Regional Sediment Management in Southeastern North Carolina

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Sand Matters: Facilitating Regional Sand Management in Southeast NC April 1, 2025



Introduction

- USACE informed perspective on dredging and beach nourishment
- 70% Beneficial Use target by 2030
- Beach Nourishment vs. Dredged Material Disposal
- Federal Standard
- Sand compatibility
- Specific inlets/beaches
 - Current practices
 - Challenges
 - Backpassing vs. Bypassing



USACE Beneficial Use Target

- Beneficial Use of Dredged Material Command Philosophy Notice (January 25, 2023) identified nationwide goal of 70% beneficial use of dredged material by 2030
- USACE Beneficial Use web site
 - <u>https://www.usace.army.mil/Missions/Civil-</u> Works/Beneficial-Use-Program/
- National Regional Sediment Management Program
- Wilmington District already >70%
- Nationally USACE was 30-40%, now ~60%



Initiatives

• RSM Program established in 1999 by CERB

- Funding source
- Recognizes dredged sediment as a resource
- Works across business lines (types of money)
- Considers regional implications of project scale actions
- Engineering With Nature
 - <u>www.engineeringwithnature.org</u>
- South Atlantic Coastal Study (SACS)





NTIC COASTAL STUDY (SACS) | ADVANCING NORTH CAROLINA RECOMMENDATIONS

HARPEN ARRAUME PRAAMINETUR PRIAMA

Companion Document to South Atlantic Coastal Study (SACS) | Overview

Congress

New Study Authority

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RECU	MMENDATION GATEGORIES DEFINED	NUKIN CAKULINA KECUN	IMENUALIUN	12			
	A. F. R	CATEGORY	TIMING	TYPE**	RECOMMENDATION	ASSIGNED TO	NEXT STEP
\odot	collection, and multi-agency efforts such as those undertaken by Silver Jackets teams, which bring together multiple that fordered, and sometimes titled and local graphics to a site form.	Activities/Areas Warranting Further Analysis	Near-Term	SP	FPMS Special Study – CHS Training Workshop,	USACE	Funding
	flooding and other natural disasters.		Mid-Term	SP	Compound Rooding Modeling Effort (National Oceanic and Atmospheric Administration's National Hurricane Center and National Water Center).	Multi-agency	Stakeholder Collaboration
m	areas barners prevening comprehensive kisk management: Ins caregory davances contunities to address the multiple barriers preventing comprehensive risk management identified ne SACS report.		Mid-Term		Enhanced Building-level Risk Assessments (North Carolina Emergency Management, University of North Carolina - UNCW, USACE).	Multi-agency	Stakeholder Collaboration
-	Design and Construction Efforts: Examples include recommendations that support design and construction of tentatively selected or recommended plans from USACE CSRM studies conducted		Mid-Term		Community Interest Night - Down East Community (Floodplain Management Services (FPMS) Special Study).	USACE	Stakeholder Collaboration
	Vities and Areas Warranting Further Analysis: This category includes development of tools, data action, and multi-agency efforts such as those undertaken by Siver Jackets teams, which bring ather multiple state, federal, and sometimes tribal and local agencies to manage risk from ding and other natural disasters. Iters Barriers Preventing Comprehensive Risk Management: This category advances orbunities to address the multiple barriers preventing comprehensive risk management identified a SACS report. Ign and Construction Efforts: Examples include recommendations that support design and attruction of fentatively selected or recommended plans from USACE CSRM studies conducted arately from SACS. Immendations on Previously Authorized USACE Construction Projects: This category includes commendations that maintain and/or adapt existing USACE CSRM projects to continue providing misk management as