SUSTAINABLE SEDIMENT MANAGEMENT AND DREDGING SEMINAR

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Sustainable Sediment Management

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Key Points

- Dredged material has value
- Beneficial Use, Engineering with Nature, Natural and Nature-based Features, and other ecological engineering techniques proven successful
- Any uncertainty about success can be managed
- Many ecosystems are sediment starved
- Together, these provide an opportunity to change the paradigm for dredged material management
- 100% Beneficial Use may actually be possible

Innovation Involves Uncertainty

- Implementing new or modified sediment management practices results in an increased uncertainty of the outcome
- These uncertainties may yield:
  - Results better than historical practices or with benefits beyond those practices
  - Results similar to historical practices or no real benefits beyond those practices
  - Results inferior to historical practices or consequences not associated with those practices

Bottom Line: Uncertainty is a necessary ingredient of progress.

Objective

Propose a paradigm shift from:

…Dredged Material is a liability that must be managed.

to

…Dredged Material is a valued resource that should, except in rare circumstances, be returned to productive uses in the environment.

Changing View of Dredged Materials

- Historically, Dredged Material considered waste, often referred to as *Dredge Spoil*
- That view has changed due to:
  - Development and application of scientifically sound management principles
  - Propagation and application of regulatory frameworks
  - Successful beneficial use projects
- BU success has led to more local pressure:
  - Avoid off-shore and confined disposal
  - Increase beneficial use

Still, a “Consequence” of Navigation

From https://www.epa.gov/ocean-dumping/san-francisco-bay-long-term-management-strategy-dredging (Feb 27, 2019):

> *“Every year, an average of 3-6 million cubic yards of sediments must be dredged to maintain safe navigation in and around San Francisco Bay. How to appropriately manage this large volume of dredged material has been a controversial environmental issue for many years.” (circa 2016)*

Implication – Dredging and dredged material are a necessary inconvenience

Increased Demand for Sediment

- Data show that watershed management has significantly reduced bed load and suspended sediment transport in most systems.
  - As “old” sediment erodes, new sediment is not available to replace it.
  - Many ecosystems find themselves in a sediment starved condition
- Sea level rise is real

Many Recognize the Sediment Deficit Problem

From Nature **562**, 178-180 (2018)
(https://www.nature.com/articles/d41586-018-06955-4)

- *"…the Bay Area faces challenges in constructing a protective phalanx of marshes. Aside from the cost and the outdated regulations that slow work, one of the biggest hurdles is finding enough sediment to do the job. Human development has trapped sediment behind dams and levees, leaving the bay, like many deltas around the world, without enough raw material to keep up with rising seas. Researchers will need to locate large quantities of sediment to fill in sunken former marshes and jump-start the restoration process. And they expect that they will also need to deliver sediment to existing marshes as sea levels rise."*

Dredged Material – the silver bullet?

- *Nature* **562**, 178-180 (2018)
- (https://www.nature.com/articles/d41586-018-06955-4)

- *"…in San Francisco Bay's deepwater ports, which require routine dredging to remove sediment piled up by the tides. Much of that dredged material is carried offshore and deposited in the ocean, says Brenda Goeden, sediment programme manager for the San Francisco Bay Conservation and Development Commission, a state planning and regulatory agency. The practice was begun to protect the bay from dumped sediment, which can harm wildlife if it is contaminated or clouds the water. Eventually, in the 1990s, regulatory agencies recognized the need for sediment in marsh restoration and began issuing permits for the 'beneficial use' of dredged material that was proved to be clean. But last year, about half was still deposited in the ocean, says Goeden."*

Summary

- Many ecosystems need sediment
- Dredged material is a proven resource that can help stabilize and restore ecosystems.

- Question
  - How do we use these to inspire Sustainable Sediment Management options that might reduce future sediment management costs?

Sustainable Sediment Management

- In this context, “Sustainable Sediment Management” means:
  - Returning all suitable dredged materials to the environment in areas where the materials provide value.
  - Characteristics determining suitability vary by location and application
  - Sediments may be modified to meet suitability requirements
- “Sustainable” implies the proposed management approach could – at least theoretically – be used in perpetuity.

sustainable adjective

sus·tain·able | \ sə-ˈstā-nə-bəl \

Definition of *sustainable*

1 : capable of being sustained

2 a : of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged
// sustainable techniques
// sustainable agriculture

b : of or relating to a lifestyle involving the use of sustainable methods
// sustainable society

