APPENDIX E

A Workshop on the Beneficial Use of Dredge Materials for Resilient Tidal Marsh Restoration and Creation

Report on Workshop Proceedings
September 28, 2017
The Maritime Aquarium, Norwalk, CT

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The University of Connecticut and Connecticut Institute for Resilience and Climate Adaptation (CIRCA) organized a free workshop on the Beneficial Use of Dredged Materials for Resilient Tidal Marsh Restoration and Creation on September 28, 2017 at the Maritime Aquarium in Norwalk, CT. The workshop brought together case study presentations of projects from Rhode Island, New York, and New Jersey, and a feasibility study for the State of Connecticut. Project planning, design, permitting, implementation and monitoring were discussed by representatives from fellow state and federal regulatory agencies, funding organizations, and researchers. The workshop was designed to provide opportunities to network with fellow mangers while sharing lessons learned, and to build future collaborations.

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Acknowledgements

We would like to thank the planning committee for their time and effort to make this workshop a success. The planning committee members include:

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Workshop Background

Creating and restoring marshes along shorelines has the potential to enhance both ecosystem resilience and provide green infrastructure to better protect communities from the impacts of flooding and sea level rise. Recently the use of dredged sediments for the creation and restoration of tidal marshes was piloted in the northeast and mid-Atlantic coastal states as a resilience strategy, particularly after Superstorm Sandy impacted the region. While information on these projects is being shared locally, there remains a need to increase collaboration and share resources and project experiences across state and regional boundaries.

The UCONN Department of Marine Sciences and UCONN CIRCA hosted the workshop on the *Beneficial Use of Dredged Materials for Resilient Tidal Marsh Restoration and Creation*. The workshop brought together case study presentations of projects from Rhode Island, New York, and New Jersey, and a feasibility study for the state of Connecticut. Project planning, design, permitting, implementation and monitoring were discussed by representatives from fellow state and federal regulatory agencies, funding organizations, and researchers. The workshop was designed to provide opportunities to network with fellow managers while sharing lessons learned, and to build future collaborations.

The three Major Goals of the Workshop include:

Framing of cross-regional collaboration of Mid-Atlantic/New England Regions, including a comparison across federal regions.

Identification of resources with an emphasis on networking and information sharing.

Models for resilient and sustainable restored and created wetlands using dredged sediments to address barriers for implementation of projects.

Workshop Participants

Name	Organization
Alison Verkade	NOAA Fisheries
Alyssa Gavlik	NROC
Angela Padeletti	Partnership for the Delaware Estuary
Avalon Bunge	The Maritime Aquarium at Norwalk
Brian Thompson	CT DEEP
Caitlin Chaffee	Rhode Island Coastal Management Resource Council
Caitlin Frame	NYSDEC
Carolyn A. Lin	UConn
Colleen Dollard	UCONN CIRCA
Cori M. Rose	US Army Corps of Engineers, Regulatory Division
Craig Tobias	UCONN – Dept. of Marine Sciences
Damian Holynskyj	GreenVest, LLC
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Patricia Pechko	USEPA - Region 2 - Dredging, Sediment and Ocean Section
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Peter Spangenberg	CTDEEP
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Sam Whitin	EA Engineering, Science, & Tech
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Stewart Hudson	Audubon - CT
Suzanne Dietrick	NJDEP
Thomas Naiman	The Maritime Aquarium at Norwalk
Walker Golder	National Audobon

Workshop Agenda

A Workshop on Beneficial Use of Dredged Materials for Resilient Tidal Marsh Restoration and Creation

September 28, 2017 11:00am to 3:50pm
The Maritime Aquarium, Norwalk, CT

Agenda

10:30 – 11:00 AM	Participant Registration
11:00 – 11:15 AM	Welcome and Workshop Overview (Brian Thompson, CT DEEP, Rebecca French, UCONN CIRCA)
11:15 – 11:45 PM	Case Study: Ninigret Rhode Island (Caitlin Chaffee, RI CRMC)
11:45 – 12:15 PM	Case Study: New Jersey Projects (Metthea Yepsen - NJDEP)
12:15 – 12:30 PM	Facilitated Discussion of Case Study Findings
12:30 – 1:30 PM	**Working Lunch – "Tables of Interest"**
1:30 – 2:15 PM	Panel Discussion: Project Partners Panel (USACE, Sacha Spector - Doris Duke Foundation, Walker Golder - Audubon, Jim Turek – NOAA, Larry Oliver – USACE – NE District)
2:15 – 2:45 PM	Case Study: Jamaica Bay, New York (Lisa Baron and Peter Weppler, USACE - NY District)
2:45 – 2:55 PM	**Break**
2:55 – 3:25 PM	Connecticut – Status of the Feasibility Assessment (Jennifer O'Donnell, UCONN Dept. of Marine Sciences)
3:25 – 3:35 PM	Facilitated Discussion of Case Study Findings
3:35 – 3:50 PM	The Way Forward (Carolyn Lin, UCONN Dept. of Communications)

Welcoming Remarks

Beneficial Use of Dredged Materials for Resilient Tidal Marsh Restoration and Creation

Dr. Rebecca French, of UCONN CIRCA, and Brian Thompson, Director of the Land and Water Resource Division within the Bureau of Water Protection and Land Reuse of the Connecticut Department of Environmental Protection (CTDEEP) provided opening remarks for the Workshop.

