Thin Layer Placement Coordination Workshop Summary

March 30, 2026

Summary

The purpose of this workshop was to discuss thin layer placement (TLP) of sediment as a tool for enhancing wetland resilience and to share successes, challenges, concerns, and lessons learned associated with the ecological impacts of placing sediment on deteriorating wetlands. Workshop attendees were provided a scientific overview of TLP and how other coastal states manage projects related to TLP and the beneficial use of dredged material. These discussions included several case studies along the U.S. east coast from New Jersey to Georgia. The workshop included small group discussions on topics related to post-construction monitoring, best management practices, habitat trade-offs, success criteria, selecting appropriate placement sites, and identifying information needs. When evaluating the potential for TLP in North Carolina, workshop attendees highlighted the importance of clearly identifying the goals, objectives, purpose and need for these projects on a case-by-case basis while considering the above topics on a specifically defined local or regional scale. As a result, a collaborative multi-agency network of stakeholders is most likely needed to progress TLP in a responsible manner. Information gathered from this workshop will be incorporated into the 2026 amendment to the Coastal Habitat Protection Plan, which identifies TLP as a priority issue within the broader theme of planning for multi-decadal wetland change.

Introductory Remarks

Charlie Deaton, NC Division of Marine Fisheries (DMF) Habitat Protection Program Supervisor, began the workshop with introductions (see Appendix A; attendee list) and an outline of the purpose and objectives of the meeting to inform the 2026 Coastal Habitat Protection Plan (CHPP) amendment (see Appendix B; workshop agenda).

Daniel Govoni, NC Division of Coastal Management (DCM) Policy Section Chief, reinforced that the workshop was not intended to discuss the permitting, policy, or regulatory components of TLP; rather, it was intended to discuss the relationships between TLP and coastal habitats and resources. Nonetheless, Mr. Govoni summarized that TLP is not currently permissible in North Carolina because in most cases, the Coastal Area Management Act (CAMA) and associated guidelines for areas of environmental concern prohibit wetland fill. However, TLP could be permitted by the NC Coastal Resources Commission (CRC) through the CAMA variance process. There has been growing interest in

TLP across coastal North Carolina, and NC DCM anticipates a potential need for future rulemaking that would authorize TLP through the typical CAMA permit process.

Research Overview

Dr. Jenny Davis, Research Ecologist with the National Oceanic and Atmospheric Administration (NOAA) Coastal Resilience, Response and Assessment Branch (CRABB), provided a broad overview of TLP and related methods for the Beneficial Use of Dredged Material (BUDM) with a presentation entitled Beneficial Use of Sediments for Habitat Restoration and Creation (see Appendix C; research overview and state resource agency panelist slides). The presentation began with a brief description of three beneficial use techniques to reverse or offset estuarine habitat loss:

- **Thin Layer Placement:** adding elevation to a deteriorating marsh to create more suitable conditions for marsh plant growth. This term is often used interchangeably with 'beneficial use.' However, TLP is just one type of beneficial use amongst others such as those defined below.
- **Thick Layer Placement:** creation of intertidal or upland habitat where it currently does not exist (i.e., habitat conversion).
- **Strategic Placement:** nearshore placement that allows for the natural distribution of sediments via waves and tides.

The remainder of the presentation focused on thin layer placement with an additional case study highlighting thick layer placement. Dr. Davis explained that the goal of each technique is to elevate existing wetlands that are vulnerable to sea level rise so that they are less vulnerable to sea level rise but remain within a vegetation-specific growth range. As such, target elevations are defined by marsh position relative to the tidal frame, and accurate placement of thin sediment layers on the marsh surface to achieve a specific target elevation becomes challenging. Dr. Davis emphasized that while TLP results in the short-term disruption of natural marsh processes, there are potential long-term benefits for marsh resilience.

Dr. Davis highlighted three TLP studies conducted in North Carolina, emphasizing that studies specific to the state have been limited and small-scale:

- Gull Rock (Wilber 1992)
- Masonboro Island (Croft et al. 2006)
- Freeman Creek, Camp Lejeune (Davis et al. 2019)

The bulk of Dr. Davis's presentation described two collaborative, large-scale case studies in Maryland: Deal Island Wildlife Management Area (thin layer placement) and Swan Island (thick layer placement):

Deal Island Wildlife Management Area

- Completed in 2024
- 167,000 cubic yards of material covering 72 acres
- Goal: raise majority of marsh platform to high-marsh elevation
- Sediment Source: Wicomico River
- Sediment Texture: fine
- Methods: sediments pumped across land (14 miles) to placement site and distributed by sheet flow across the marsh platform
- Placement Depth: up to 18 inches
- Containment Method: approximately 30,000 straw bales
- Plantings: hand planting over 700,000 native species over two growing seasons to discourage the establishment of invasive species.
- Outcomes and Lessons Learned
    - Straw bales were effective containment structures except when the structure became compromised during a winter storm.
    - Site access was challenging due to limited nearshore depth and submerged aquatic vegetation (SAV).
    - Recommendation to "plant like crazy" wherever sediment is bare.
    - Vegetative response is dynamic in early years and likely influenced by nutrients in deposited sediments and plant community changes in response to increased marsh elevation.
    - Native vegetation that did not persist after the first year was replanted.
    - Existing invasive common reed (*Phragmites australis*) on the site that was not treated before sediment placement had notably expanded by year two.
    - It can take several years to reach equilibrium (i.e., target elevation profile)
    - Created new habitat for salt marsh sparrow.

Swan Island

- Completed in 2019
- 60,000 cubic yards of material covering 12 acres
- Goal: create new habitat matrix (low and high marsh, dunes)
- Sediment Source: Chesapeake Bay Navigation Channel

- Sediment Texture: fine and coarse
- Methods: thick layer deposition of dredged material
- Placement Depth: a few centimeters up to one meter
- Containment Method: coir logs
- Plantings: hand planting approximately 200,000 native plants over two years
- Outcomes and Lessons Learned:
    - An as-built survey is needed to track changes over time and compare to intended design.
    - The containment structure remained in place.
    - It was more difficult to contain fine sediments, but installing fresh containment structure helped mitigate some loss.
    - Adjacent SAV was covered due to the loss of some fine sediments. While unintentional, it is necessary to evaluate whether potential trade-offs such as this are acceptable if they occur.
    - Creating high marsh was more successful than creating low marsh.

The Swan Island project was characterized by several performance thresholds and subsequent adaptive actions if thresholds were not met (see below). As such, Dr. Davis emphasized the need to identify a source of funding to support corrective action.

- **Vegetative Percent Cover:** If vegetation in planting zones did not spread to 50-75% of the total placement area, failing areas had to be replanted. If elevation changed, planting compatible species was required.
- **Sediment Surface Elevation:** If elevations did not remain within the appropriate range, additional sediment placement was required.
- **Shoreline Position:** If the designed shoreline did not maintain its position over time, the shoreline had to be rebuilt with additional sediment or plantings.

Dr. Davis concluded her presentation with closing thoughts and several best practices to consider for BUDM projects:

- Design for sediment leakage and plan/budget for additional fortification of containment structures.
- Plan/budget for replacing at least 50% of plants by the second year of the project.
- Attempt to control invasive species before sediment placement.
- Develop a monitoring and adaptive management plan with a temporal component to support corrective actions.
- Consider a range of acceptable outcomes.

- Offshore and upland disposal of dredged material deprives marshes of sediment that is critical for their survival (i.e., a "missed opportunity").
- Habitat trade-offs are inevitable.

At the conclusion of her presentation, Dr. Davis (JD) answered several questions from workshop attendees (A), which are paraphrased below:

- A: Who completed the work on Deal and Swan Island?
  JD: The work was contracted out but managed by the United States Army Corps of Engineers (USACE).
- A: Is there a way to determine a project's carrying capacity for plants and the nutrients needed to sustain them?
  JD: Due to variable site conditions, plant success is often driven by continuous planting and re-planting. Plant communities will most likely go through a "boom and bust" cycle until dense vegetation is established.
- A: For Deal Island, were straw bales used for containment allowed to naturally degrade?
  JD: Yes
- A: What is the strongest driving factor when determining placement depth?
  JD: Placement depth is incredibly project-specific, but it is important to establish boundaries. For example, identify a maximum allowable elevation or thresholds for other environmental variables.
- A: For Swan Island, can you discuss a bit more about comparing an as-built survey to intended designs?
  JD: Conducting as-built surveys are not part of the application process but are standard for projects on which NOAA participates. There was supposed to be more high marsh constructed from the dredged material, but during placement, some decisions had to be made on the fly which affected the end result.
- A: Was sediment characterized to ensure that dredged material matched that of the placement site?
  JD: Generally. At Swan Island, sand was used to construct high marsh and dune habitats. Fine sediments were used to construct low marsh.
- A: Are TLP projects ever paired with other types of marsh restoration, for example tidal flow restoration?
  JD: Most likely.
- A: Should thin layer placement specifically be defined as "no change in habitat" even though Deal and Swan Island were characterized by the destruction of existing vegetation and the conversion from low to high marsh?

JD: While converting to a different marsh elevation, the habitat itself still functions as a marsh.

- A: Did the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have different perspectives on project goals?
  JD: Yes. The USFWS service is typically more upland habitat-oriented for bird populations while NMFS is more intertidal habitat-oriented for fish populations. State resource agencies requested them to scale back the volume of sediment used for the project.

State Resource Agency Panel

The workshop continued with a panel of representatives from several resource agencies outside of North Carolina to discuss progress on TLP and BUDM in other states (see Appendix C; research overview and state resource agency panelist slides):

- Sarah Bouboulis, Coastal Programs Manager, Delaware Coastal Zone Management Program
- Tyler Kinney, Coastal Biologist, New Jersey Department of Environmental Protection
- Maggie Cavey, Beneficial Use Planner, Maryland Department of Natural Resources
- Jan Mackinnon, Program Manager, Georgia Department of Natural Resources

<u>Delaware</u>

Sarah indicated that in Delaware, they are in 'the thick of it' in terms of implementing TLP with only a few recent projects completed. There is a state-run dredge / beneficial use work group that meets regularly (approximately every 6-8 weeks) to ensure all participating agencies are on the same page and to check-on the status of active projects. This workgroup is comprised of researchers, restoration experts, the USACE, the Delaware Department of Natural Resources and Environmental Control (DNREC) Fish and Wildlife, the USFWS, and non-profit and contracting partners.

The state is currently developing a Dredge Material Management Plan to establish goals for how dredge material is used, including those uses that are not considered beneficial. While the USACE handles the majority of projects, Sarah indicated that the Watershed Stewardship Section of DNREC handles projects that involve dredging smaller waterways and evaluating potential resource impacts. Delaware often has issues with avoiding archaeological resources, and there are frequently challenges related to water quality and matching material types with restoration projects. For any beneficial use project in Delaware, adaptive management plans are required.

Looking to the future, Delaware is interested in better streamlining the process for BUDM projects (there is often a lot of "waiting around" due to permitting constraints, etc.) and working more closely with regulatory partners to develop a framework for establishing criteria that satisfies the concerns of all participating agencies (e.g., number and types of samples required to assess dredged material compatibility).

New Jersey

In New Jersey, TLP and BUDM projects have already been scaled beyond the pilot stage through a programmatic approach and careful coordination between regulators, dredgers, and landowners. Tyler indicated that building a successful network, not the science, is the most challenging barrier to overcome. Tyler emphasized that successful programs begin at the policy level, and it is important to establish clear standards that do not lead to continuous permit battles with every project that is proposed.

New Jersey created their programmatic approach to TLP and BUDM projects by first building trust with regulators to develop, pilot, and if successful, engage in new policies for establishing project planning programs and systems. Tyler emphasized that successful programs must first and foremost address environmental needs that are also of value to dredgers (i.e., establish buy-in) and recommended that projects begin with land owned by state and federal governments to ensure proper scaling and consistency. The state's approach to TLP and BUDM is based on a logistics system and not a project-by-project approach: 1) regulators must develop methods for a programmatic approach once trust is earned, 2) landowners must develop and enforce a project development system to build trust, and 3) dredge teams must engage at the project level and buy-in to the concept of restoration.

Maryland

Maggie introduced the Maryland Beneficial Use Playbook and associated toolkit used by local counties and planners for navigating the BUDM landscape. The toolkit includes:

- Guidance Document: provides an overview of state regulations and associated considerations for dredged material management and types of beneficial use. This document can be used as a "grading system," and it outlines standards and criteria for implementing successful BUDM (for example, ensuring sediment type and chemistry are compatible between dredged and placement sites).

- Digital Matchmaking Tool / MD Coastal Atlas: a spatial planning tool that allows users to identify restoration sites and match dredge projects with potential BUDM projects.
- Roadmap and Process Diagram: provides flow charts and decision trees that outline the process for planning and implementing successful BUDM projects.