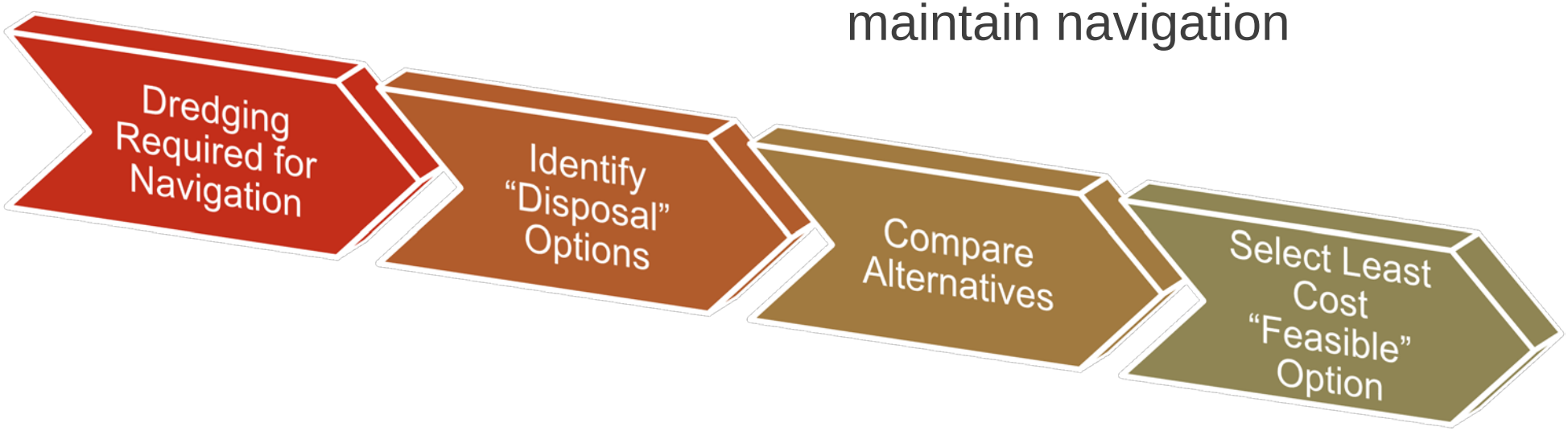
from Merriam-Webster (https://www.merriam-webster.com/dictionary/sustainable)

Dredging Program Goals

- Maintain or improve navigability within time and budget
- Minimize environmental impacts (beyond permit compliance)
- Minimize impact on long-term storage capacity
- Maximize environmental and economic benefits

Current Dredged Material Management Approach

- LTMPs developed in many areas provide placement alternatives to serve for years/decades to come.
- Dredging serves as the catalyst for all further actions.
- Project-specific approach carries implicit volume and timing challenges
- Puts COE in “defensive” position
- Resource agencies try to take advantage of COE’s desire to maintain navigation



Traditional Sediment Placement Options

DIFFICULT TO SUSTAIN/ INCREASINGLY EXPENSIVE

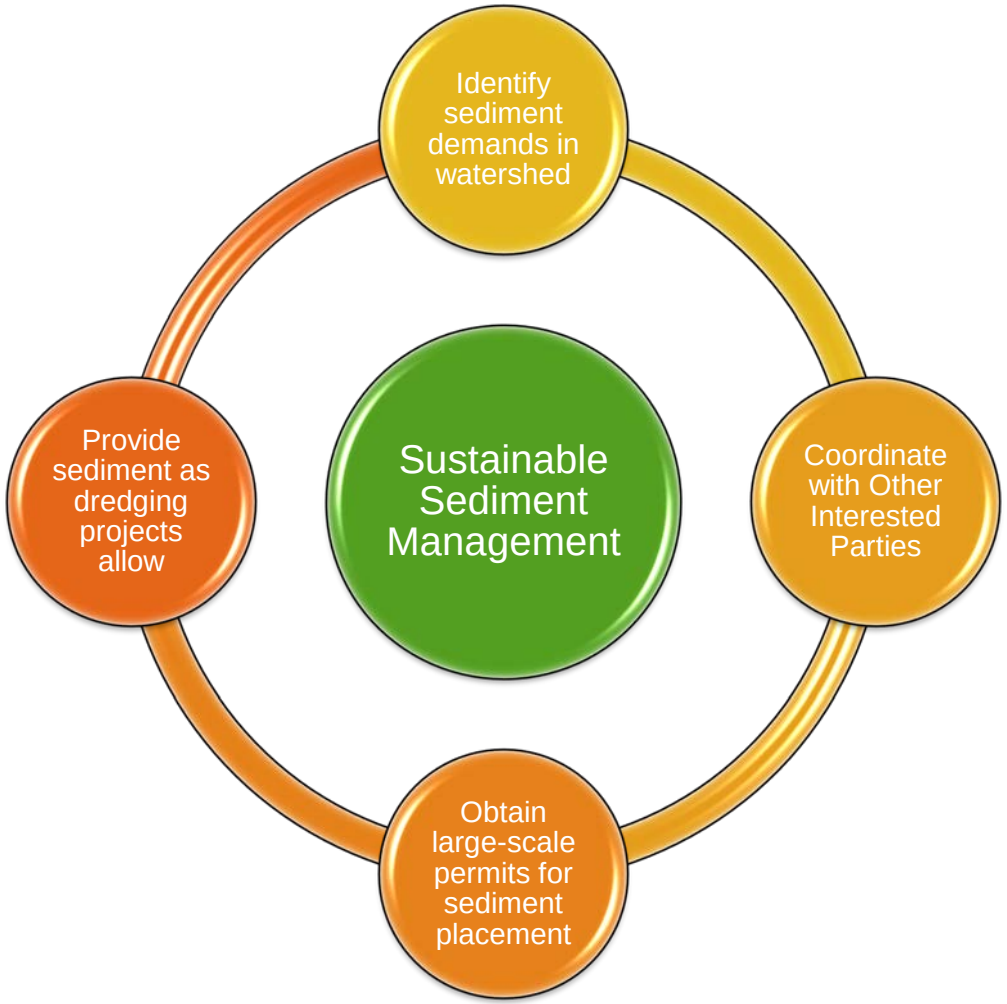
- Open Water
  - Side Casting
  - Aquatic Disposal
- Upland/Nearshore
  - Unconfined placement
  - Confined placement
- Individual Beneficial Use Projects
  - Compatible with project parameters
  - Financially competitive with Federal Standard

