



GREAT
LAKES
DREDGING
TEAM

2018 Fall Webinar Meeting

December 12, 2018

Implementation of Beneficial Use of Dredged Material Projects in the Great Lakes

aka “Engineering With Nature®”

Lessons Learned, Remaining Challenges, and Further Opportunities

Burton Suedel

US Army Corps of Engineers
ERDC

Dan Breneman

Minnesota Pollution Control Agency

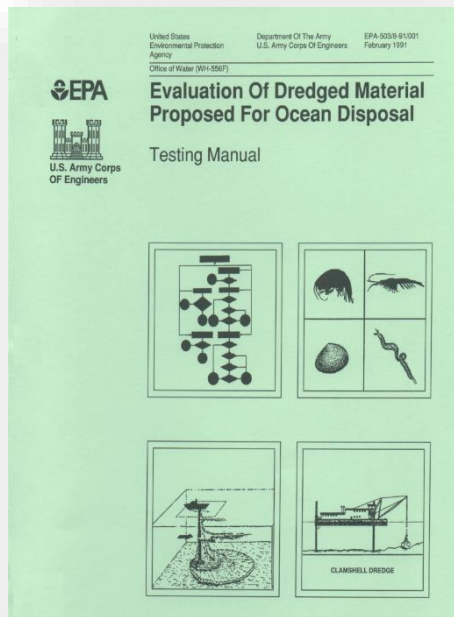
Amanda Meyer

US Army Corps of Engineers
Detroit District

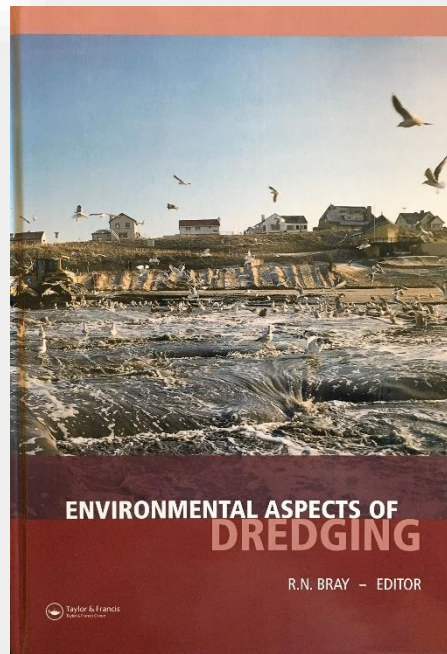
Scudder Mackey

Ohio Department Natural Resources

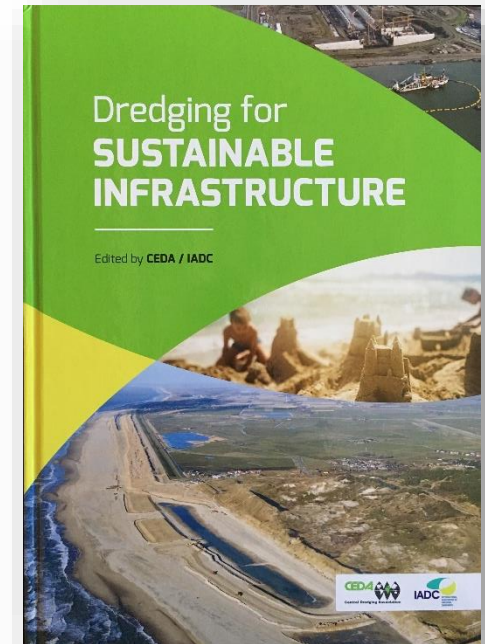
Progressive Evolution



1977/1991



2008



2018



SUSTAINABLE DEVELOPMENT GOALS

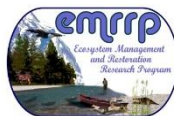
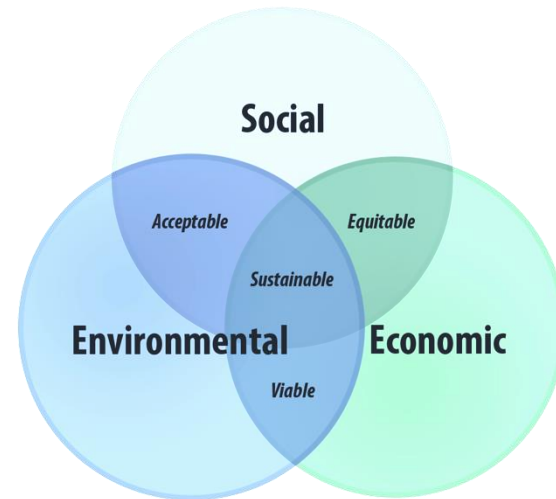


