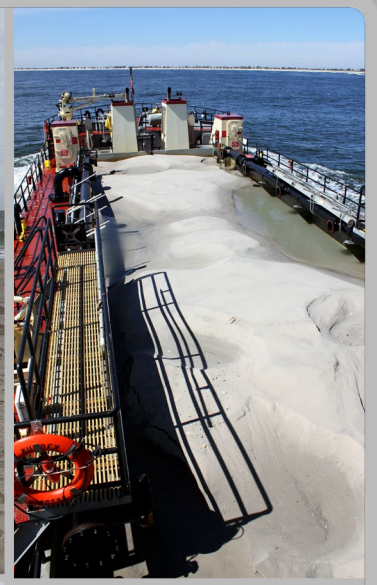
A NATIONAL PERSPECTIVE ON NEARSHORE NOURISHMENT AS A SHORELINE PROTECTION STRATEGY

NEARSHORE NOURISHMENT CHALLENGES

Doug Krafft, Brian McFall, Hande McCaw, Brooke Walker, Scott Spurgeon

COASTAL INLETS RESEARCH PROGRAM

TECHNICAL DISCUSSION



US Army Corps of Engineers®

CHL COASTAL & HYDRAULICS LABORATORY

ERDC ENGINEER RESEARCH & DEVELOPMENT CENTER

Capability and Strategic Impact Statement

The variety of benefits from different nearshore nourishment techniques can meet project specific needs and constraints, so the ability to choose between them is important.

Having information and lessons learned from previous nearshore nourishments can be an important part of gathering support.

Introduction

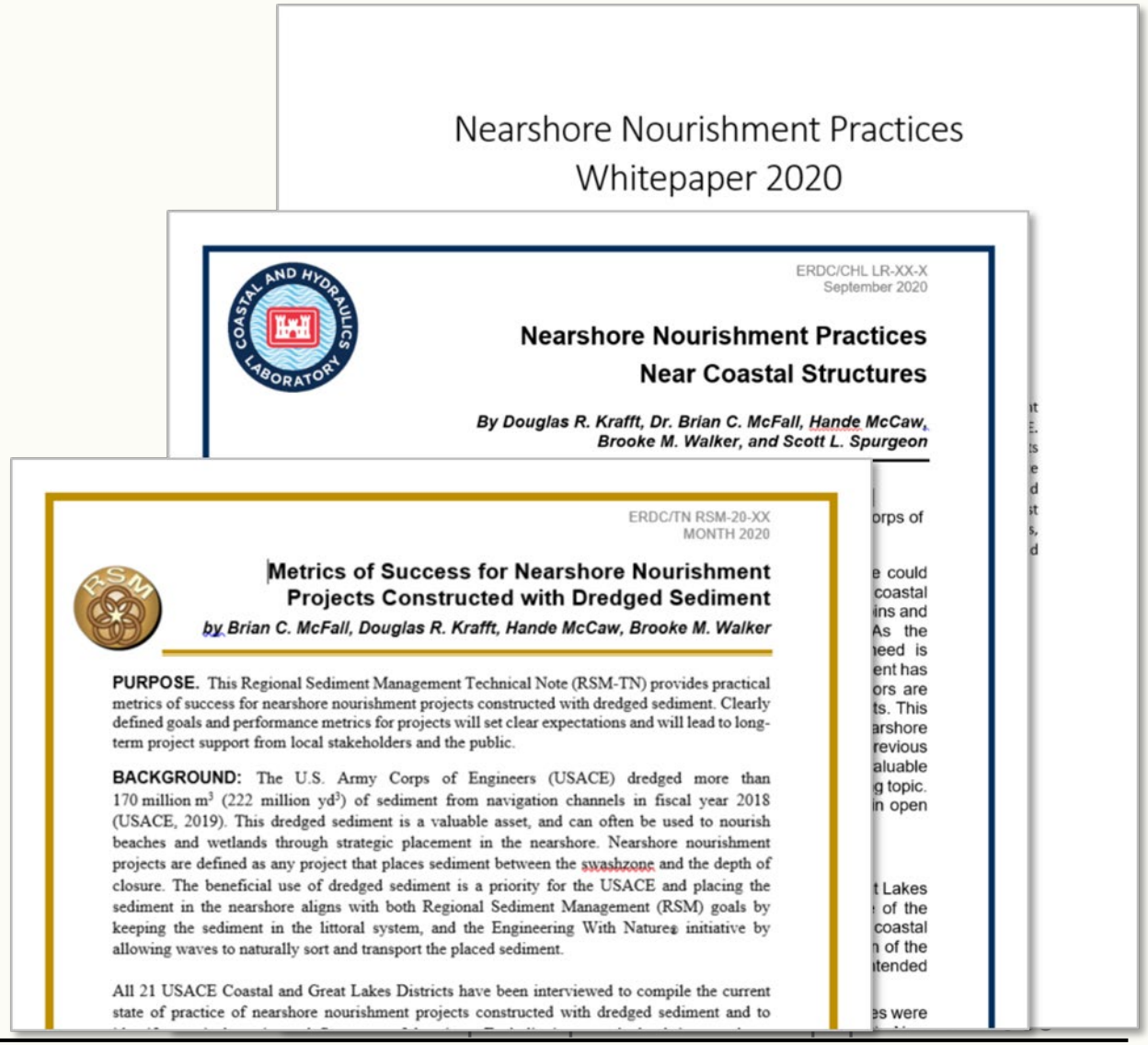
District Nearshore Placement Conversations:

- All 21 coastal and lake USACE Districts were contacted
- The state of nearshore nourishment was discussed with each
- 16 Districts mentioned ongoing nearshore nourishment projects
- Another 2 Districts are planning future projects

https://cirpwiki.info/index.php?curid=2385

Teleconference Series Deliverables

- Tech Note on Metrics for Success in review
- Letter Report on Nearshore Nourishments near Coastal Structures in review
- White Paper Describing each call completed
- Upcoming FY21 Special Report synthesizing information from the White Paper
- Planned FY22 Technical Report and Journal Paper on Best Practices



Intermediate Depth Hopper or Scow Placements

- 12 Districts mentioned intermediate depth hopper or scow
- Can provide cheapest beneficial use option
- Can allow accretionary waves to pass over and dissipate energy from larger erosive storm waves
- Can satisfy local interest in sediment proximity to the subaerial beach as well as cost and operational considerations

https://cirpwiki.info/index.php?curid=2385

Hydraulically Placed Nearshore Berms

- 6 Districts mentioned hydraulically placed nearshore berms
- Can effectively dissipate wave energy and form salient
- Can have large positive impact on adjacent beach
- Material can be pumped to shallow depths

https://cirpwiki.info/index.php?curid=2385

Relatively Deeper Hopper of Scow Placements (Thin)

- 5 Districts mentioned hopper or scow Thin Layer Placement projects
- Limits placement impacts on wave climate and local fauna
- Limits navigation concerns

https://cirpwiki.info/index.php?curid=2385

Relatively Deep Mounded Hopper or Scow Placements

- 4 Districts mentioned relatively deep mounded hopper or scow placements that are dispersive
- Can be easier to construct
- Can be easier to document sediment movement
- May result in faster dispersal of sediment in some cases

https://cirpwiki.info/index.php?curid=2385

Common Difficulties and Concerns

- **Sediment Compatibility**
  - **Permissible fines content for nourishments**
    - ▸**Maximizing sediment available for beneficial use is critical**
    - ▸**Ongoing research into the winnowing of fines should improve understanding**

- **Fate of Placed Sediment**
  - **Concerns about placements not moving onshore, nourishment lifespans, sediment placement depths, and nourishment proximity to the subaerial beach**
    - ▸**Many unknowns remain**
    - ▸**Alongshore transport may be an important process at nearshore nourishments**
    - ▸**Un-intended consequences can occur where wave climates are altered, and it is important to communicate risk from the start**
    - ▸**Broader view of the sediment system can promote least cost nourishments where appropriate**

Nearshore Nourishments as Alternatives

Potential Benefits:

- Cost savings
- Flexible placement winds and the ability to match natural accretion
- Can reduce impact to endangered and threatened species

