.5	41		0.042
Lead	0.0075*	81	400	400	Background	300		50
Zinc	7,500	10000	65	1,242**	Background	2,800		4,700
PCBs	1	1.8	1.2	1.2	1.0	--		--
Benzo(a)pyrene	0.09	0.5	2	1.0**	0.061	--		0.0088
Benzene	0.03	0.034	0.1	0.034**	0.06	--		--
Criteria Source	Cleanup – Residential	Cleanup – Residential	Use-specific regulation	Cleanup – Residential	Specific reuse and general cleanup	Sludge rules		Reuse – General

All units are in milligrams per kilogram (mg/Kg) of material except \* in milligrams per liter (mg/L) of leachate.

a: Illinois values are based on the most restrictive exposure route for that contaminant from the TACO Tier 1 residential tables.<sup>73</sup> For ionizable contaminants, a soil pH of 7.0 is assumed for the groundwater ingestion route.

b: Indiana values are based on the RISC tables for a residential soil.<sup>74</sup>

c: Michigan compost criteria are based on draft rules<sup>183</sup> for Part 115.<sup>13</sup>

d: Minnesota criteria are based on SRV Tier 2 chronic residential standards,<sup>96</sup> except for \*\*, which are from SLV Tier 1 standards<sup>194</sup>.

e: New York criteria are based on DER TAGM.<sup>98</sup> Background can be a site or regional background, as appropriate. Compost values in 6 NYCRR Part 360-5<sup>16</sup> may apply if the dredged material is used as a limited component.

f: Ohio values are based on monthly average limits contained in Ohio's sewage sludge rules<sup>22</sup>. There are additional limits for a single application and a total lifetime loading limit.

g: Wisconsin criteria are based on NR 538, Appendix 1, Table 1B. These criteria qualify the material as Category 1, allowing its application in nearly all beneficial uses.



# New Guidance for Suitability

ERDC/EL TR-07-27



US Army Corps  
of Engineers®  
Engineer Research and  
Development Center

*Dredging Operations and Environmental Research Program*

## **Summary of Available Guidance and Best Practices for Determining Suitability of Dredged Material for Beneficial Uses**

Dennia L. Brandon and Richard A. Price

November 2007

**Summary of available evaluation and implementation guidance**



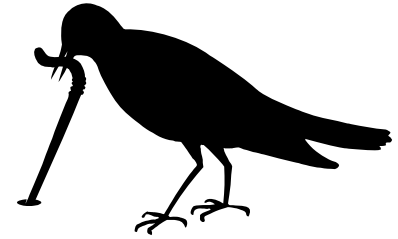
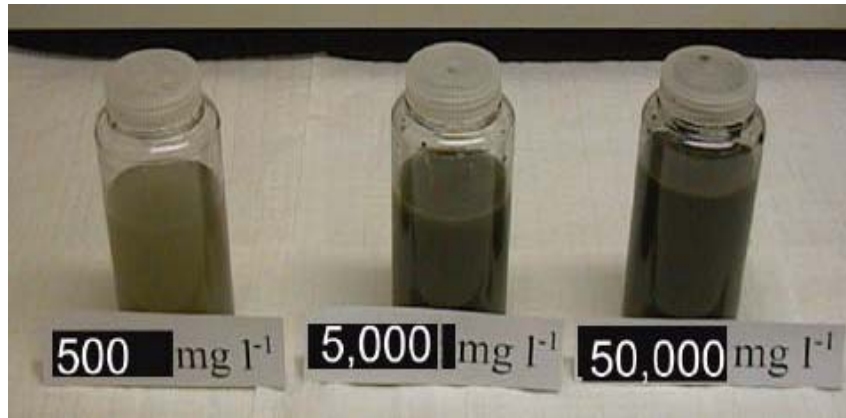
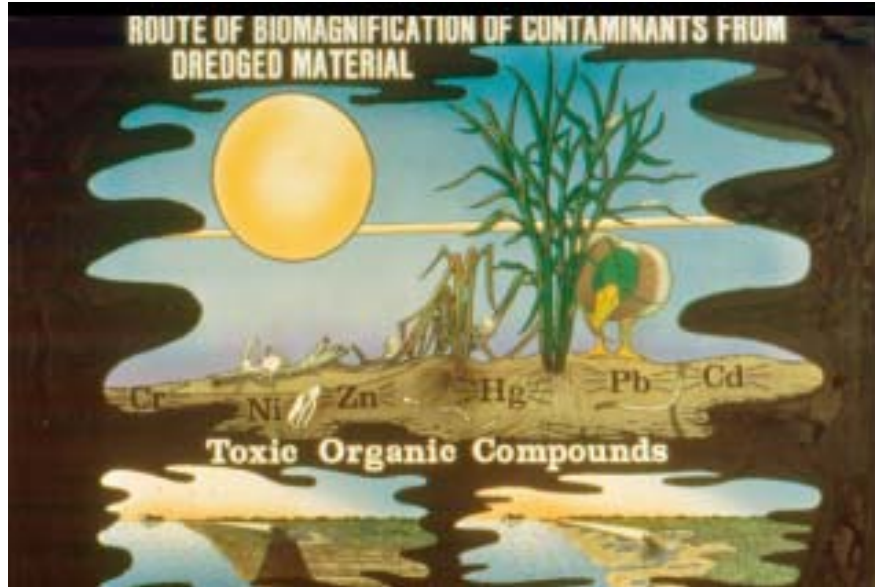
# Physical Suitability

Table 2. Suitability of dredged material for various BUs.