Maggie serves as a liaison between the regulatory community and restoration practitioners. She offered tips on how to discuss TLP and BUDM with mixed audiences to gain public trust and support for these projects:

- Dredge 'spoil' appears negative or a 'bad thing' to the public. Sediment is not a waste but an opportunity to build resilience. Adopting the term 'dredged material' removes that negativity and is more meaningful.
- Talk openly about the 'ugly phase' of TLP (short-term temporary impacts).
- Humanize projects and create outreach products beyond simple fact sheets.
- Refer to TLP as 'elevation enhancement.' It is more easily understood by the public and captures all types of sediment placement (thin versus thick layer).

Maryland currently has a "random assortment" of TLP and BUDM projects. Maggie indicated that their long-term goal is to create a state-wide matchmaking program that includes innovative, out-of-water reuse (for example, covering landfill material with dredged sediment) and traditional TLP and BUDM projects. To achieve this goal, the state is in the process of developing a twenty-year dredge management plan and playbook. The state has coordinated workshops and developed specific funding calls for BUDM projects. The state is also in the process of conducting a Shallow Draft Channel and Restoration Assessment to identify areas of concern that would benefit from BUDM. Maggie concluded her presentation by highlighting a successful, recent TLP project and associated outreach materials at the Chesapeake Bay Environmental Center in Queen Anne County, Maryland.

Georgia

Jan provided an overview of TLP on Jekyll Island, Georgia in coordination with the Georgia Federal Consistency Program, the USACE, The Nature Conservancy, and the Jekyll Island Authority. This was one of just a few projects that have been implemented in the state. Unlike typical TLP projects, dredged material was placed on a healthy marsh rather than a deteriorating marsh. Details below:

- Completed in 2019
- 125,000 cubic yards of material (5,000 used specifically for TLP) over 5 acres

- Goal: keep dredged sediment within the system and increase marsh resilience to sea level rise.
- Sediment Source: Jekyll Creek and shallow areas of the Intracoastal Waterway
- Sediment Texture: fine
- Methods: direct pipe discharge with manual re-working of the material at low tide.
- Placement Depth: 6-10 inches
- Containment Method: coir logs
- Plantings: none

Jan discussed several outcomes and lessons learned from the project. Uncrewed Aerial Vehicle (UAV) imagery was used to evaluate aboveground plant biomass several years post-placement. After five years, 84% of the marsh had regrown primarily from the marsh edge inward. Revegetation took longer than anticipated and did not support the vision of full regrowth between 3-5 years. There has been no evidence that the placement site has "caught back up" with the reference site since monitoring began, and benthic species diversity has decreased with evidence of ponding along the perimeter of the placement site. Overall, Jan acknowledged that monitoring could have been improved but was limited due to funding constraints.

Panel Discussion

At the conclusion of their presentations, Sarah (SB), Tyler (TK), Maggie (MC) and Jan (JM) answered several questions from workshop attendees (A), which are paraphrased below:

- A: Most coordination appears to involve state and federal agencies' relationship with the USACE. Are there any examples of TLP or BUDM projects conducted by private organizations, non-profits, or smaller agencies?
  JM: The Jekyll Island project was completed on state-owned land, so it was easiest to work with the USACE.
  MC: The Chesapeake Bay Environmental Center project was led by Queen Anne County in Maryland. The County selected a contractor and managed the project.
- A: What type of marsh was selected for the Jekyll Island project?
  JM: The Jekyll Island site was 100% *Spartina alterniflora* and was selected based on its elevation at the time and its proximity to the dredge location.
- A: How have state resource agencies evaluated concerns with potentially contaminated dredge material?
  TK: The New Jersey Department of Environmental Protection has a section devoted to testing sediments to ensure they are safe (Sediment Innovation Lab).

SB: Delaware is addressing this concern through framework development. The state might test sediments from both dredged and placement sites and place contaminated dredge material on already-contaminated placement sites.
MC: The Maryland Beneficial Use Toolkit provides guidance on determining allowable contaminant levels in dredged material for BUDM projects. The Toolkit provides information about concentration thresholds and the number of samples needed to complete such an evaluation. Sediment is treated as hazardous material if it is determined to be unsafe for beneficial use.

- A: Any suggestions for local dredge operators who do not have experience with TLP or BUDM but may have an interest in bidding on these types of projects?
  TK: Contact those with experience (e.g., the USACE) for assistance. In New Jersey, the Department of Transportation Maritime Services has been a valuable resource for dredgers.
- A: Were any of the projects discussed considered compensatory mitigation for impacts associated with other development activities?
  SB: It has been discussed in Delaware but has not yet been authorized.
  TK: Not in New Jersey
  MC: Not in Maryland
  JM: Not in Georgia.
- A: What are the key policy decision points that allow projects to move forward?
  TK: It is most important to negotiate on the amount of data needed to guide successful restoration and satisfy participating agencies.
- A: Any projects that have less drastic impacts on vegetation in relation to building trust and alleviating concerns with habitat alteration?
  MC: It is difficult to completely avoid impacts to existing vegetation, especially for larger projects with high sediment volume.

Small Group Breakouts and Discussion

The final portion of the workshop involved small group discussions that addressed four questions developed by the workshop planning team and informed by attendees' input during the registration process:

1. What are your biggest concerns about sediment placement? What should be monitored? What does success look like? Do we need BMPs for sediment placement (e.g. suspended sediment control)? How to minimize impacts to adjacent habitats?
2. What do we need more information on to use sediment placement to increase marsh resilience?

3. These projects are happening in a changing ecosystem – how should we evaluate tradeoffs between current environmental impact and project longevity? What long term target should we be shooting for, end goal? How far out do you plan (i.e. SLR scenario?)
4. How do we define a degraded wetland to justify thin layer placement of sediment. How do you prioritize wetlands for TLP, what does that look like?

Attendees were organized into small groups and rotated between each question (roving flipcharts), building on previous groups' responses. Moderators for each question summarized key takeaways once all groups provided input:

Question 1 Summary

What are your biggest concerns about sediment placement? What should be monitored? What does success look like? Do we need BMPs for sediment placement (e.g. suspended sediment control)? How to minimize impacts to adjacent habitats?

Biggest Concerns

Success uncertainties were identified as a primary concern with TLP projects. Attendees noted that in some cases, TLP could do "more harm than good" especially if there is a lack of regulatory oversight once projects are implemented. As a result, it is necessary to develop an adaptive permitting framework that would be responsive to lessons learned.

Some attendees were concerned about effectively matching sediment types between dredged and placement sites. Likewise, there was concern about the impacts of contaminated sediments (e.g., heavy metals, forever chemicals, etc.) on placement sites and associated risks to fish, wildlife, and public health.

Lastly, attendees expressed concern over the potential loss of wetland function once sediments are placed (e.g., loss of SAV and fish habitat, introduction of invasive species such as *P. australis* or nutria).

Monitoring and Success Considerations

Attendees identified several parameters that could be monitored once sediment is placed on an existing wetland. These parameters could be validated with the NC Wetland Assessment Method (NCWAM) and the Uniform Mitigation Assessment Method (UMAM). Generally, attendees agreed that choosing what to monitor should be dependent on specific success criteria and may include some or all the following:

- Vegetation abundance and recovery, including invasive species
- Recovery and response of invertebrate, bird, fish, and reptile species
- Hydrology
- Elevation
- Funding costs
- Water quality and turbidity
- Soil chemistry, microbiome pre- and post-application
- Ecosystem services (e.g., reduced flooding, economic assessment)

Attendees stressed the importance of securing reliable funding for long-term post-construction monitoring, which could be a barrier to success. Likewise, attendees identified the need to develop standard operating procedures (SOPs) for monitoring to ensure consistency across projects (e.g., establishing relevant monitoring durations, identifying appropriate control and reference sites, etc.). These SOPs should account for potential site recovery time, impacts from storm events, environmental work windows, and marsh growing seasons. Some attendees agreed that SOPs should also require monitoring and mitigation for any temporary habitat and species impacts associated with wetland mats, pipelines, or other construction activities. As such, adaptive best management practices (like those typically used for stormwater and sediment and erosion control) should be integrated into TLP monitoring plans. Collectively, these factors would help restoration practitioners develop appropriate budgets and timelines for effective monitoring once projects are complete.

According to workshop attendees, TLP could be considered successful if there is evidence of consistent sediment placement and containment across the marsh surface, adequate post-construction tidal flow, and benefits that exceed financial and ecological costs. Successful projects are also those that evaluate public perception and demonstrate a return on investment.

Minimizing Impacts to Adjacent Habitats

To minimize impacts to adjacent habitats, attendees recommended that initial sediment placement should occur in less sensitive habitats (e.g., avoiding primary nursery areas, SAV, open shell fishing waters, outstanding resource waters, etc.) or areas within larger marsh systems. Attendees also recommended coupling TLP with other nature-based approaches (e.g., living shorelines) to develop a more holistic restoration strategy that incorporates the protection of adjacent habitats.

Question 2 Summary – Information Needs

What do we need more information on to use sediment placement to increase marsh resilience?

Attendees identified a suite of factors that need careful attention before TLP is used to enhance marsh resilience to sea level rise. They were broadly categorized as follows:

- Sediment contaminants and establishing acceptable thresholds
- Acceptable habitat trade-offs and adaptive management
- Evidence of need
- Sediment characteristics and texture
- History of wetland loss and future trends (couple with marsh migration efforts)
- Tidal, geomorphological, and hydrological information
- Projections of outcomes / modeling
- Detailed site mapping (elevation, soil and vegetation types, archaeological surveys)
- Additional demonstration and pilot studies
- Frequency of repeat sediment applications
- Current ecological and economic function of any given marsh system

Question 3 Summary

These projects are happening in a changing ecosystem – how should we evaluate tradeoffs between current environmental impact and project longevity? What long term target should we be shooting for, end goal? How far out do you plan (i.e. SLR scenario?)

Evaluating Trade Offs

Attendees highlighted the need to evaluate acceptable trade-offs relative to project-specific purpose and need. For example, trade-offs are different for projects that aim to either restore or create new habitat. Like environmental impact statements required for large projects, TLP proposals should consider an array of action alternatives, including the "no action" alternative, when evaluating acceptable trade-offs. In some cases, no intervention and the subsequent conversion of intertidal to subtidal habitat could be most appropriate. In areas with adequate natural sediment supply and undeveloped corridors, facilitating natural marsh migration may be most appropriate and cost-effective.

Attendees also discussed trade-offs between TLP and public trust rights. For example, sediment placement that results in the fill of canals or ditches or in the creation of new upland habitats may eliminate navigable waters and public trust resources. As such, it is important to consider TLP success relative to community and stakeholder benefits. One

attendee noted that if TLP results in the creation of new upland areas, conditions should be in place to prevent new development on those areas.

Long Term Planning Scenarios

In North Carolina, the life span of TLP projects and the associated ecosystem services they provide would most likely be determined by several location-specific factors such as current and future rates of sea level rise, the ability to match dredge frequency and sediment availability to marsh vulnerability (e.g., number of applications needed), the time frame in which a restored marsh reaches equilibrium and recovers post-construction, and the potential for future development and subsequent barriers to marsh migration. Attendees cautioned that using sea level rise alone to justify TLP could result in the "convenient disposal" of dredged material. As emphasized throughout the workshop, it is therefore necessary to consider a variety of factors that specifically target the restoration of deteriorating wetlands. In some cases, wetland loss may be driven by other stressors such as boat wakes and wave impacts. Wetlands susceptible to multiple stressors could benefit from protective measures other than TLP such as wave attenuating structures.

Lastly, attendees compared long-term TLP planning and implementation to beach nourishment and prescribed burns. Attendees suggested that once established, TLP could be incorporated into local resiliency plans to garner additional public support and funding from municipalities. Compared to beach projects, wetland change is typically slower and less obvious which could impact public perception or support. However, stakeholders could show a higher risk tolerance with TLP and associated uncertainties since candidate areas for sediment placement comprise a relatively small fraction of total wetland area across the state.

Question 4 Summary – Prioritizing Wetlands for TLP

How do we define a degraded wetland to justify thin layer placement of sediment. How do you prioritize wetlands for TLP, what does that look like?

Attendees agreed that characterizing a wetland as "degraded" may not be the most effective way to determine whether a site is a good candidate for TLP. Instead, practitioners should consider wetlands that are "at risk" of vegetation loss and ponding while also accounting for factors such as a site's proximity to existing infrastructure, the proposed dredge area and established migration corridors. Attendees also emphasized that just because a marsh is near a dredge area does not automatically make it a good candidate for TLP.

Evaluating regional status and trends of existing marshes is particularly important (e.g., natural conditions, future change, tidal ranges, salinity, ecology). For example, a highly developed region with many barriers to natural marsh migration (e.g., New Hanover County) may not benefit from TLP as much in the long-term compared to scarcely developed regions with higher migration potential (e.g. Hyde County). On the other hand, more developed regions could benefit more in the short term since options to enhance resilience are limited.