Engineering With Nature®

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

Key Elements:

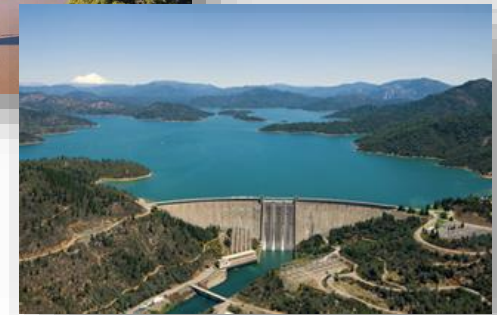
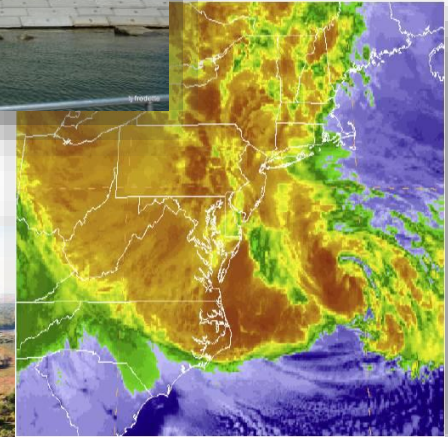
- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



www.engineeringwithnature.org

EWN Across USACE Mission Space

- Navigation
 - Strategic placement of dredged material supporting habitat development
 - Habitat integrated into structures
 - Enhanced Natural Recovery
- Flood Risk Management
 - Natural and Nature-Based Features to support coastal resilience
 - Levee setbacks
- Ecosystem Restoration
 - Ecosystem services supporting engineering function
 - “Natural” development of designed features
- Water Operations
 - Shoreline stabilization using native plants
 - Environmental flows and connectivity



Natural and Nature-Based Features

NNBF are landscape features that are developed to provide engineering functions relevant to flood risk management while producing additional economic, environmental and social benefits.



Natural and Nature-Based Infrastructure at a Glance

GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:
STORM INTENSITY, TRACK, AND FORWARD SPEED, AND SURROUNDING LOCAL BATHYMETRY AND TOPOGRAPHY



Dunes and Beaches

Benefits/Processes
Break offshore waves
Attenuate wave energy
Slow inland water transfer

Performance Factors
Berm height and width
Beach Slope
Sediment grain size and supply
Dune height, crest, width
Presence of vegetation



Vegetated Features: Salt Marshes, Wetlands, Submerged Aquatic Vegetation (SAV)

Benefits/Processes
Break offshore waves
Attenuate wave energy
Slow inland water transfer
Increase infiltration

Performance Factors
Marsh, wetland, or SAV elevation and continuity
Vegetation type and density



Oyster and Coral Reefs

Benefits/Processes
Break offshore waves
Attenuate wave energy
Slow inland water transfer

Performance Factors
Reef width, elevation and roughness



Barrier Islands

Benefits/Processes
Wave attenuation and/or dissipation
Sediment stabilization

Performance Factors
Island elevation, length, and width
Land cover
Breach susceptibility
Proximity to mainland shore



Maritime Forests/Shrub Communities

Benefits/Processes
Wave attenuation and/or dissipation
Shoreline erosion stabilization
Soil retention