sea level rises. Immendations that maintain and/or adapt existing USACE CSRM projects to continue providing misk management as sea level rises. Immendations that maintain and/or adapt existing USACE casthers approach for more cent and effective use of sediments in coastal environments, ranging from agency collaboratior and source identification to leveraging the beneficial use of dredged material with emerging ural, nature-based features (NNBF). Immediations to the right include: MARCENMENDATIONS nendations to the right include: MARCENMENDATIONS APPLICABLE TO NORTH CAROLINA Torify Recommendations may be applicable to the entire region, such as improvin fing and application of compound flooding effects, or they may be location-specifi		Mid-Term		Leverage CHS directly to NCORR Strategic Buyout Program.	USACE	Stakeholder Collaboration
2	recommendations that maintain and/or adapt existing USACE CSRM projects to continue providing	Address Barriers	Near-Term	SP	Masonboro Inlet Jetty project.	USACE	Funding
	storminsk manogement as sed levelinses.	Davies and Construction	Near-Term		Neuse River Basin and Tar-Pamlico Flood Risk Management Feasibility Study Recommendations.	Congress	Funding
	ional Sediment Management Practices: This category supports a systems approach for more cient and effective use of sediments in coastal environments, ranging from agency collaboration	Design and Construction	Near-Term		City of New Bern Flood Resiliency Study Recommendations.	Multi-agency	Funding
10.0	on sand source identification to leveraging the beneficial use of dredged material with emerging natural, nature-based features (NNBF).	Regional Sediment Management	Mid-Term		SAD-RSM-RCX coordination with SAW on applicable District projects identified in the 2020 RSM Optimization Update.	USACE	Stakeholder Collaboration
	ludy Efforts xamples include USACE feasibility study recommendations, studies that may be led by other		Long-Term		Offshore Sand Management Strategy Discussions (Bureau of Ocean Energy Management - BOEM, USACE, N.C. Division of Coastal Management - NCDCM).	Multi-agency	Stakeholder Collaboration
20	Stakenoloers, and studies that fail under existing USACE authomies, such as the Continuing Authomies. Program (CAP) and Planning Assistance to States (PAS).	Study Efforts	Near-Term	RP, SP	Back Bay Erosion/Marsh Restoration Study (Albemarle-Pamilco Estuary System – APES, USACE).	Multi-agency	identify Nonfederal Sponsor (USACE Study)
NOR	TH CAROLINA RECOMMENDATIONS		Near-Term)	SP	Oak Island CSRM feasibility study.	Congress	Funding
The re	ecommendations to the right include:		Near-Term	SP	Lola Road - Emergency Streambank and Shoreline Erosion Protection.	USACE	Identify Nonfederal Sponsor (USACE Study)
	REGIONAL RECOMMENDATIONS APPLICABLE TO NORTH CAROLINA		Mid-Term	SP	Wanchese (south of Harbor) - Continuing Authority Program (CAP) 204.	USACE	Funding
Regional Priority Recommendations may be applicable to the entire region, such as improving understanding and application of compound flooding effects, or they may be location-specific recommendations to address areas with the most significant risk relative to the entire study area.			Near-Term	SP	Masonboro Island - Beach, Dune and Back-barrier Ecosystem Restoration (USACE).	Congress	New Study Authority
			Mid-Term	SP	NC Battleship Memorial - Continuing Authority Program (CAP) 205.	USACE	Stakeholder Collaboration

NORTH CAROLINA-SPECIFIC RECOMMENDATIONS

There are seventeen (17) Recommendations specific to North Carolina. Of these, twelve (12) are USACE-led recommendations and five (5) are non-USACE-led recommendations. North Carolina Recommendation are consistent with Key Finding in the SACS Main Report. Additionally, multiple Recommendations support the North Carolina State Resiliency Strategy.