Conclusion and Next Steps

When evaluating the implementation of and trade-offs associated with TLP in North Carolina, workshop attendees highlighted the importance of clearly identifying the goals, objectives, purpose and need for these projects on a case-by-case basis – rather than as a catch-all approach – while considering the above topics on a specifically defined local or regional scale. As a result, a collaborative multi-agency network of stakeholders is most likely needed to progress TLP in a responsible manner.

The information gained from this workshop will be incorporated in and directly inform the 2026 CHPP amendment. TLP will be addressed as a stand-alone issue paper within the proposed Planning for Wetland Change thematic area. This paper will synthesize the best available science and guidance related to TLP, identify research needs and knowledge gaps, discuss policy, permitting, and regulations, and highlight concerns and best practices related to TLP that may collectively inform next regulatory steps and identifying priority areas where TLP may be successful in North Carolina.

APPENDIX A: WORKSHOP ATTENDEES

First Name	Last Name	Organization
Aaron	Bunch	The Nature Conservancy
Abby	Williams	NC Coastal Reserve
Ana	Zivanovic-Nenadovic	North Carolina Coastal Federation
Anne	Deaton	NOAA
April	Hall	North Carolina Coastal Federation
Billy	Standridge	USACE
Brandon	Puckett	NOAA
Byron	Toothman	NC Coastal Reserve
Caroline	Causey	USFWS
Carolyn	Currin	EA EST
Cat	Bowler	Audubon North Carolina
Catherine	Otero	NC DEQ Division of Water Resources
Cathy	Brittingham	N.C. Division of Coastal Management
Charlie	Deaton	NC DMF
Claire	Rapp	NC Coastal Federation
Daniel	Govoni	NC Division of Coastal Management
Derek	Detweiler	North Carolina Division of Marine Fisheries
Emily	Hughes	USACE
Gregg	Currey	Army Corps of Engineers
Gregg	Bodnar	NC DCM
Jacob	Boyd	NC Coastal Federation
Jenny	Davis	NOAA
Jonathan	Lucas	NC Division of Coastal Management
Justin	Ridge	NC Coastal Reserve & NERR
Kate	Jones	Atlantic Conservation Coalition (NCDNCR)
Kelsey	Beachman	Division of Coastal Management
Kristina	Hellinghausen	NC DWR
Lisa	Wickliffe	NOAA Fisheries
Mary	Plummer	DNCR Atlantic Conservation Coalition
Melanie	Flood	NC Natural Heritage Program
Michael	Meilinger	NC DEQ DWR
Michael	Schafale	NC Natural Heritage Program
Michelle	Brodeur	NC DMF
Michelle	Moorman	USFWS
Molly	Bost	NOAA
Paula	Gillikin	NCNERR
Richard	Mahoney	NC Division of Coastal Management

Sara	Ward	NC Dept. of Natural and Cultural Resources
Sarah	Marschhauser	Audubon North Carolina
Shane	Staples	Army Corps of Engineers
Stephen	Lane	NCDCM
Trish	Murphey	NC DMF
Whitney	Jenkins	NC Coastal Reserve
Zach	Harrison	NC DMF

APPENDIX B: WORKSHOP AGENDA

Thin-Layer Placement Coordination Workshop
to inform the Coastal Habitat Protection Plan (CHPP) update

Thin-layer placement of sediment (TLP) is a strategy to restore or maintain a tidal marsh's elevation relative to sea level, to support marsh resilience. The approach leverages a marsh's natural ability to withstand large, storm-driven sediment deposits. TLP mimics this natural process by applying layers of sediment, often dredged material, to the marsh's surface.

Date: Monday, March 30, 2026

Location: Duke University Marine Lab, Repass Lecture Hall, 135 Duke Marine Lab Rd, Beaufort NC 28516

Time: 10:00am - 3:00pm

Target audience: Resource agencies, researchers, restoration practitioners

Workshop Objectives – Participants will:

- Share and discuss the latest Thin-Layer Placement of sediment (TLP) research and project implementation best practices,
- Discuss state policies and challenges in assessing project proposals, and
- Identify information needs to inform policy and permitting.

Workshop Outcomes:

- Regulatory agencies can better assess the purpose, need, and habitat impacts/tradeoffs from proposed TLP projects,
- Researchers understand knowledge gaps and connect with restoration practitioners for potential study sites, and
- Resource managers incorporate perspectives presented into planning and policy through the CHPP.

Agenda

Time	Item
9:30am	Workshop check-in
10:00am	Welcome & Introductions
10:15am	TLP Research Overview – Jenny Davis, NOAA
10:55am	15-minute break

11:10am	Resource agency panel via Zoom • Sarah Bouboulis, DE Department of Natural Resources and Environmental Control • Tyler Kinney, NJ Department of Environmental Protection • Maggie Cavey, MD Department of Natural Resources • Jan Mackinnon, GA Department of Natural Resources
12:10pm	TLP – Tasty Lunch Provided! Thank you, NC Coastal Federation!
1:00pm	Small group discussion • What are your biggest concerns about sediment placement? • What do we need more information on to use sediment placement to increase marsh resilience? • These projects are happening in a changing ecosystem – how should we evaluate tradeoffs between current environmental impact and project longevity? • How do we prioritize wetlands for thin-layer placement of sediment?
2:45pm	Action Items & Next Steps
3:00pm	Adjourn

APPENDIX C: RESEARCH OVERVIEW AND STATE RESOURCE AGENCY PANELIST SLIDES

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Beneficial Use of Sediments for Habitat Restoration & Creation

Jenny Davis
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There are many options for beneficially using dredged sediments to reverse/offset estuarine habitat loss

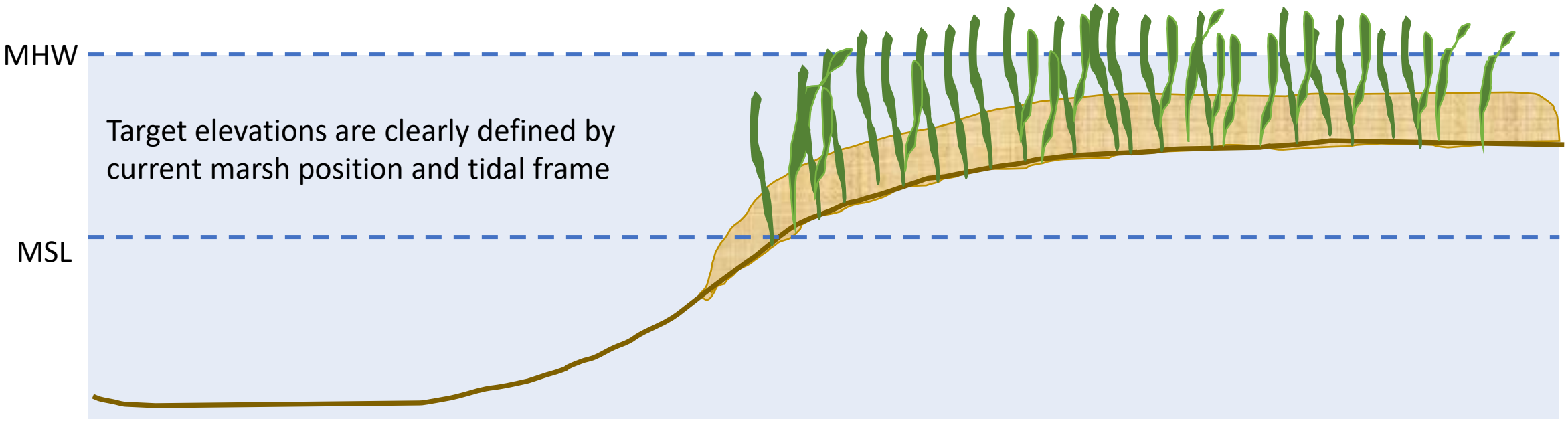
1 . Thin Layer Placement – add elevation to deteriorating marsh to create more suitable conditions for marsh plant growth

2. Thick Layer – creation of intertidal or upland habitat where it doesn't currently exist, or restoration that involves conversion to a different habitat type than what is present

3. Strategic placement – placement in nearshore and letting waves and tides distribute aka sand motor/mud motor

Thin Layer Placement

Done with the goal of elevating an existing wetland to an elevation that is **less vulnerable** to SLR, **but still within** wetland growth range

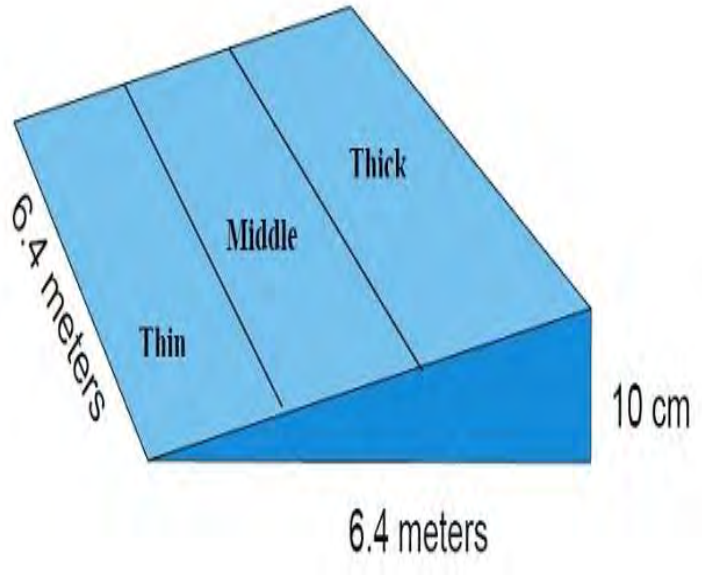


Appropriate for marshes that are very low in the tidal frame and therefore most at risk from SLR, target elevations are dictated by tidal datums (*need a very local and up to date assessment)

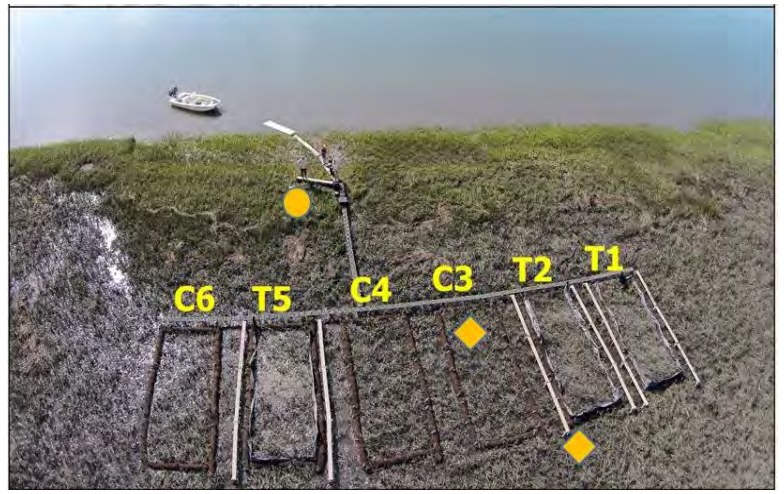
Thin Layer Placement in NC

Gull Rock – Wilbur 1992

Masonboro Island - Croft et al 2006



Freeman Creek - Davis et al 2019



Adding thin layers of sediment results in short-term disruption of marsh processes and long term benefits to marsh resilience

Thin Layer Placement Challenges

1. Application
2. Application
3. Application….

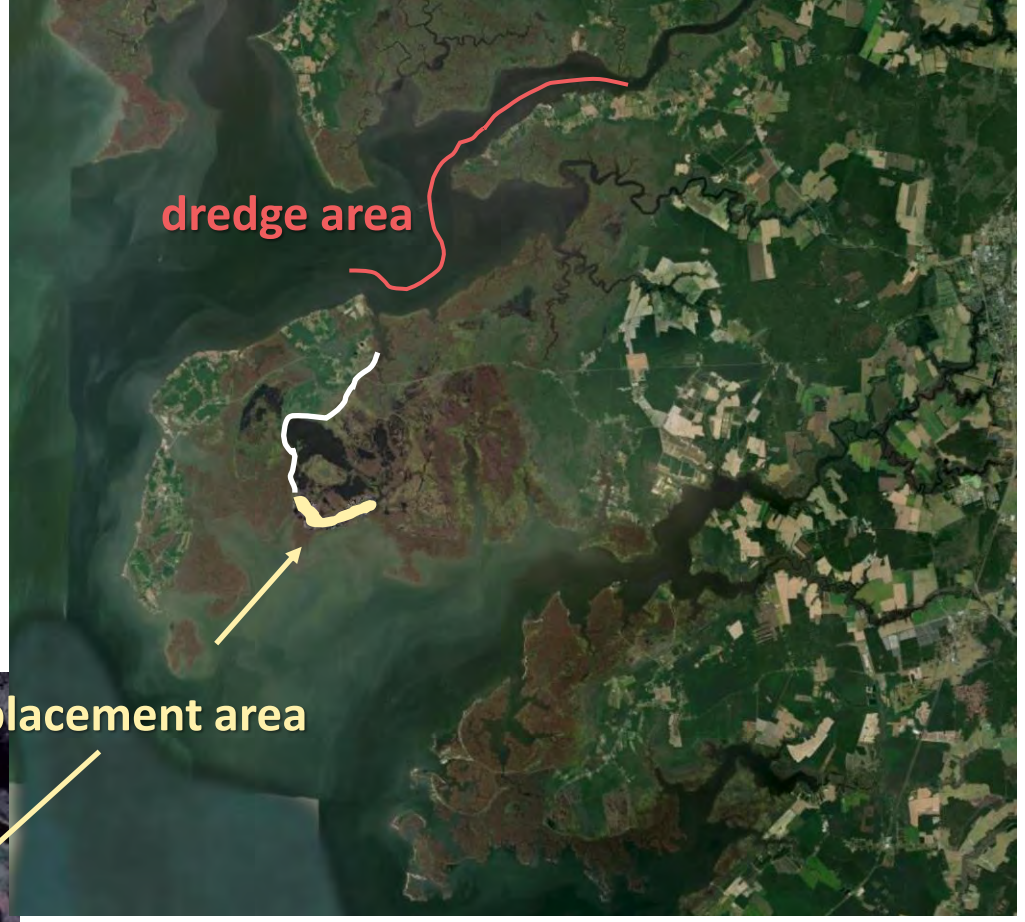
spreading a thin and somewhat consistent layer of sediment over a large area of marsh is not easy