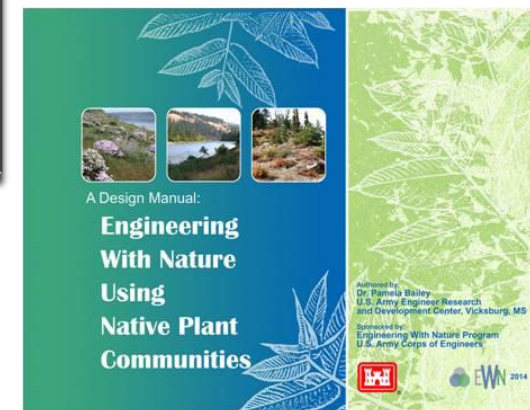
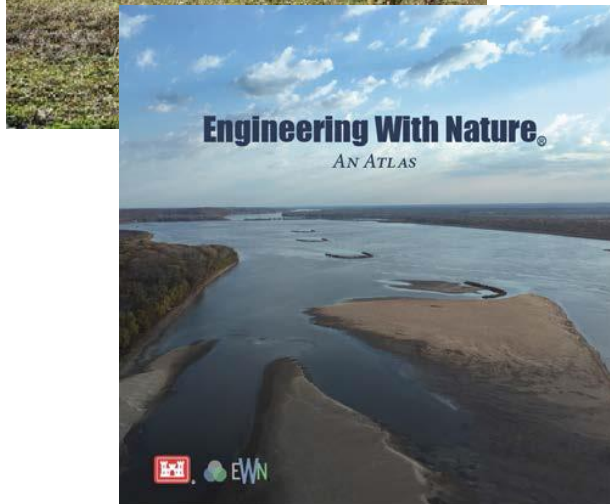
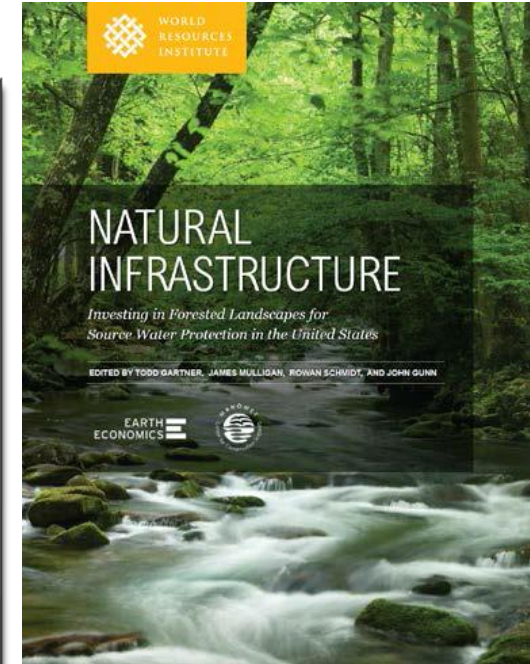
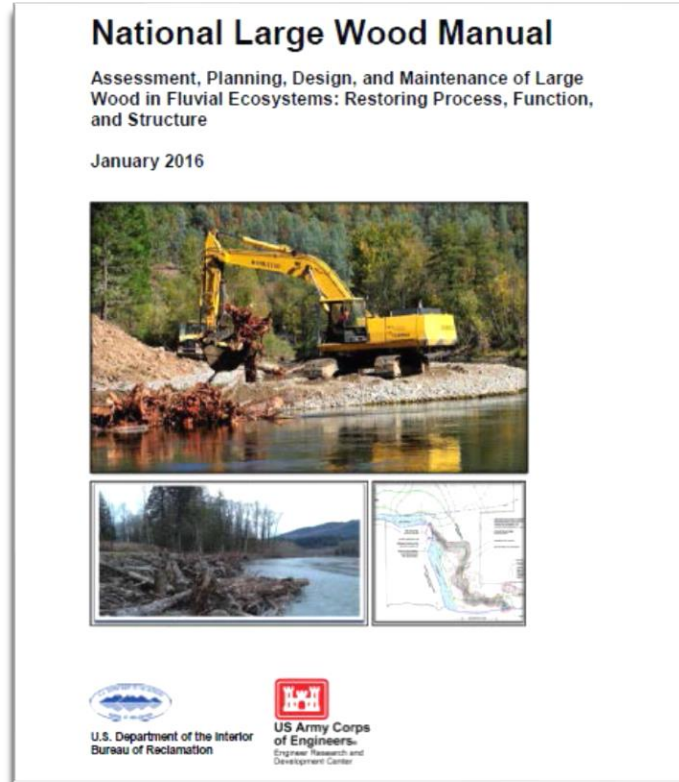
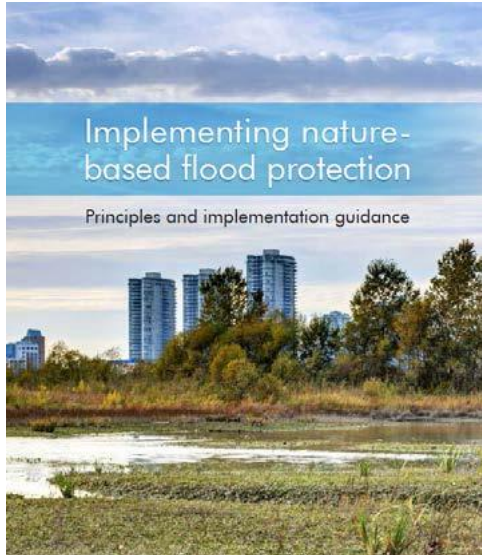
Performance Factors
Vegetation height and density
Forest dimension
Sediment composition
Platform elevation