Figure 1. Conceptual illustration of compound flooding

SP ADDITIONAL REGIONAL PRIORITY RECOMMENDATIONS APPLICABLE TO ALL STATES

Near-Term

CATEGORY	TIMING*	TYPE**	RECOMMENDATION	ASSIGNED TO	NEXT STEP
	Mid-Term	RP	Advance ongoing interagency work to improve understanding and application of compound flooding effects on existing and future coastal storm risk.	Multi-Agency	Stakeholder collaboration
Activities/Areas Warranting	Near-Term	RP	SACS key products should be maintained and updated by USACE and utilized, as applicable, by USACE and stakeholders to support consistent, efficient, and effective analyses. Additionally, other agency-led data and tools should be supported to facilitate use of consistent, up-to-date information for decision making. Examples of such agency-led efforts include the Bureau of Ocean Energy Management (BOEM) Minerals Management Information System (MMB) and the National Oceanic and Atmospheric Administration (NOAA) Coastal Change Analysis Program.		Funding
CATEGORY TIMING* TYPE** Activities/Areas Warranting Further Analysis Mid-Term RP Advance floading SACS key and stake data and B(BCPW) A Administr Activities/Areas Warranting Further Analysis Near-Term RP Advance floading Administr Near-Term RP Administr Administr Near-Term RP Convertioned to Regio Previously Previously Authorized USACE Construction Projects Near-Term RP Develop to Regio Previously Authorized USACE Construction Projects Regional Sediment Management Near-Term RP Prioritize explicitly Promote	A multi-agency and collaborative approach should be used to develop methods that account for environmental benefits in traditional habitat units and economic quantities (monetlaed) in order to acknowledge and consider environmental benefits as a factor in deciding on a recommended plan in all tuture CSRM studies.	Multi-Agency	Guidance/ Policy		
	Near-Term	RP	Develop streamlined and vetted methods to quantify and incorporate risk management benefits to Regional Economic Development, Environmental Quality, and Other Social Effects to ensure Federal interest determinations consider benefits other than National Economic Development.	USACE	Guidance/ Policy
Address Barriers	Near-Term	RP 📕	Develop streamlined and vetted methods to quantify and incorporate risk management benefits to Regional Economic Development, Environmental Quality, and Other Social Effects to ensure Federal interest determinations consider benefits other than National Economic Development.	USACE	Guidance/ Policy
	Near-Term	RP	Priorifize funding for renourishment of existing federal CSRM beach nourishment projects (except Puerto Rico and USVI).	Congress	Funding
Previously Authorized USACE Construction Projects	Near-Term	RP	Prioritize extension of federal periods of participation in existing CSRM beach nourishment projects, as appropriate, to continue providing coastal storm risk management and important incidential benefits to coastal systems, communities, and environmental and cultural resources. Options could include prioritizing funding and review of studies on existing CSRM projects, streamlining the study process for existing projects, or providing extensions to the existing periods of federal participation through legislation such as was done by WRDA 2018 (PL 115-270) (except Puerto Rico and USVI).	Congress	Funding
	Near-Term	RP	Ongoing and future federal and nonfederal studies recommending beach nourishment should explicitly incorporate adaptive capacity to improve project resilience.	Multi-Agency	Guidance/ Policy
Regional Sediment	Near-Term	RP	Promote partnerships and collaboration on beneficial use of dredged material opportunities.	Multi-Agency	Stakeholder collaboration
wanogemeni	Near-Term	RP	Develop regional prioritization of strategies to address sand needs.	ASSIGNED TO NEXT Multi-Agency Stakehold, collaborat Multi-Agency Funding Multi-Agency Funding Multi-Agency Guidance, USACE Guidance, USACE Guidance, Congress Funding Multi-Agency Guidance, Congress Funding Multi-Agency Guidance, Guidance, Funding Congress Funding Multi-Agency Guidance, Multi-Agency Guidance, Multi-Agency Stakehold, Guidance, Funding	Funding

Cape Fear River Basin - Flood Risk Management (FRM)study (USACE).