Thin Layer Case Study
Deal Island WMA, MD

~167,000 yd^3, 72 acres, completed 2024

Goal: raise majority of the platform to high marsh elevation

Site access was challenging due to limited nearshore depth and presence of SAV



Ultimately, sediments were pumped across land 14 miles to placement site (this is expensive…)

Ecological Design Considerations

Fine-grained sediments distributed by sheet flow across the marsh platform

Placement depths up to 18 inches

Straw bale containment along full southern extent (~30,000 bales)

Hand planting of > 700,000 plants over two growing seasons (to discourage invasives)

Outcomes & Lessons learned

The straw bales were effective where their structure wasn’t compromised

Ecological Outcomes & lessons learned

The vegetative response is very dynamic in the early years (and in this case, likely influenced by nutrients in the deposited sediments)

Black Needlerush remained standing and appeared to be relatively resilient to the added sediments

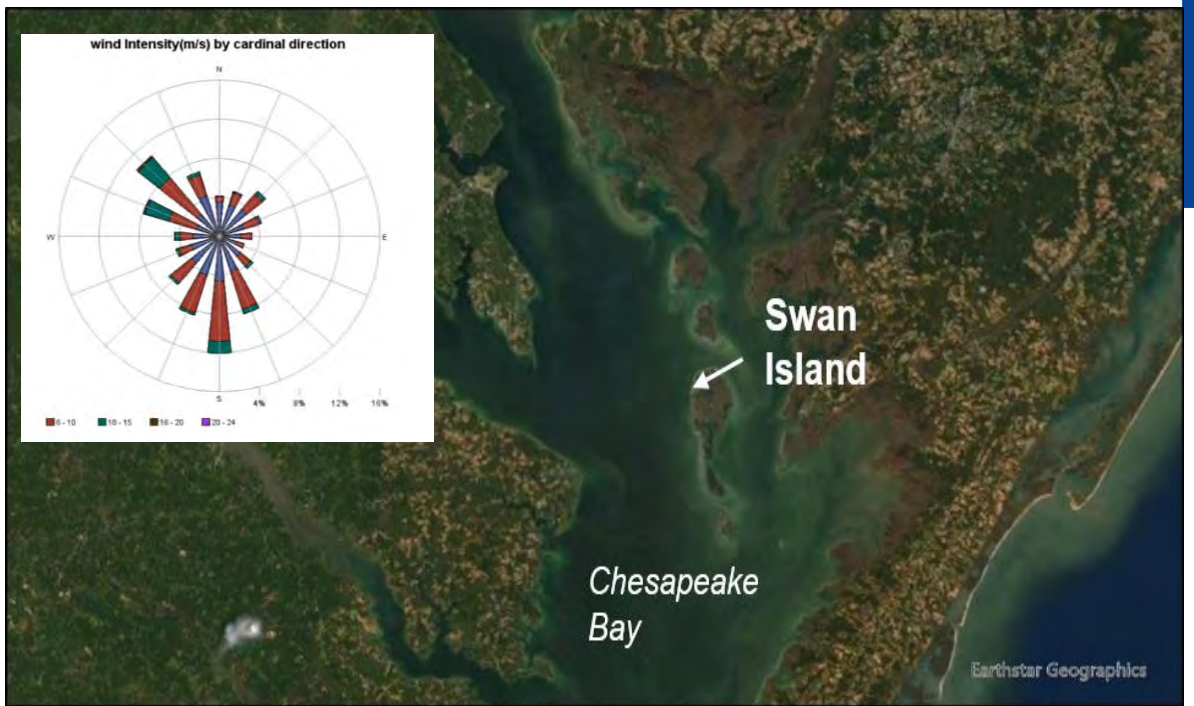
Ecological Outcomes & lessons learned

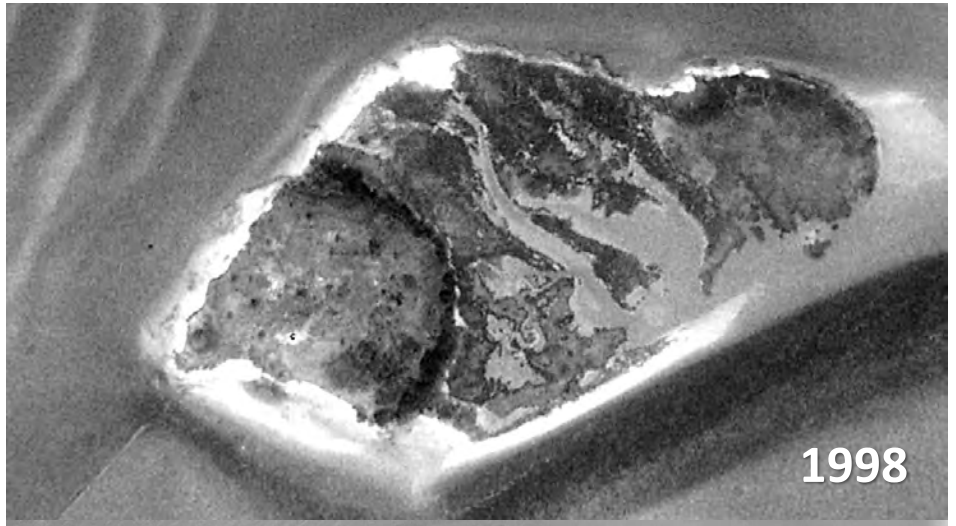
The vegetative response is very dynamic in the early years (and in this case, likely influenced by nutrients in the deposited sediments)

* It can take several years to reach equilibrium

Thick Layer Case Study: Swan Island, MD

~60,000 yd^3,12 acres, completed in 2019





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EWN Engineering With Nature

US Army Corps of Engineers® Baltimore District

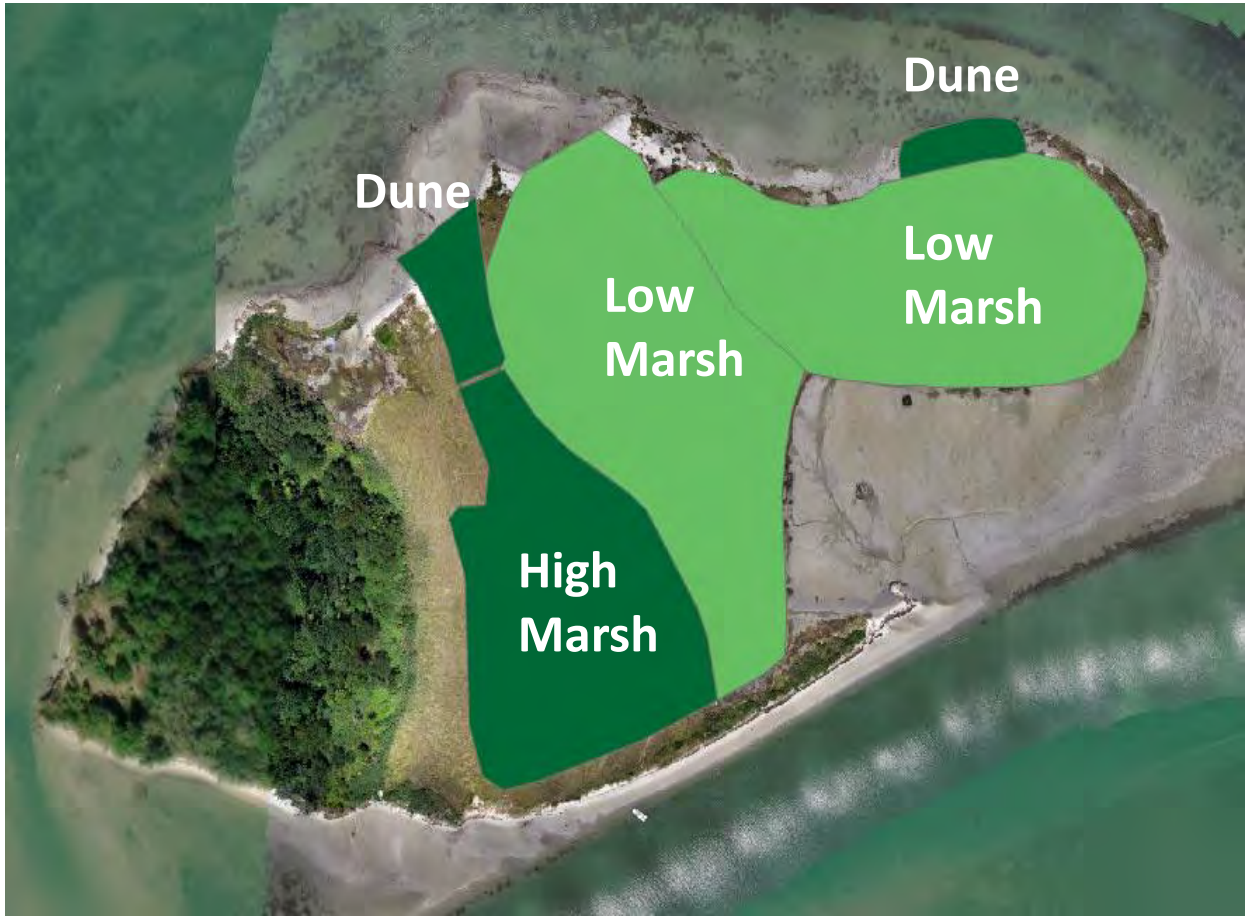
Ecological Design Considerations

Placed depth from a few cm to > 1 m (much of the existing veg would be buried)

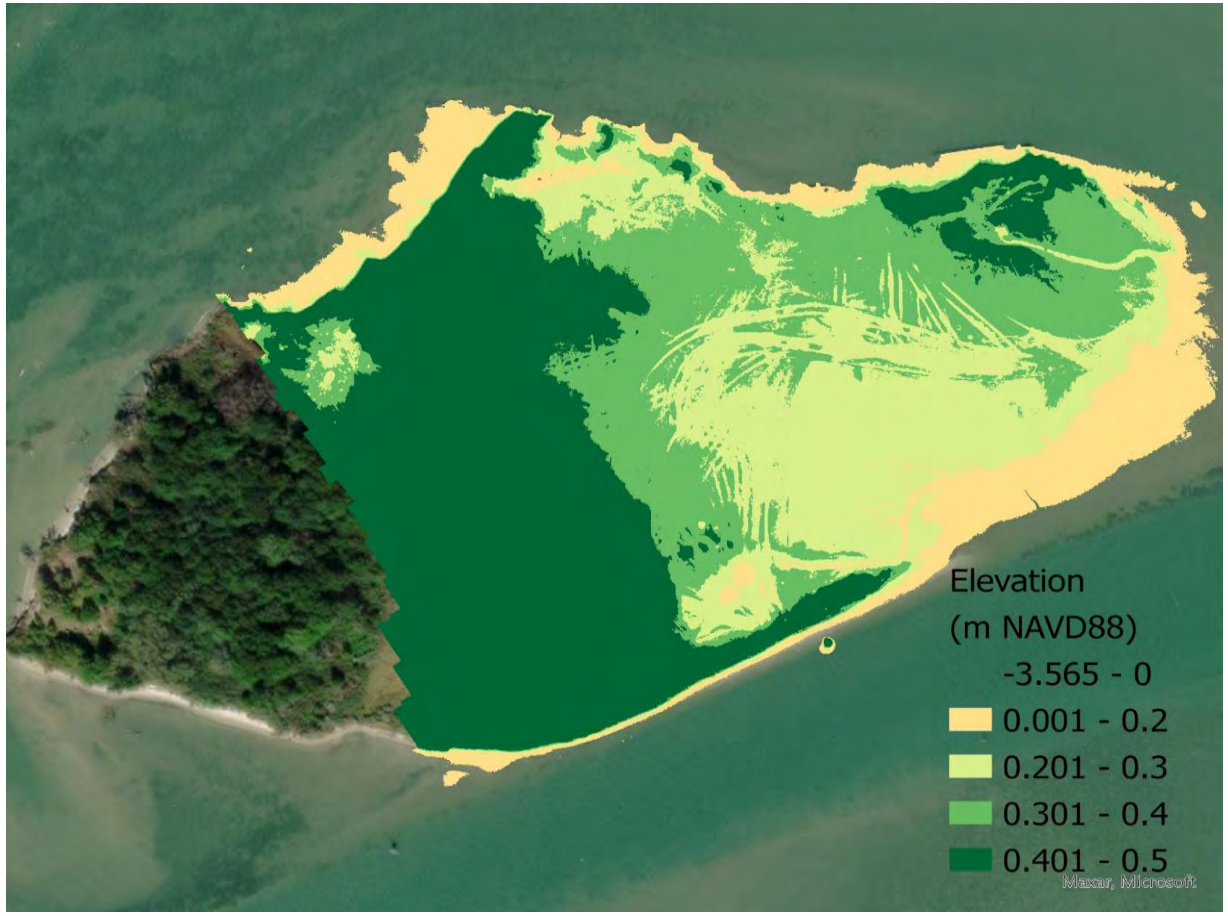
Revegetation by hand planting (~ 200,000 plants)