International Guidelines for Use of Natural and Nature-Based Features for Sustainable Systems

- **Publish coastal NNBF technical guidelines by 2020:**
 - ▶ **Multi-author: government, academia, NGOs, engineering firms, construction companies, etc.**
 - ▶ **Addressing the full project life cycle: planning, design, engineering, construction, and maintenance**
 - ▶ **Guidelines in 3 Sections**
 - **Overarching topics**
 - **Coastal Applications**
 - **River/Inland Applications**



Role of Guidance and Standards in Innovation



Great Lakes specific documents

<https://greatlakesdredging.net/publications/>

Beneficial Use of Dredged Material in the Great Lakes



March 2013



Guide to Policies and Projects Related to Beneficial Use of Dredged Material in the Great Lakes



Prepared for and by:
GREAT LAKES DREDGING TEAM
July 2016



Cat Island Chain, Green Bay, Wisconsin

Beneficial Use of Dredged Material in the Great Lakes

Examples of Beneficial Use Applications



Cat Island Restoration Project
Green Bay, WI



Lorain Harbor CDF
Lorain, OH



Beneficial Use as a Management Strategy

- Beneficial use of dredged material can help create capacity and extend the life of CDFs by removing suitable material from the site.
- State and local beneficial use programs help identify ways to maximize the use of dredged material as a sustainable resource.
- Dredged material may contain such materials that can be used for beach replenishment, capping, land creation and improvement, habitat creation or restoration, replacement fill, construction fill, and for riprap enhancement.
- Beneficial use includes the use of recently dredged sediments as well as productive reuse of CDFs for habitat creation, public access, and economic development.
- Examples of beneficial use projects include:
 - 21st Ave West, Duluth, MN: Placement of dredged material into four areas within the 21st Ave West embankment to reduce water depths to help promote vegetation growth in support of aquatic habitat.
 - Golf Course Turf Restoration, Duluth, MN: Reclaimed silt from the Duluth-Superior CDF were used for turf restoration at a local golf course in Duluth, MN.
 - Cleveland Lakeland Nature Preserve, Cleveland, OH: After closing a CDF that reached its capacity, the peninsula was converted to a publicly accessible nature preserve and is home to hundreds of species of birds, butterflies, and mammals.
 - Cat Island, Green Bay, WI: A 2.5 mile access barrier was built atop the remaining shoals of the original Chain of the Cat Islands which were eroded away during periods of high water levels to create and protect 1,200 acres of near shore and wetland habitat and 200 acres of inland habitat favored by native species such as double-crested cormorants and American white pelicans.

Why Dredge?

Maintain transportation on the Great Lakes system generates more than 1.6 billion in revenue each year and moves an average of 300 million tons of cargo, making it an important economic driver and job creator for the region. Recreational boating – \$3.5 billion industry – and commercial navigation requires continued maintenance of harbors, ports, marinas, and shipping channels, which can be costly and comes with numerous challenges influenced by water levels and misconceptions about dredging.

Dredged Material Placement

Slightly more than half of the dredged sediment includes enough contamination from past industrial discharge, agricultural runoff, and other activity to require confined disposal, typically in specifically designed "confined disposal facilities" or CDFs.

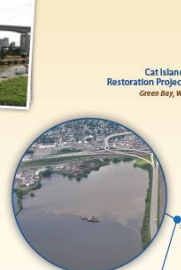
Clean, sandy material is often used for beach replenishment, making dredged material a desirable commodity in sand-starved areas.

Open lake placement is a common practice land often the least expensive for managing clean dredged sediment. This practice does present some political challenges and is not universally accepted as the most desirable placement option in the Great Lakes region.

In many cases, dredged material is clean enough to be managed not as a burden but as a sustainable resource, a commodity with value.

Community Involvement

Community involvement is important in identifying local projects that are able to use dredged material instead of an original source material. Potential projects may include road construction, park improvements, brownfield reclamation, habitat restoration, and more.