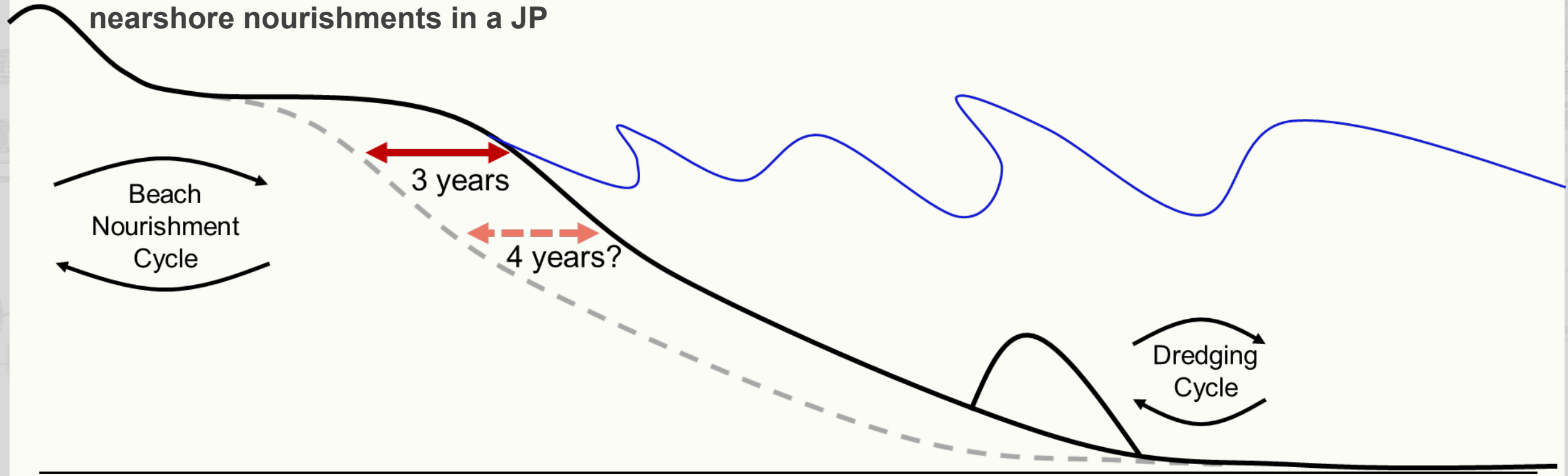
Examples

- Surf-zone nearshore berms
  - Examples to avoid piping plover swash foraging areas and tiger beetle larva habitat
- Swash placements
  - Indian River Inlet, DE

Swash placement north of Indian River Inlet, DE. Sediment was dredged from Massey Ditch and used to nourish the downdrift beach at Indian River Inlet.