Coir log containment structure to protect SAV beds

Intended



As-Built

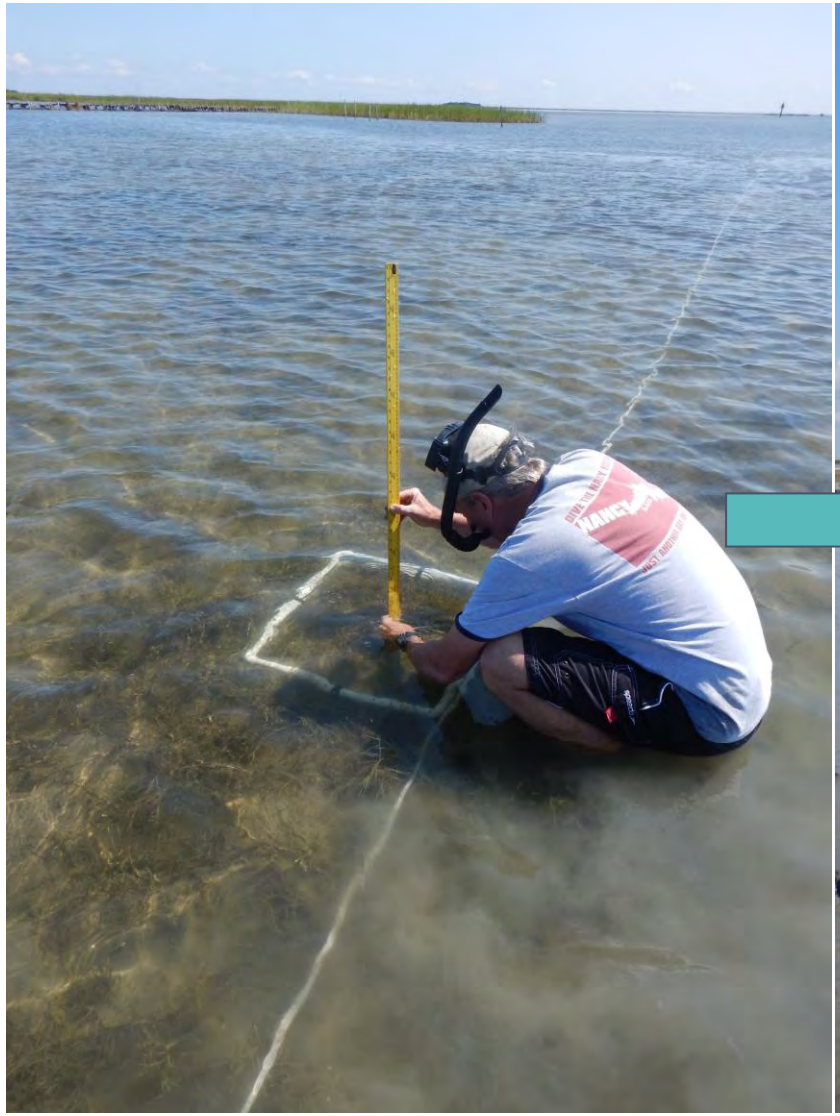


2017 – before sediment application

2019 ~ 6 months after completion

Ecological Outcomes & lessons learned

Its really hard to contain fine sediments (but having a fresh containment structure helps)

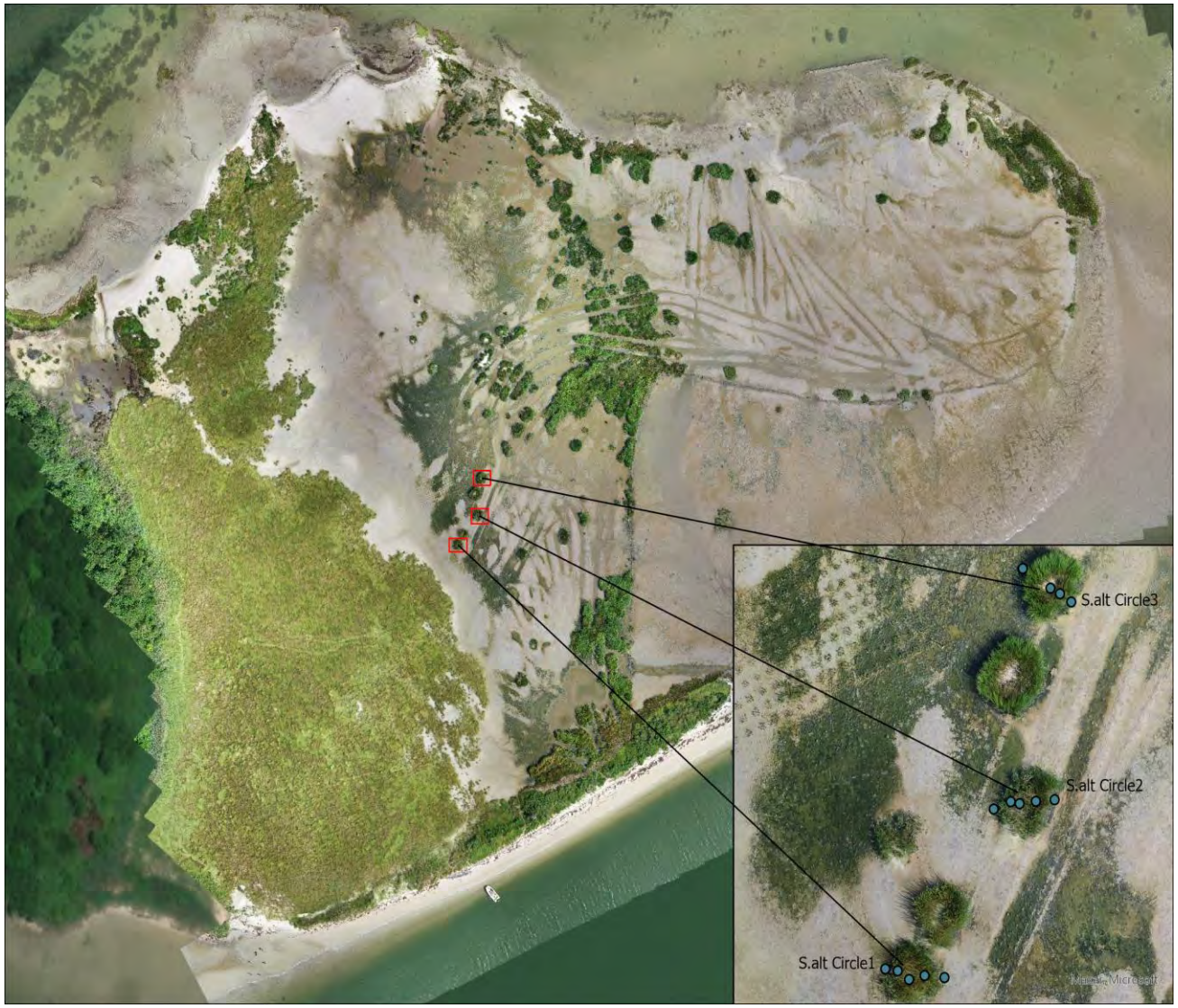


Ecological Outcomes & lessons learned

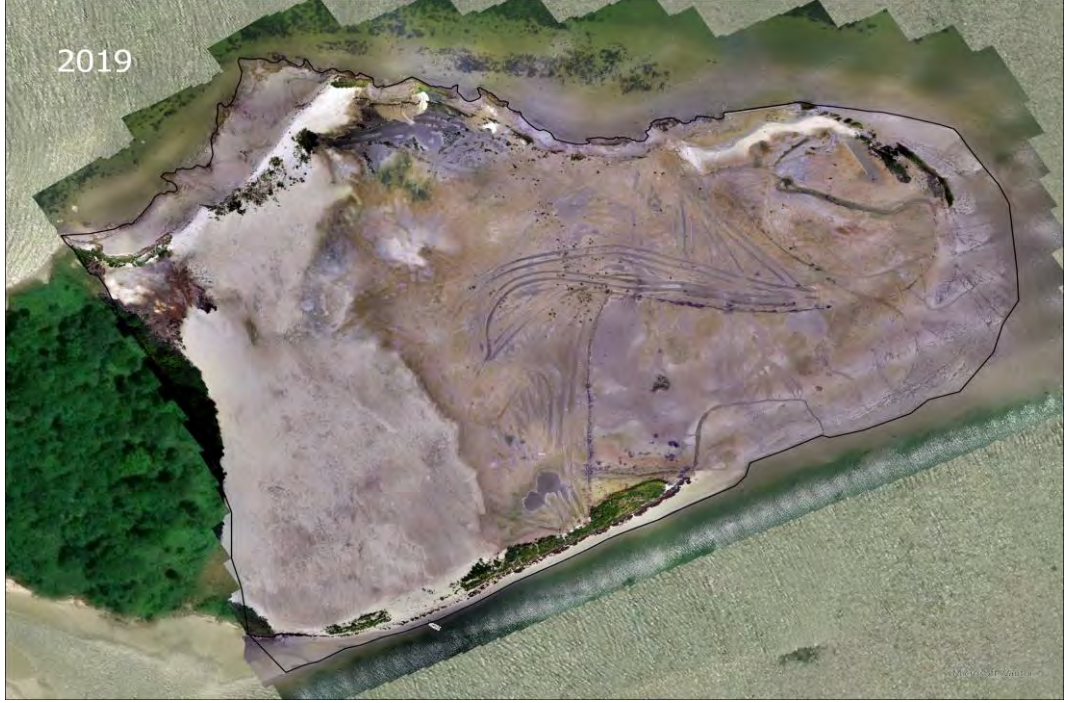
Vegetative establishment is critical (and challenging)

Ecological Outcomes & lessons learned

Vegetative establishment is critical (and challenging)