21st Avenue West Pilot Project Demonstration
Duluth, MN



Golf Course Turf Restoration
Duluth, MN



Calumet River Brownfield Restoration
Chicago, IL



Times Beach
Buffalo, NY



Brownfield Redevelopment
Cleveland, OH

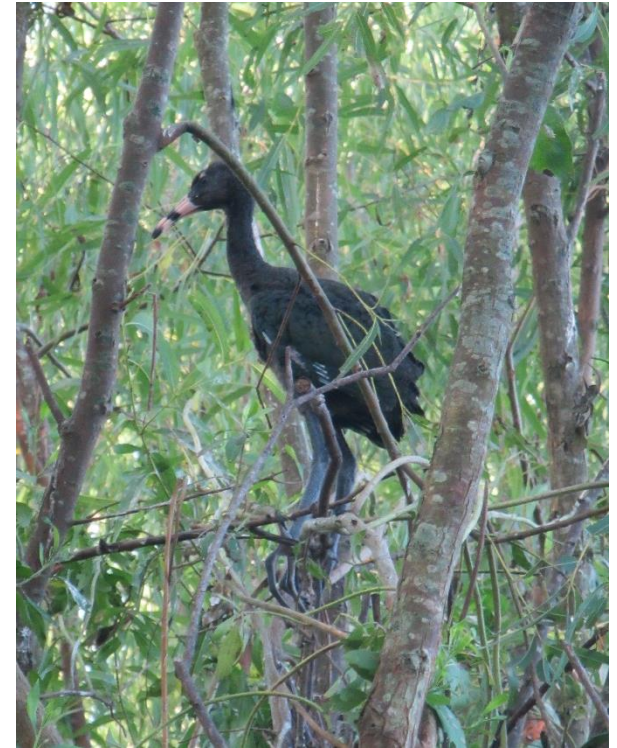


Cleveland Lakeland Nature Preserve (formerly Dike 14)
Cleveland, OH



About the Great Lakes Dredging Team
The Great Lakes Dredging Team (GLDT) serves as a forum for both government and non-government Great Lakes change leaders to discuss the global dredging needs, to coordinate and to support, by means of reports, meetings, and other activities, the development and implementation of dredging projects in U.S. harbors and navigational channels of the Great Lakes, to coordinate and to provide technical assistance, to provide information and to provide technical assistance to other Great Lakes change leaders. The GLDT is a non-profit organization and is not affiliated with any government agency. For more information, please contact the Great Lakes Dredging Team at <http://greatlakesdredging.net>

Examples of Beneficial Uses of Dredged Material and Engineering With Nature® Outside of the Great Lakes Basin



Deer Island, Biloxi, MS

- Biloxi Harbor Navigation Project - 12-ft deep navigation channel
- BU of dredged material to restore marsh, create terrestrial and aquatic habitat, provide a more resilient shoreline for future storm events, create long term disposal capacity
- Hurricanes over time destroyed forests, significantly eroded shoreline, and left elevations too low to support marsh vegetation
- Filled breach in west end of the island
- 1.95 mcy DM to restore southern shoreline using 2.5-mile long wave barrier
- Strategic vegetation plantings (625,000+ plants)
- Construction of a 1 mcy lagoon for BU dredged material from navigation channels
- Providing significant environmental, coastal storm, and recreational benefits