* Near-Term: < 5 Years / Mid-term: 5 - 10 Years / Long-term: >10 Years / ** RP: Regional Priority / SP: State Priority

Table 5-1: Existing Coastal Storm Risk Management Projects in North Carolina (USACE 2020c)

Project Name	County	Project Sponsors	Estimated 50 Year Sand Need (cy)
Bald Head Island	Brunswick	USACE, FEMA, Village of Bald Head Island	25,704,000
Caswell Beach	Brunswick	USACE	4,160,000
Holden Beach	Brunswick	USACE, FEMA, Town of Holden Beach	12,903,000
Oak Island	Brunswick	USACE, FEMA, Town of Oak Island	9,639,000
Ocean Isle Beach	Brunswick	USACE, Town of Ocean Isle Beach	10,353,000
Atlantic Beach/Ft. Macon	Carteret	USACE	14,575,000
Emerald Isle	Carteret	USACE, FEMA, Town of Emerald Isle	8,619,000
Indian Beach	Carteret	USACE, FEMA, Carteret County, Town of Indian Beach	2,907,000
Pine Knoll Shores	Carteret	USACE, Carteret County, Town of Pine Knoll Shores	7,410,000
Duck	Dare	Dare County, Town of Duck	2,480,400
Hatteras Island- Buxton	Dare	USACE	8,996,000
Kill Devil Hills	Dare	USACE, Dare County	3,445,000
Kitty Hawk	Dare	USACE, Dare County	6,837,000
Mirlo Beach/Rodanthe	Dare	NCDOT	94,700
Nags Head	Dare	USACE, Town of Nags Head, Dare County, FEMA	25,500,000
Pea Island	Dare	USACE	19,437,000
Southern Shores	Dare	Dare County	2,465,000
Carolina Beach	New Hanover	USACE, Town of Carolina Beach	16,677,000
Figure Eight Island	New Hanover	New Hanover County, Figure "8" Beach HOA	15,276,000
Kure Beach	New Hanover	USACE	18,513,000
Masonboro Island	New Hanover	USACE	6,420,000
Wrightsville Beach	New Hanover	USACE	9,204,000
Surf City/North Topsail Beach	Onslow & Pender	USACE, North Topsail Beach	26,210,000
North Topsail Beach	Onslow	USACE, North Topsail Beach	15,660,000
Onslow	Onslow	USACE	2,610,000
Topsail Beach	Pender	Town of Topsail Beach	11,679,000

Town of Topsail Beach

Topsail Beach

Pender

SACS NC Appendix Sand Needs and Resources



Surf City – NOURISHMENT

Photo courtesy Chris Gibson, TI Coastal

What's the difference?

Bald Head Island – DISPOSAL Photo courtesy villagebhi.org (2022-23 USACE WHIOB)





- Dredge discharge pipe
- Dozers
- Training dikes
- Support equipment
- Cutterhead dredge (not in photos)

Definitions

- Beach Nourishment
 - USACE Coastal Storm Risk Management (CSRM)
 - Design intent: reduce storm damage (reduce risk)
 - Accomplished by constructing a template
 - Specific features: dunes and berms (widths, elevation, volumes, alongshore extent)
 - Borrow site: inlets, navigation channels, offshore sites, upland, disposal islands
- Beach Disposal
 - Design intent: dredge a navigation channel
 - Accomplished by disposing beach quality sand on beach or nearshore (keep it in system)
 - Beach-specific features: primarily berms (width, elevation, volume)
 - No storm damage reduction or recreation purpose



Nourishment vs. Disposal

- Does nourishment provide navigation benefits?
 - Yes
 - Wrightsville Beach, Carolina Beach, Topsail Beach, Ocean Isle
 - No
 - Kure Beach
- Does disposal provide storm damage reduction benefits?
 - Yes, though not quantified
 - Wilmington Harbor Inner Ocean Bar disposal to Bald Head or Caswell/Oak Island
 - Morehead City Harbor to Fort Macon/Atlantic Beach
 - No/minimal
 - AIWW inlet crossings



Context Is Important

• To the Corps

• beach nourishment and beach disposal are different things

How it's paid for

- Funded differently (different "colors" of money)
- Designed differently
- Contracted differently
- To local communities
 - It's all the same thing
 - Sand out of a channel good
 - Sand on the beach good
 - Sand out of a channel AND on the beach real good



Federal Standard

- 33 Code of Federal Regulations (CFR) 335 338
- O&M Dredging
- Federal Standard is...
 - ...the dredged material disposal alternative or alternatives identified by the Corps which represent <u>the least costly</u> <u>alternatives consistent with sound engineering practices and</u> <u>meeting the environmental standards</u> established by the 404(b)(1) evaluation process or ocean dumping criteria.
- Engineering Codes of Ethics
 - ASCE
 - Fundamental Principles: "... using their knowledge and skill for the enhancement of human welfare and the environment."
 - Canon 1: "Engineers should be committed to improving the environment by adherence to the principles of sustainable development so as to enhance the quality of life of the general public."
 - NSPE
 - "Engineers are encouraged to adhere to the principles of sustainable development in order to protect the environment for future generations."