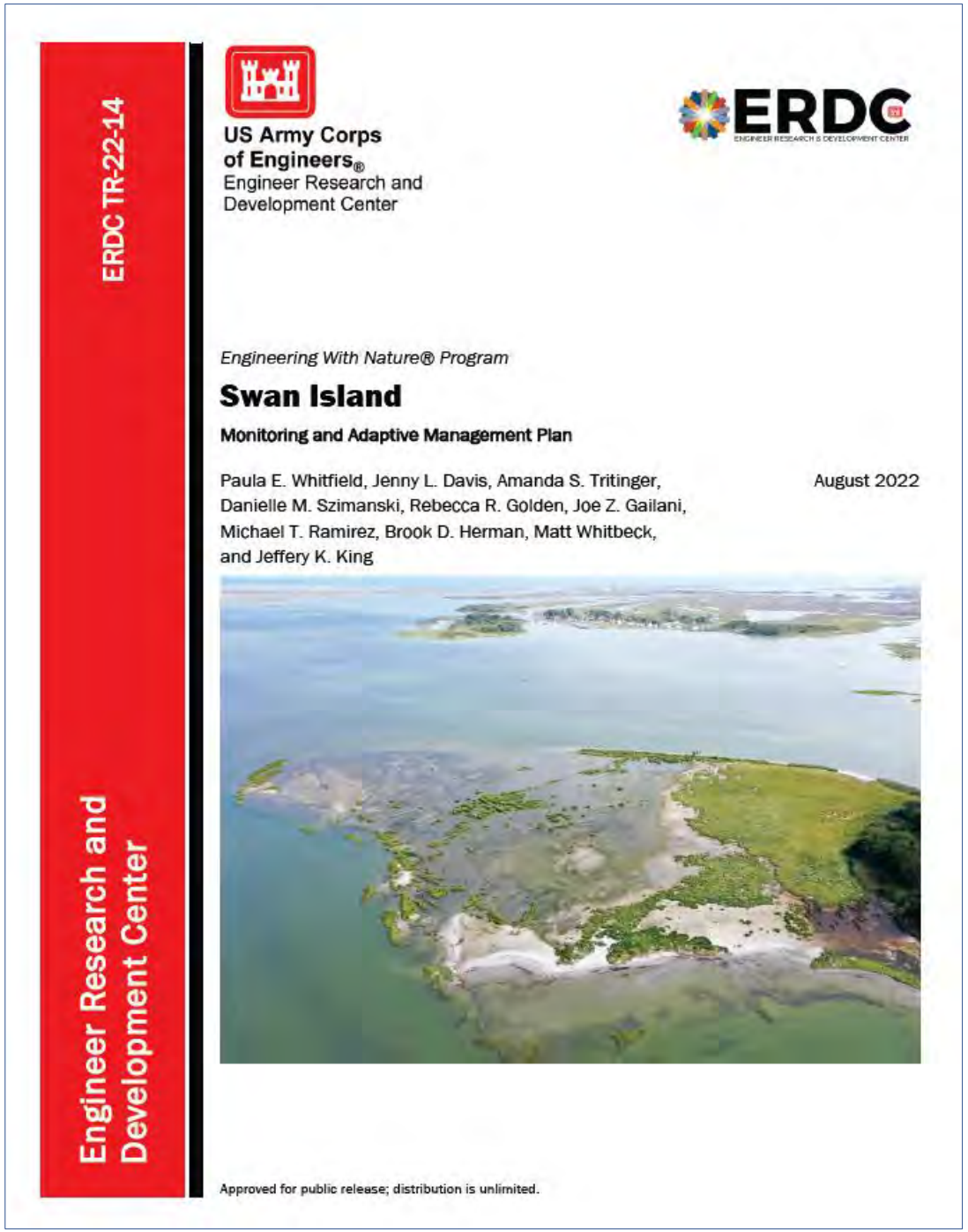
S. alterniflora mounds are 20-30 cm higher in the middle


2019


2023


2021


2025



Establish Performance Thresholds

Metric	Performance Criteria	Adaptive Action
Vegetative % Cover	Vegetation in planting zones spreads to 50-75% total coverage	Replant failing areas, consider different species if elevations have changed
Sediment Surface Elevation	Elevations remain in appropriate range (or greater) for designed habitat type	Add additional sediment if elevations fall below desired ranges
Shoreline Position	Maintain designed shoreline position over time	Implement living shoreline and/or rebuild shoreline with additional sediment & planting

And most importantly identify a source of funding to support corrective action

Best Practices for BU Projects

- Design for sediment leakage and plan/budget for **additional fortification** of containment structure

- If the project involves planting, plan/budget for **replacing *at least* 50% of plants** by year 2 post-placement

- If present, attempt to **control invasives** before placement

- **Develop a MAMP** to guide the need for corrective action – this should have a temporal component

- Consider a **range of acceptable outcomes**, the project probably won't look like the brochure

Closing Thoughts

Offshore & Upland disposal of dredge material deprives marshes of sediment that is critical for their survival = missed opportunity

Habitat tradeoffs are inevitable

No two BU projects are the same, and success is never guaranteed BUT… there is a wealth of previous experience to guide project development

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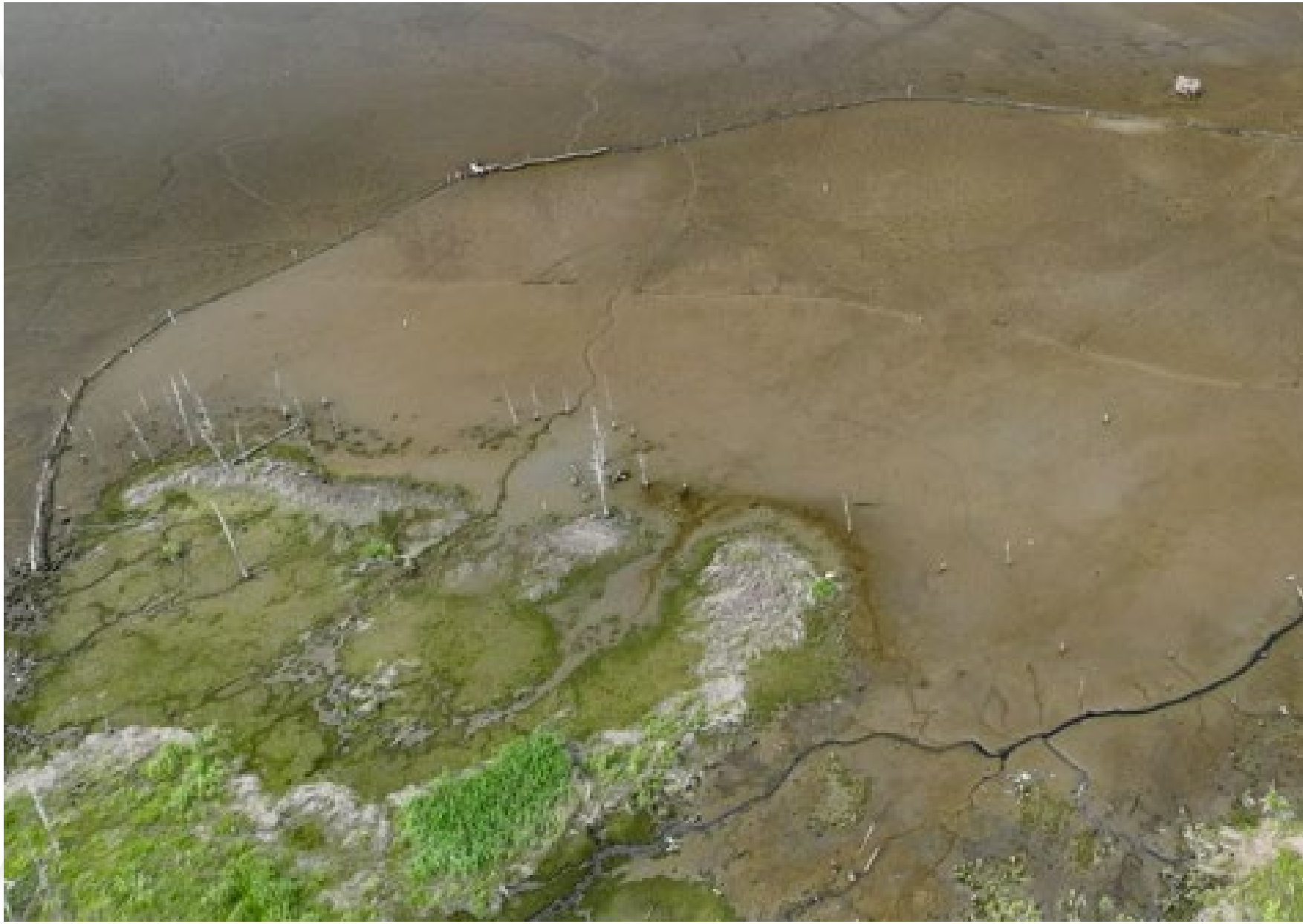
Delaware Dredge Material Management

DELAWARE DEPARTMENT OF
NATURAL RESOURCES AND
ENVIRONMENTAL CONTROL

Topics

- Dredge/BU Workgroup
- Dredge Material Management Plan
- Dredge Regulation Framework



THE BIG THREE

STRATEGIC ALIGNMENT FOR BENEFICIAL USE

NEW JERSEY DEP
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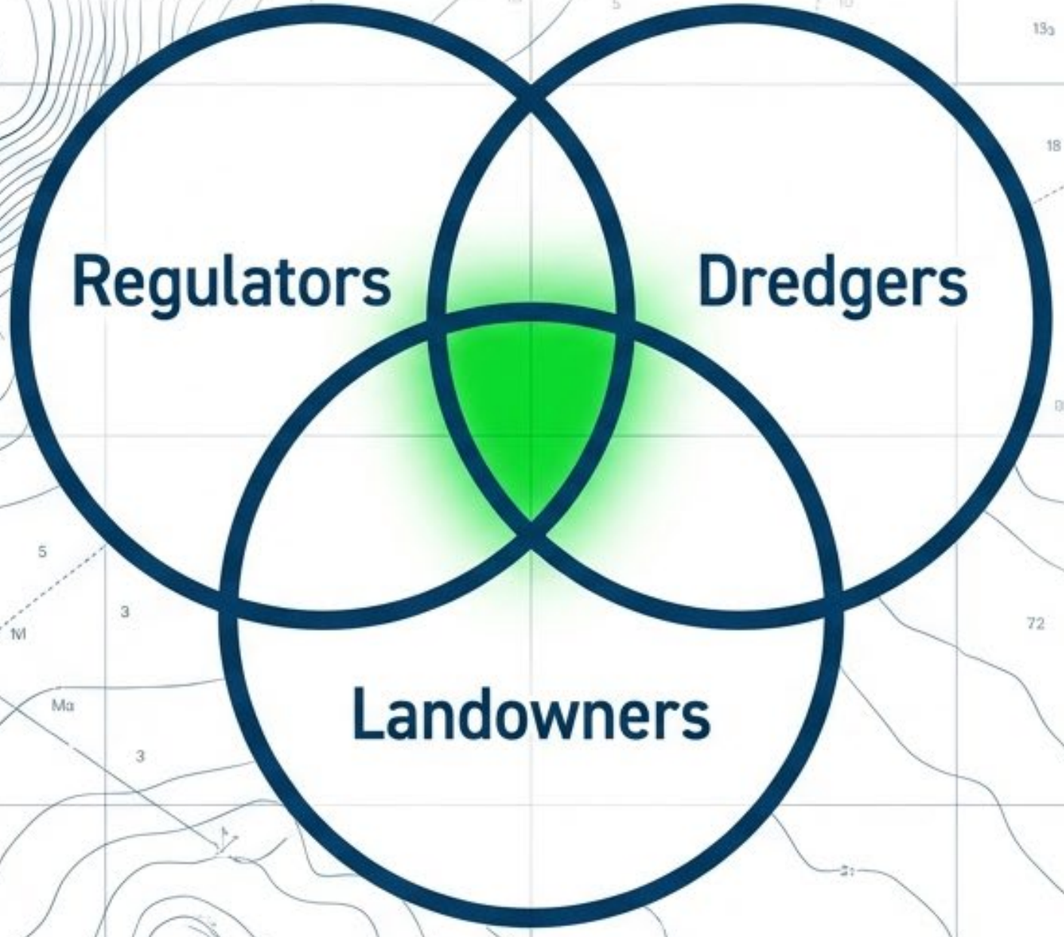
Getting Beneficial Use Off the Ground

This is not a science problem — it's a coordination problem.



Programs succeed or fail based on alignment between the "Big 3" Stakeholders:

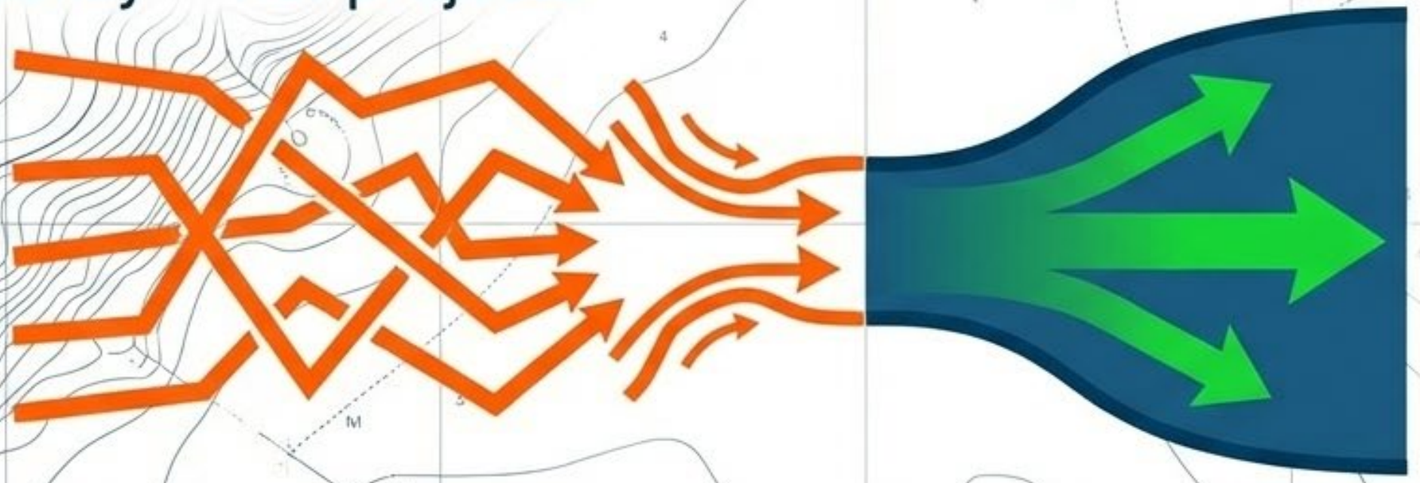
If these three aren't aligned, nothing scales

Getting Beneficial Use Off the Ground

Step 1: Regulatory Permission

Barrier vs. Pathway

Prioritize policy — not projects



Establish programmatic / general permits early

Define clear sediment standards (“clean enough”)

> **If every project requires a permit battle — the program will fail**

Solution:

Step 2: Dredge Teams

Environmental need leads the way — but acknowledge your constraints.