Middle Harbour Port of Oakland, USA

2018 PIANC *Working with Nature* Award Winner



USACE Philadelphia District: EWN in Back Bay New Jersey



Mordecai Island

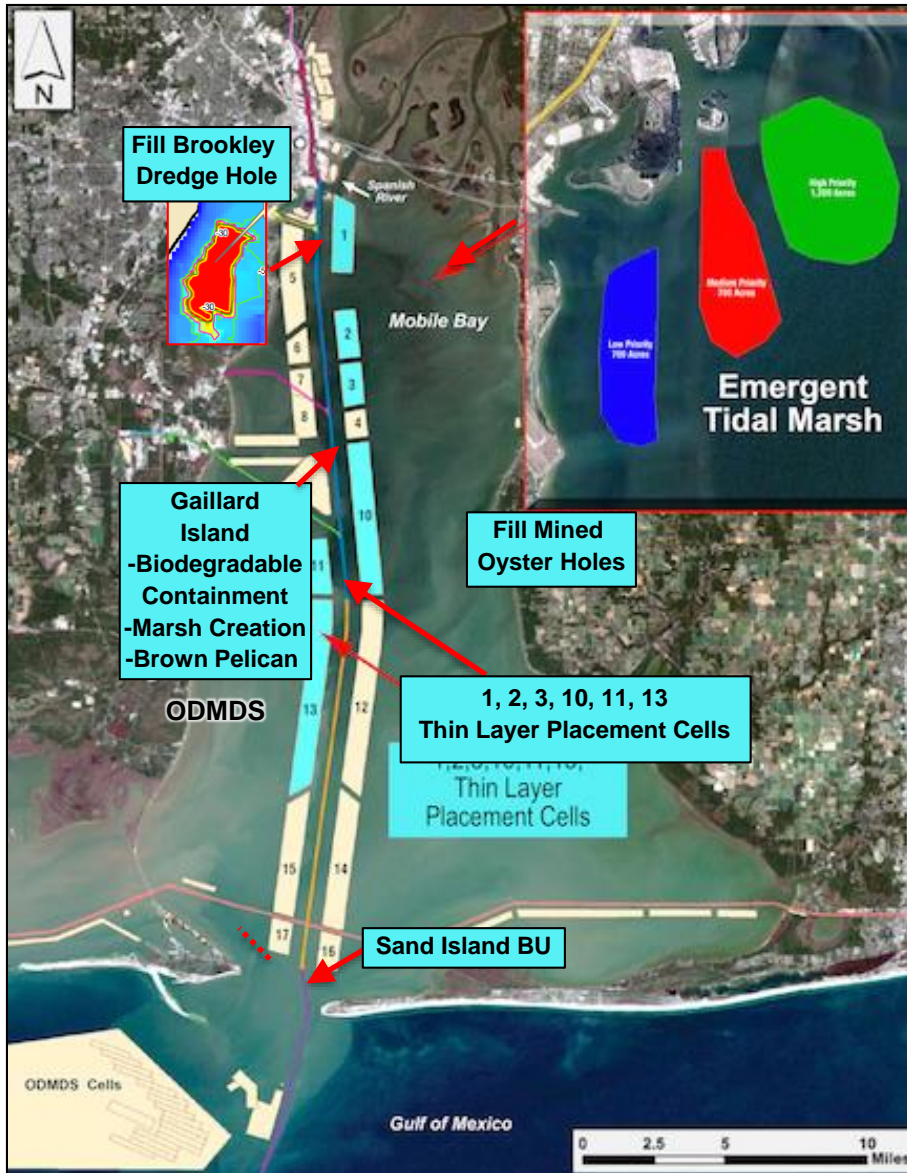


Stone Harbor



Avalon

Mobile Bay: Applying RSM and EWN



WRDA86:

- Place all dredged sediments in ODMDS
- 4.0 mcy/yr, Hopper Dredge, 20-Miles
 - Tripled maintenance costs

2014 decision reversed:

- EWN approaches and techniques
- RSM Interagency Work Group

\$12M annual value

Thin Layer Placement in Mobile Bay

Sand Island Beneficial Use Area (SIBUA)

- Downdrift benefits to Dauphin Island
- Protect lighthouse

Fill dredge holes

- Brookley Hole, Oyster Holes

Gaillard Island

- Biodegradable Containment
- Marsh Creation
- Brown Pelican

Future in-Bay placement:

Thin Layer Placement

- 1000 acre emergent marsh

Engineering With Nature in Rivers



**Upper Mississippi River Training
Structures: Chevrons**



**Horseshoe Bend Island,
Atchafalaya River**

**Atchafalaya River
Federal Navigation Channel**



*Developed Island with Upriver
Feeder Mounds (2010)*

Navigation and Climate Benefits

- **Island formation reduced dredging requirements**
- **Natural channel formed east of the island due to self-scouring**
- **US Coast Guard realigned channel**
 - **channel length reduced**
 - **sharp bends eliminated**
 - **improved navigation safety**
- **Reduction in long-term dredging requirements**
- **Resultant carbon savings and reduced air pollution**

Beneficial Use/EWN Strategies in the Great Lakes

Broaden Benefits

- Create natural and nature based elements via BUDM to promote:
 - Emergent wetland restoration
 - Sub-aquatic habitat restoration
 - Coastal resiliency
 - Recreation
 - Commercial fisheries
- Harvest and reuse DM from upland confined placement areas as a BU strategy



“Skate to where the puck is going to be”.

Wayne Gretzky