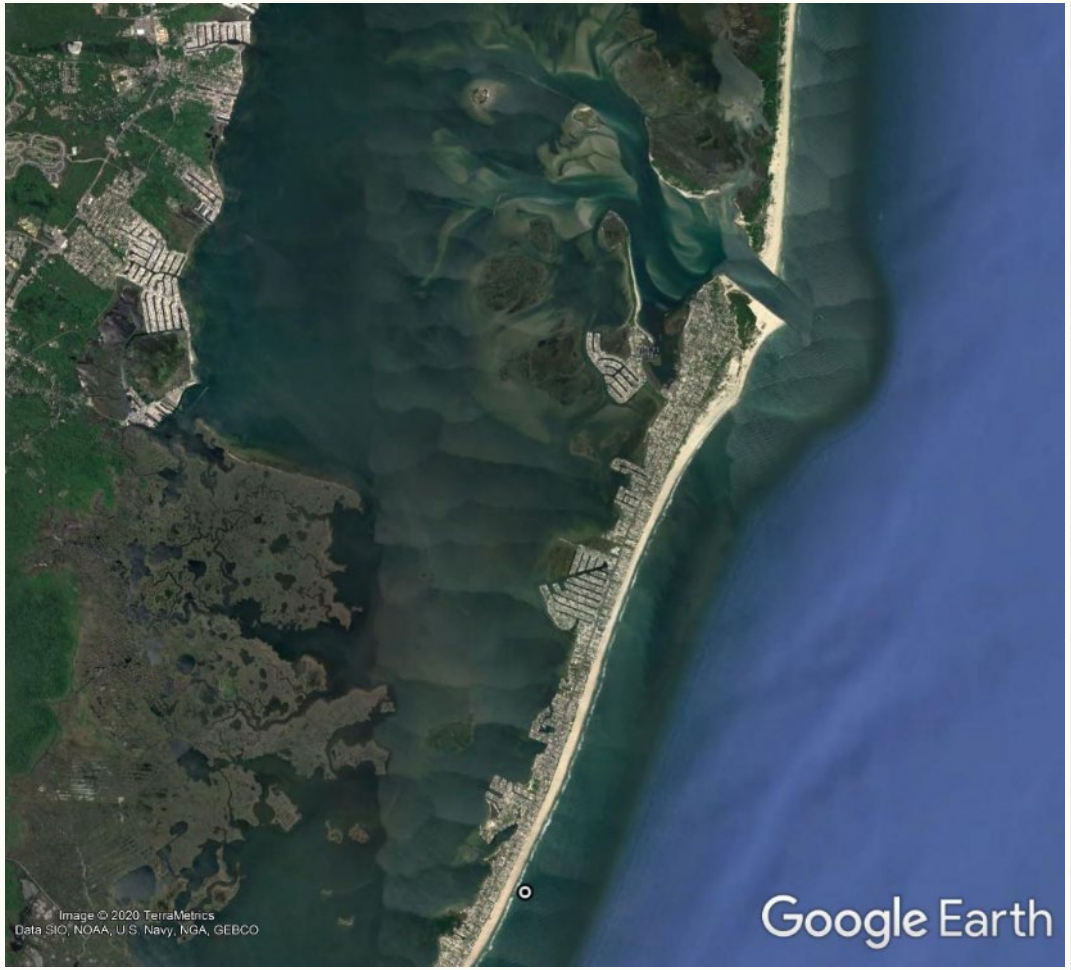
Nearshore Nourishments as Supplements

- Optimally placing dredged sediment in the nearshore, increased sediment availability (more flexible compatibility), and the potential to dissipate wave energy indicate nearshore nourishments intuitively will increase the lifespan of direct beach nourishments
- Galveston example adding nearshore nourishments to simulations from the STORM-SIM team
- Beach nourishment lifespan in the example will be compared with and without higher frequency nearshore nourishments in a JP



Nearshore Nourishments as Supplements

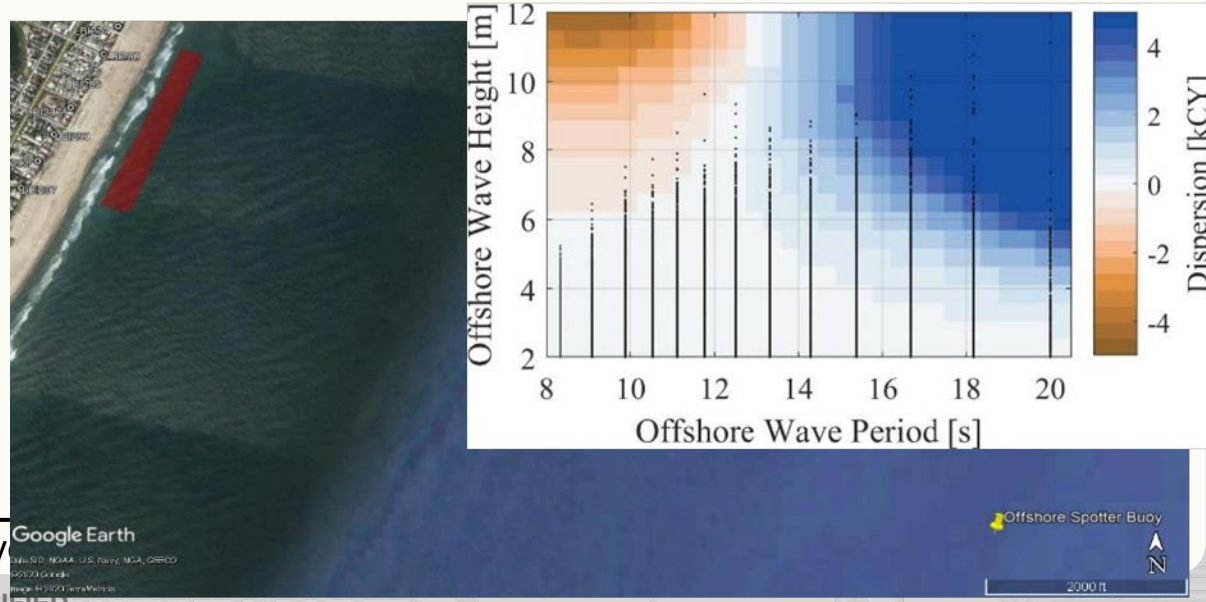
- An upcoming Section 1122 pilot project at Harvey Cedars, NJ, plans to construct a 150 to 200 k cy nearshore placement between 10’ and 20’ depths, in the footprint of the adjacent beach nourishment
  - Wave measurements planned offshore and on either side of the placement. Precondition measurements collected
  - Detailed bathymetry data plans for pre-construction, post construction, 30 days later, and 60 days later
- Upcoming Research Task analyzing data and investigating placement morphodynamics with empirical and process-based numerical models
  - Placement depth, distance from the inlet, and planned data collection make this an excellent case study for wave impact on 10’ to 20’ depth hopper placements



Barnegat Inlet NJ, Long Beach Island, & planned placement location (white marker)

Harvey Cedars Monitoring

- Wave measurements planned offshore and on either side of the placement. Precondition measurements collected
- Detailed bathymetry data plans for pre-construction, post construction, 30 days later, and 60 days later
- FY22 RSM Proposal to Investigate:
  - Cross-shore Sediment Transport (Hudson et al., 2021)
  - Depth of Closure Return Period (Hudson technique)
  - Longshore Deflation
  - Morphological Evolution
  - Energy Dissipation