Identify Dredgers needs in NC

Plan to maximize value to Dredge Teams

Dredge Teams MUST collaborate in project design to ensure constructability.

If beneficial use adds friction — it won't scale.

If it removes friction — it becomes the default

Solution: Establish buy-in by identifying Dredge Team needs. Lead with restoration need but facilitate a good relationship. Emphasize project level participation.

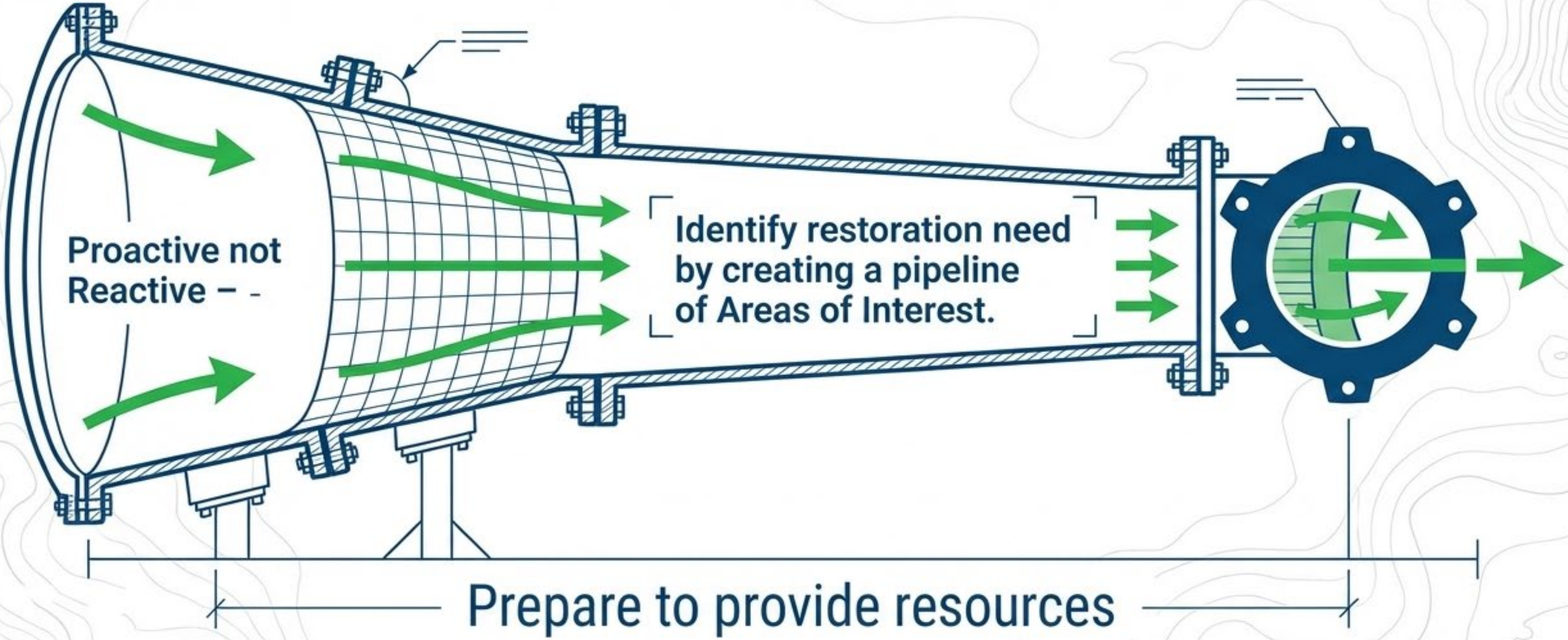
Dredge Team + Habitat Team = Restoration Team

Step 3: Landowners (Habitat Team)

Start with state and federal government landowners (scale + mission + consistency)

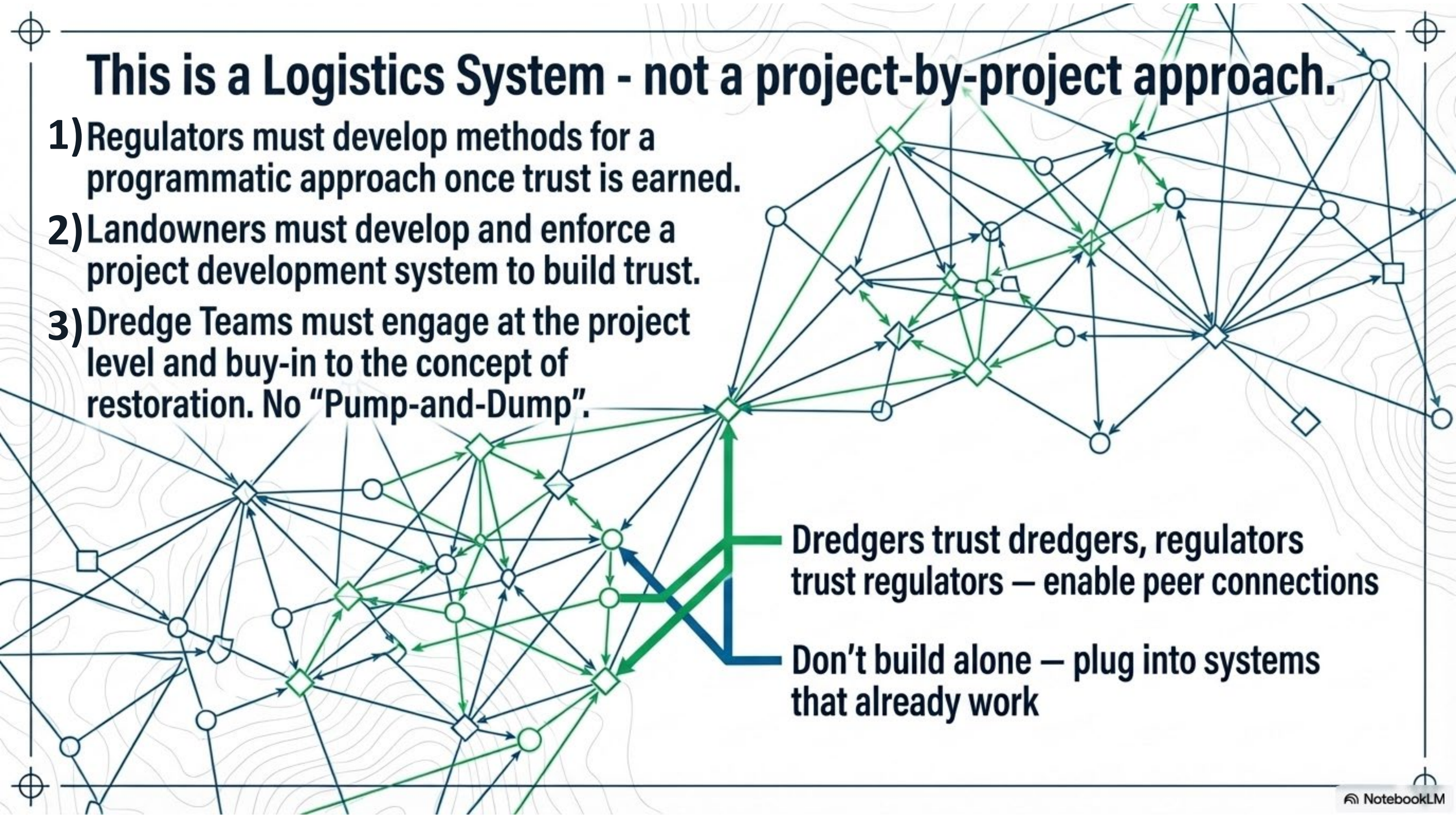
Landowners are best suited to lead Habitat Teams – support from conservation partners.

Landowners should own the system and coordination of projects.



This is a Logistics System - not a project-by-project approach.

1) Regulators must develop methods for a programmatic approach once trust is earned.
2) Landowners must develop and enforce a project development system to build trust.
3) Dredge Teams must engage at the project level and buy-in to the concept of restoration. No “Pump-and-Dump”.



Dredgers trust dredgers, regulators trust regulators — enable peer connections

Don’t build alone — plug into systems that already work

Tyler Kinney, Coastal Biologist

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NEW JERSEY DEP
Fish and Wildlife

The Maryland Blueprint – Scaling Up TLP and BU

North Carolina Thin-Layer Placement Coordination Workshop

March 2026

Maggie Cavey, M.Ed., *Beneficial Use Planner*
Maryland Department of Natural Resources

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Beneficial Use Toolkit

The Rulebook: IRBU Guidance Document

Maryland
Department of the Environment

Maryland Department of the Environment
in collaboration with
Maryland Department of Transportation
Maryland Port Administration

Innovative Reuse and Beneficial Use of Dredged Material
Guidance Document

December 2019

Maryland Department of the Environment
1800 Washington Boulevard | Baltimore, MD 21230 | www.mde.maryland.gov | 410-537-3000

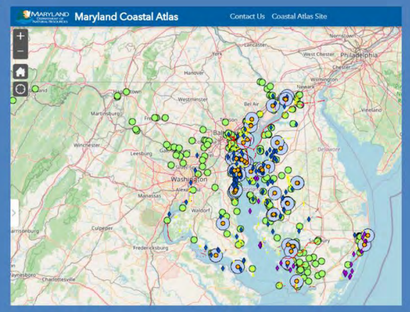
The Manual: The BU Playbook

Coming Soon!

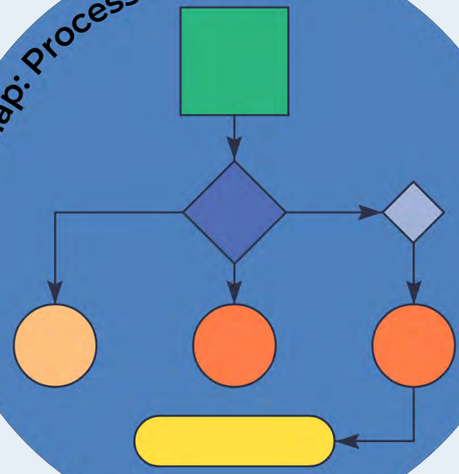
The Human Resource

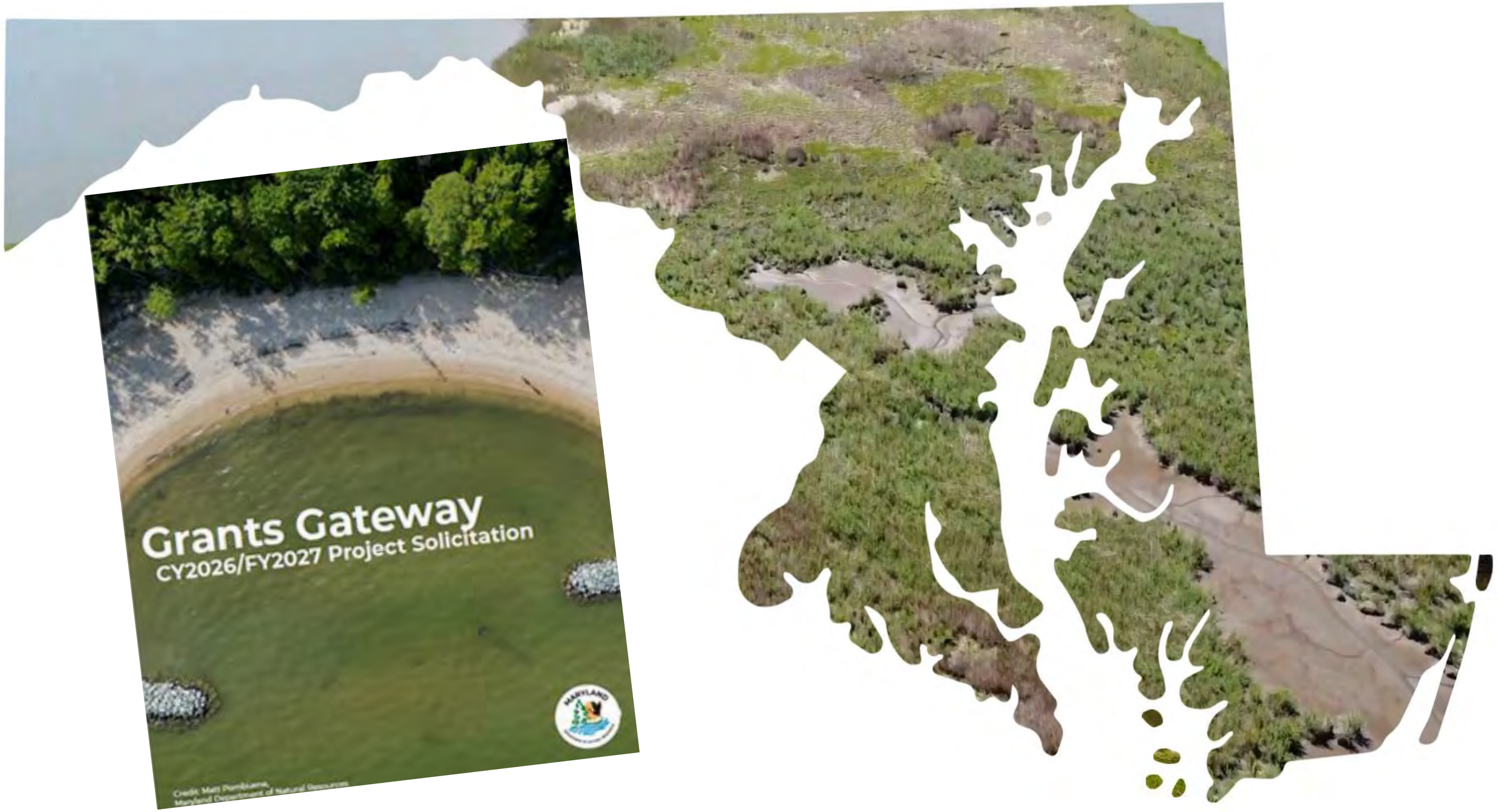
Maggie Cavey, MD DNR, Beneficial Use Planner