Regional Sediment Projects

INCREASED SUSTAINABILITY

- Beach nourishment
- Near-shore placement
- EWN projects
- Nature-based design features
- Thin-layer placement
- Strategic placement
- Marsh nourishment, restoration, establishment
- Off-site uses – fill material, etc.
- Many others

Sustainable Sediment Management Paradigm



That pesky Federal Standard…

- Cost and budgets are the issue, not the Federal Standard

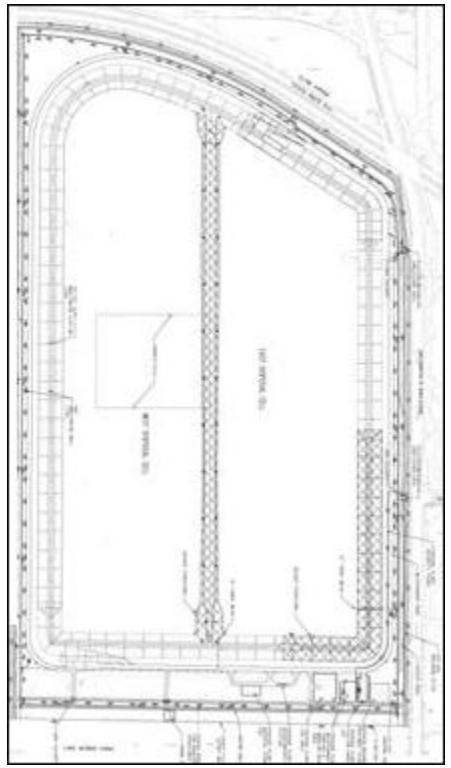
- Sustainable sediment management must be cost effective
  - Savings in project delivery
  - Savings in project management
  - Other funds to cover cost increases

Increasing Sediment Use Opportunities

- Extensive interagency collaboration essential
- Pursue broader, larger permits
  - e.g. Hamilton Wetlands
- Modify dredging schedules to resolve spatial and temporal sediment availability mismatches
- Innovative approaches to meeting Federal Standard requirements
- Make it a priority!

Sustainable Upland Placement Sites?

- Some upland placement will likely always be required
- Can we envision sustainable placement sites that never fill?
- Basic Requirements
  - Multiple cells (not necessarily co-located) to allow “fallow” years
  - Sufficient area for manageable annual placement depths
  - Subsurface drains to accelerate dewatering
  - Firm bottom to support mechanical equipment at all times
  - Reliable market for dewatered sediment
  - Possible combination with dewatered sewage sludge



Sustainable Sediment Management
= 100% Beneficial Use

Challenges

- Extensive groundwork with regional/watershed entities
- Requires comprehensive understanding of ecosystem sediment processes
- Proactive identification of positive sediment use alternatives
- Large-scale permitting
- Some agencies addicted to current model
  - Provides $ for their pet projects

Questions

1. What sediment demands exist in your area?

2. Will changing the paradigm increase the efficiency of the permitting process?

3. Can “unsuitable” sediments be economically modified to have value?