Relatively Deep Nearshore Nourishments & The Sediment System

Motivation: In many cases relatively deep nearshore nourishments (far from the surf zone but within the DOC) are often more efficient to construct and can minimize potentially adverse local effects (e.g. wave climate changes, navigation concerns)

Impact:

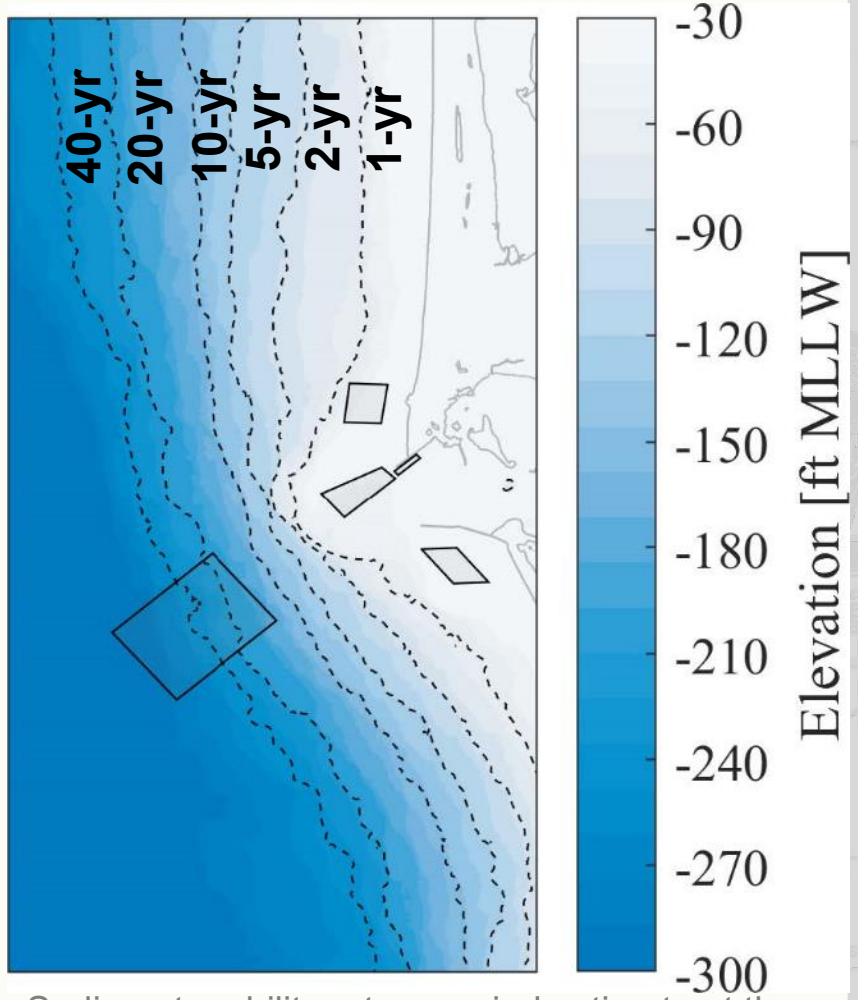
- Relatively deep placements are an important part of least cost beneficial use in many locations and contribute to the effort to retain the most sediment within the system
- Relatively deep placements often allow for larger placement vessels and may reduce downtime from energetic wave conditions
- Relatively deep placements within the DOC generally do disperse
- This gradual diffusion supplies sediment to the broader nearshore system
- Cross-shore sediment sorting may bring beach quality sediment onshore

Traditional Depth of Closure & The Sediment System

Concept: Several locations have seen sediment disperse from placements near the edge of the outer depth of closure (shoal zone). This sediment supports the system and may move onshore.

Examples:

- Galveston District and New Orleans District examples where sediment diffuses from placements deeper than commonly used DOC but within the Hallermeier Outer Depth of Closure (shoal zone)
- Portland District example of sediment being dispersed from a very deep placement
- The idea of a return period analysis approach to Depth of Closure has been proposed and an FY22 research effort intends to investigate implementing this.



Sediment mobility return period estimate at the Mouth of the Columbia River. Image courtesy of Austin Hudson, Hans Moritz, and Jarod Norton (USACE Portland District, North West Division)

Summary

- Different practices fit the variety of challenges projects can face
- The ability to choose the nearshore nourishment style that best matches project constraints is important
- Information about and lessons learned from the variety of nearshore nourishment approaches can help plan and gather support for future projects
- New projects and observations can create additional opportunities to beneficially use more sediment in similar environments