Beneficial Use Options	Dredged Material Sediment Type				
	Rock	Gravel & Sand	Consolidated Clay	Silty/Soft Clay	Mixture
<b>Engineered Uses</b>					
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
<b>Agricultural/Product Uses</b>					
Construction materials	X	X	X	X	X
Aquaculture			X	X	X
Topsoil				X	X
<b>Environmental Enhancements</b>					
Wildlife habitats	X	X	X	X	X
Fisheries improvement	X	X	X	X	X
Wetland restoration			X	X	X
Source: <a href="http://el.erdc.usace.army.mil/dots/budm/types.html#mixture">http://el.erdc.usace.army.mil/dots/budm/types.html#mixture</a> .					



# Environmental Suitability



# Contaminated Sediment?

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- ***Define Contaminated***
  - Rendered impure
  - Rendered harmful (unsuitable)
- ***Define Clean***
  - Zero (undetectable) metals, organics, etc
  - Causes no adverse effects (suitable)

**"WARNING: Keep out of reach of children under 6 years of age. If you accidentally swallow more than used for brushing, seek professional help or contact a poison control center immediately."**  
- FDA Mandated Warning on Fluoride Toothpaste Labels

***Do the benefits outweigh the risks?***



# Testing Guidance for Environmental Suitability

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- Evaluation of Dredged Material Proposed for Ocean Disposal (Ocean Testing Manual)
  - **Marine Protection, Research and Sanctuaries Act (1972)**
  - **Pass/fail testing for suitability – Generally applies to BU**
- Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual (Inland Testing Manual)
  - **Section 404 CWA (1977)**
  - **Pass/fail testing for suitability – Generally applies to BU**
- Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities – Testing Manual (Upland Testing Manual)
  - **NEPA and CWA**
- *Future Guidance – Beneficial Uses Testing Manual (BUTM)*



# Reclaim CDF Capacity - Beneficial Use

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- **Material assumed not suitable for open water disposal**
  - Assumed to be contaminated
- **Material from mixed dredging projects**
  - Sampling and characterization – segregate, blend?
- **Testing and evaluation procedures are not well established**
  - State regulatory requirements vary widely
- **Emerging Issues – Noxious plants**





# Addressing Contaminant Status

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- **Suitability - State regulatory guidance for reuse.**
  - State criteria, cleanup levels, Eco-SSLs, etc.
- **Exposure effects - Contaminant pathways.**
  - Effects on water quality (solubility) - WQS
  - Bioavailability to plants and animals
  - Human contact
- **Treatment Options - Material may be treated to meet regulatory compliance.**
  - Phytoremediation, bioremediation, chemoremediation, etc.
- **Adverse impacts - Restricted uses.**
  - Exposure/effects response, risk assessment.



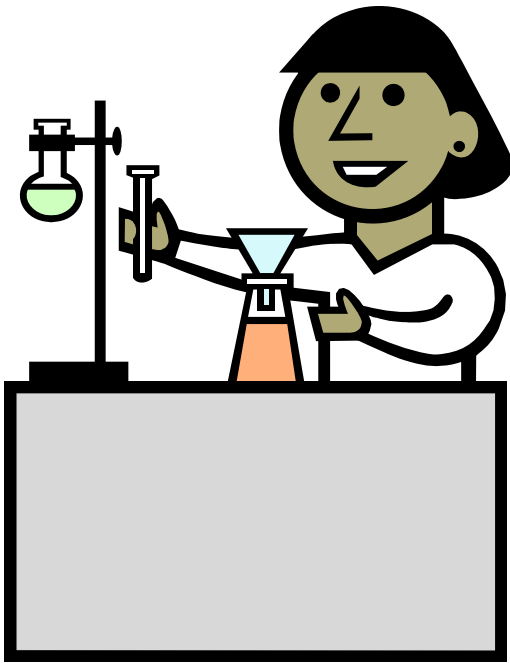
# Challenges

- Negative press and perceptions
- Clear guidance for implementation
- Finding willing stakeholders
- Long-term sustainability
- Liability, regulations



# The Bottom Line

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# Beneficial Uses of Dredged Material

U.S. Army Corps of Engineers | Engineer Research and Development Center | U.S. Environmental Protection Agency



## Introduction



## Engineered Uses



## Environmental Enhancement



## Agricultural/ Product Uses



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 material 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

# Web Resources

- **Dredging Operations Technical Support**  
<http://el.erdc.usace.army.mil/dots/dots.html>
- **Beneficial Uses of Dredged Material**  
<http://el.erdc.usace.army.mil/dots/budm/budm.cfm>
- **Dredging Operations and Environmental Research Program**  
<http://el.erdc.usace.army.mil/dots/doer/doer.html>