The Digital Matchmaker: The BUILD Tool



The Roadmap: Process Diagrams




Grants Gateway
CY2026/FY2027 Project Solicitation
Credit: Matt Pemboume,
Maryland Department of Natural Resources

A Marsh That Can Keep Up

Helping wetlands rise with the tide

What Is Happening Here

We carefully place just a few inches of sediment across the marsh surface. This small lift helps wetlands stay healthy, resilient, and alive in a changing climate.

This *Thin Layer Placement project* at **the Chesapeake Bay Environmental Center** helps restore marsh health, support wildlife habitat, and strengthen the shoreline for the future. Partners work together to plan, design, place sediment carefully, and study how the marsh responds.

CBEC Chesapeake Bay Environmental Center

Why Do Healthy Wetlands Matter?

Protect Communities
Marshes slow waves and reduce flooding during storms.

Keep Water Clean
Marsh plants filter pollution before it reaches rivers and the Bay.

Support Wildlife
Marshes provide nursery habitat for crabs, fish, birds, and terrapins.

Build Climate Resilience
Marshes store carbon and grow upward as conditions change.

Imagine this marsh in 5 years.
Will it be taller? Wetter? More full of life?

How It Works

1. Sediment is collected from nearby waterways.
2. It's transported to the marsh and spread in a thin layer.
3. Plants grow back up through the sediment.
4. Wildlife returns, and the marsh keeps pace with rising water.

Who Lives Here

[images/graphics from] Integration and Application Network (ian.umces.edu/media-library).

Learn More About CBEC
SCAN HERE

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Sediment isn’t a waste— it’s an opportunity to build resilience.

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Thank you!

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

Jekyll Creek Thin Layer Placement

Jan Mackinnon

https://coastalgadnr.org/JekyllCreek

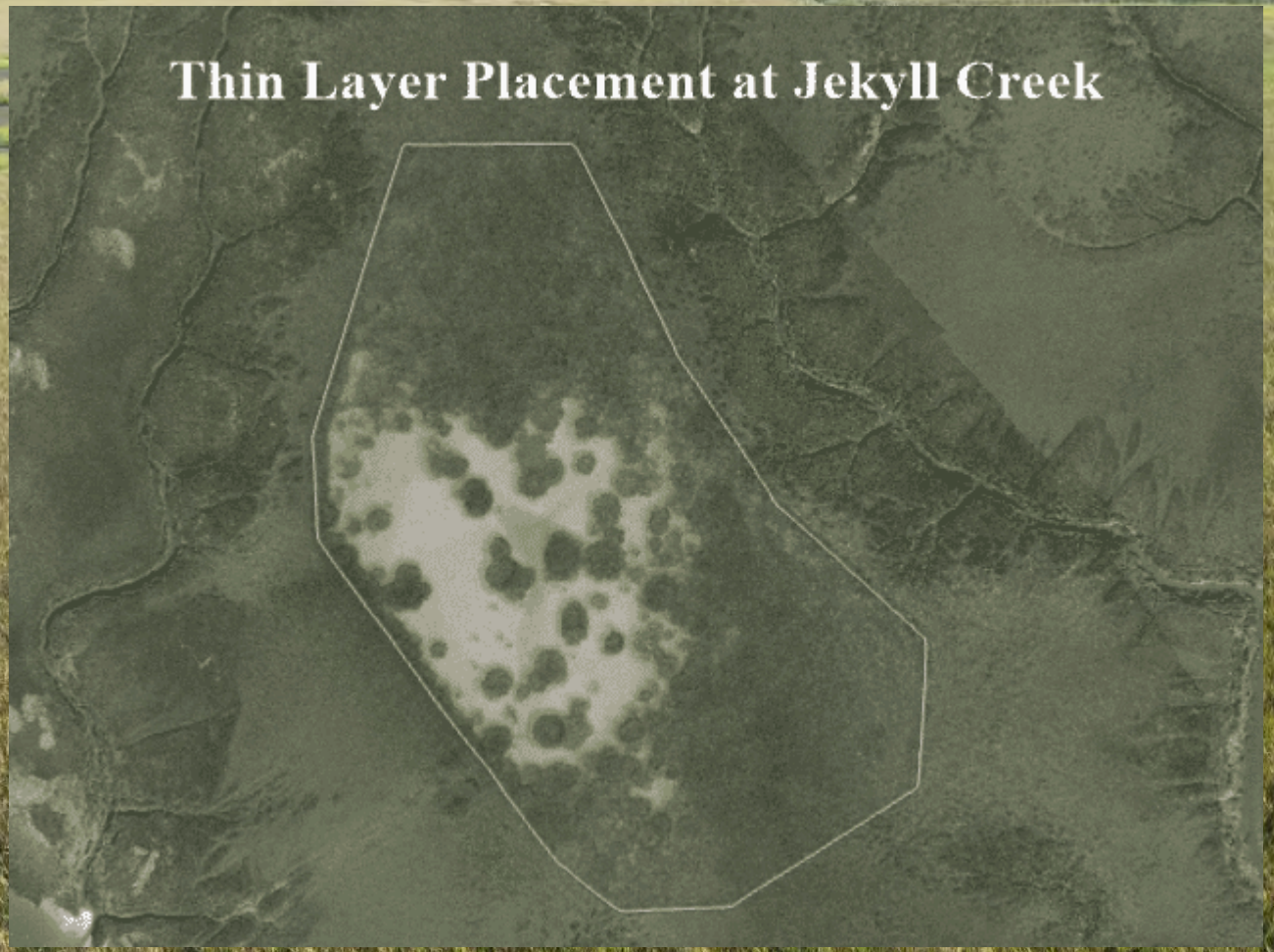
See presentation animations here: https://dnr.box.com/s/c5m1h119clghp3ubirper534foec5e3b

Project Specs

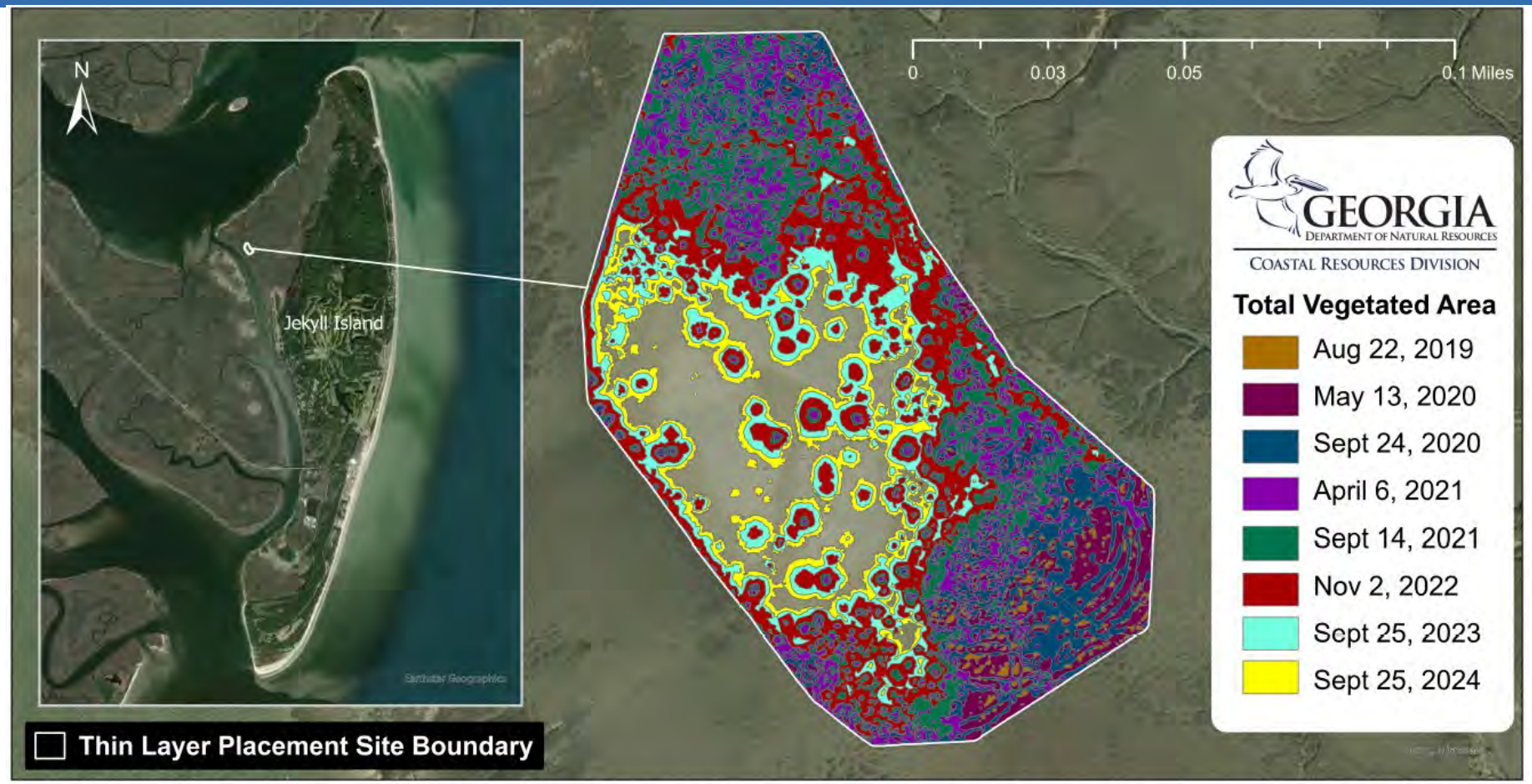
- 125,000 cubic yards total
- 5,000 cubic yards to TLP
- Dredged only eastern half of Jekyll Creek
- 5 acre TLP placement site
- 5 acre reference site
- Pumping by pipe, not rainbowing

Construction - 2019

2019-2024 post placement above ground regrowth



Above Ground Biomass



Flight Date	Total Vegetated Area (m^2)	Percent of TLP Site Vegetated	Change in area vegetated since previous flight (m^2)
22-Aug-19	261.7	1.20%	0
13-May-20	1,707.9	7.80%	1,446.2
24-Sep-20	4,237.2	19.30%	2,529.3
6-Apr-21	6,945.6	31.60%	2,708.4
14-Sep-21	9,992.7	45.40%	3,047.1
2-Nov-22	14,334.2	65.20%	4,341.5
25-Sep-23	16,693.7	75.90%	2,359.5
25-Sep-24	18,498.3	84.10%	1,804.6

Thin Layer Placement at Jekyll Creek

This map visualizes the change in total vegetated area at a thin layer placement (TLP) site along Jekyll Creek in Jekyll Island, GA from August 2019 to September 2024. Unmanned Aerial Systems (UAS) were deployed by GA DNR Coastal Resources Division to monitor the site. Once aerial images of the site was collected, GIS staff hand digitized vegetation areas to monitor change overtime.

PCS: NAD 1983 2011 StatePlane Georgia East FIPS 1001 Ft US
Map Created By: Tyler Cooper-Kolb