Federal Standard

• USACE Wilmington practice

- Successfully argued against "throwing away sand" offshore because while it may be less expensive
- Not consistent with sound engineering practice of sustainable development principles
- Keep it in the system
- Exceptions/compromises
 - Wilmington Harbor up to 100,000 cy
 - Morehead City ODMDS specified sand placement area so that it can be retrieved
 - Morehead City nearshore disposal
- Fine-grained material
 - Is it sustainable to put in ODMDS or upland disposal removing it from the system, even if temporary?
- Beneficial Use and RSM includes fine-grained material



Sand compatibility

• USACE

- Less than 10% fines (passing #200 sieve, i.e., smaller than 0.074 mm)
- Has become known as the "Corps standard"
- Primarily only focused on the borrow site
- Corps does not have to follow NC standards
- NC Technical Standards for Beach Fill Projects
 - 15A NCAC 07H.0312
 - Requires borrow site sand to closely match native beach sand

• Dredging effect on grain size

- Maglio (2018, 2020, et al)
 - Gulf of Mexico beaches (TX and FL)
 - "Grain size indicates significant "fines" losses during dredging process"
 - D50 borrow sites ranged from 0.067 to 0.203 mm
 - "You lose 60% of the fines each time material is hydraulically slurried."



Inlet Case Studies

- Beaufort Inlet/Morehead City/Shackleford Banks/Fort Macon/Atlantic Beach
- Masonboro Inlet/Wrightsville Beach/Masonboro Island
- Carolina Beach Inlet/Masonboro Island/Carolina Beach
- Wilmington Harbor Inner Ocean Bar/Bald Head/Caswell Beach/Oak Island
- Lockwoods Folly Inlet/Oak Island/Holden Beach
- Shallotte Inlet/Holden Beach/Ocean Isle



Backpassing or Bypassing

Morehead City Harbor/ Beaufort Inlet

- Deep-draft navigation (disposal)
- O&M funded
- 3-year cycle
- Beach placement for erosion
- Nearshore disposal to slow deflation of ebb tide delta
- Backpassing
 - Nearshore 78%W:22%E
 - Beach 100% to Bogue Banks
- ODMDS
 - Site managed for sand and silt separately

Harbor Section	Range	Disposal/Placement Location	Dredge Type	Sediment Classification (% Sand)
Inner Harbor	Northwest Leg	ODMDS/Brandt Island	Bucket/Pipeline	23% to 77%
	West Leg	ODMDS/Brandt Island	Bucket/Pipeline	88% to 94%
	East Leg	ODMDS/Brandt Island	Bucket/Pipeline	40% to 95%
	Partial Range C	ODMDS/Brandt Island	Bucket/Pipelire	80% to 99%
Outer Harbor	Partial Range C	Beach/Nearshore	Pipeline/Hopper	≥90%
	Range B	Beach/Nearshore	Pipeline/Hopper	≥90%
	Cutoff	Beach/Nearshore	Pipeline/Hopper	≥90%
	Range A out to Station 110+00	Beach/Nearshore	Pipeline/Hopper	≥90%
Outer Entrance Channel	Range A, beyond Sta. 110+00	ODMDS	Hopper	17% to 99%



"While ODMDS disposal of beach-quality dredged material is the least cost alternative for most channel reaches, the long-term effects of ODMDS-only disposal to inlet stability, adjacent shorelines, and biological communities makes it both engineeringly and environmentally less preferable than alternatives that keep most of the sand in the inlet sand-sharing system."

<u>Masonboro Inlet</u>

- Shallow draft navigation (disposal)
 - O&M funded
 - Authorized -14 ft, 400 ft wide
 - North Jetty (1965)
 - South Jetty (1980)
 - Impact of navigation to Masonboro Island (2000)
- Borrow site for WB CSRM
 - CG funded
 - ~800K cy
 - Every 4 years
 - Inlet cannot support this volume
- CBRA
- Additional borrow site (next slide)
- Dec 2024 Masonhoro Inlat **Nrightsville Beach** Jetty/
- Navigation project causes a deficit in sand supply to both Masonboro Island and Wrightsville Beach
- Bypassing needed: 60,000 cy/yr to Wrightsville and 125,000 cy/yr to Masonboro Island
- Last bypassing to Masonboro Island was in 2010 (1,875,000 cy deficit to Masonboro Island since 2010)
- But if there's no need for O&M dredging to maintain navigation channel, there's no O&M funds for bypassing*

*A bit of an oversimplification...but typically O&M funds request for Masonboro Inlet does not rank high for budgeting

- ~12M cy sand inside of 3 miles
- ~650K tires
- 1700 magnetic anomalies



1956







- South jetty under construction
- Channel moved center of jetties post construction



1980





Carolina Beach Inlet

- Shallow draft navigation
 - O&M funded
 - Authorized -9 ft, 150 ft wide, following deep-water
 - Typically side-cast
 - Impact to Masonboro Island?
- Borrow site for Carolina Beach CSRM
 - CG funded
 - ~600K 900K cy
 - Every 3 years
 - Dredge depths -20 to -40 ft
- CBRA
- Borrow Site "B" primarily used for Kure Beach (~ <10M cy remaining)



Small volume of inlet crossing maintenance material placed on Masonboro Island once.



Wilmington Harbor Inner Ocean Bar

- Deep draft navigation (disposal)
 - O&M funded
 - -44 ft from offshore thru Battery Island Channel
 - Beach quality sand in Smith Island Channel, Bald Head Reach 1 and 2
 - ~800K 1M cy dredged every 2 years
 - Sand Management Plan
 - Established with 1996 Act deepening
 - Backpassing: 2/3 from BHI, 1/3 from Oak Island
 - 6-year cycle
 - Years 2 and 4 to Bald Head
 - Year 6 to Caswell and East Oak Island
 - USACE planning to update SMP

Old Brunswick Beaches Study had considered Jay Bird Shoals as a borrow site, but wave transformation modeling showed increased wave impacts to adjacent beaches not acceptable over a 50-year project lift, therefore Jay Bird was eliminated from further consideration as a borrow site.



Lockwoods Folly Inlet

- Shallow draft navigation
 - O&M funded
 - Authorized -8 ft, 150 ft wide, following deep-water
 - Typically side cast
 - AIWW inlet crossing disposed of on adjacent beaches
 - Typically small quantities <50K cy



Shallotte Inlet

- CSRM Borrow Site for Ocean Isle Beach
- CG funded
- Dredged to -15 ft
- Historically needed on the east end/ transition area





Challenges

- Lack of sand (obviously)
- Use inlets responsibly (cause and effect)
- USACE 10% fines criteria
 - What's wrong with 12% or 15% or 20%?
 - Can we expand research to better understand dredging process and effect on % fines of what actually makes it to the beach?
 - Sand-silt separation?
- Cost of dredging
- Industry shallow-draft dredging capability
- Partnering between Fed, State, Local, Resource Agencies, Consultants, Dredgers



What do you see as the biggest impediment to managing our sand resources?



Or go to menti.com and enter 3189 7688



Question

- Where/how is the best way to engage with our Federal partners (USACE, BOEM, et al.) on funding, regulations, policies on RSM?
- What do you see as the biggest impediment to managing our sand resources?
- How can we improve partnering between Federal, State, Local, Resource Agencies, Consultants and Dredgers for optimum RSM?