French welcomed all participants to the workshop and acknowledged the planning committee that supported the development of the workshop. She described the basis for concern due to sea level rise projections increasing the baseline for storm surge. These conditions have implications for coastal communities and natural resources. French identified the UCONN Marine Sciences Project hypothesis that "Creating and restoring marshes along shorelines has the potential to enhance both ecosystem resilience and provide green infrastructure to better protect communities from the impacts of flooding and sea level rise." Natural infrastructure can provide storm protection benefits. Integration of multiple natural habitats with hybridized solutions can provide coastal protection through multiple lines of defense. The question becomes, can we create these solutions with dredged sediment? French reviewed the Workshop Goals:

1. Framing of cross-regional collaboration of Mid-Atlantic/New England Regions, including a comparison across federal regions.
2. Identification of resources with an emphasis on networking and information sharing.
3. Models for resilient and sustainable restored and created wetlands using dredged sediments to address barriers for implementation of projects.

Brian Thompson overviewed why CTDEEP cares about the topic of beneficial reuse of dredged material for resilient tidal marsh restoration. He described the Coastal Management Program for the state of Connecticut, and the interest in using dredged material to build resilience within coastal areas. Habitat and wetland restoration is an important issue within the state.

The challenges the state of Connecticut is facing from the perspective of coastal resilience, can be seen through the impacts caused by Hurricane Irene in 2011, and Hurricane Sandy in 2013. Housing on the coastline of Connecticut was not appropriately elevated and designed to withstand severe storm impacts, particularly when taking into account sea level rise projections. Coastal resources, including marshes and beaches are degrading due to adjacent land use, including placement of hard structures such as groins or seawalls or intense development within the coastal region and conditions associated with a changing climate.

Open water disposal dominates dredged material management in Connecticut. Dredged materials are dominated by fine-grained materials that may not be suitable for alternative reuse or disposal options. The Final Long Island Sound Dredged Material Management Plan (LIS DMMP) and Final Programmatic Environmental Impact Statement (PEIS) were completed on January 11, 2016. The LIS DMMP identifies a wide range of alternatives to open-water disposal and recommends standards and procedures for determining which alternatives to pursue for different dredging projects. Connecticut 's situation demonstrates a continued need for dredge material disposal projected over a 30-year period in Long Island Sound.

The multiple challenges faced by coastal Connecticut also provide opportunities. Restoration of coastal resources, including marshes and beaches and use of nature-based solutions, have inherent benefits for the resilience of coastal areas. Currently, dredged materials management, coastal resource restoration initiatives and coastal resilience projects are not integrated. There is great potential for the creation of innovative and effective solutions in the form of resilience focused projects.

Case Studies

Case studies within the region from Rhode Island, New York and New Jersey, were selected to provide examples of models for resilient and sustainable restored and created wetlands using dredged sediments to address barriers for implementation of projects. The case study presentations addressed the following topics:

- Project Assessment/ Project Goals
- Design
- Stakeholder and Community Engagement
- Federal and State Policy and Permitting
- Implementation & Monitoring

A facilitated discussion followed a block of two case study presentations. Full presentations are available on the UConn CIRCA website at https://circa.uconn.edu/2017/08/10/a-workshop-on-beneficial-use-of-dredged-materials-for-resilient-tidal-marsh-restoration-and-creation/#.

Beneficial Reuse and Marsh Elevation Enhancement of Rhode Island's South Shore

Caitlin Chaffee, RI CRMC

Caitlin Chaffee, of the Rhode Island Coastal Resource Management Council (RI CRMC), presented a case study reviewing a combined dredge beneficial reuse and thin layer placement marsh elevation enhancement project within Ninigret Pond, located on the southeast shoreline of Rhode Island. The project was funded through multiple sources including USFWS, and a Hurricane Sandy Disaster Relief Grant. Approximately 68,000 cy of material was dredged and placed to restore approximately 20 acres of tidal marsh at a cost of just over $1.6 million. Chaffee articulated the importance of early engagement of permitting agencies, project partners, and public stakeholders, and conducting site visits with project partners. It is essential to collect data and document baseline site conditions to support project design and development. Chaffee concluded that projects involving a diversity of partners and stakeholders must focus on managing expectations and budget for design and construction, and providing immediate and long-term adaptive management strategies.

Beneficial Use of Dredged Material to Restore Salt Marsh Resiliency: A New Jersey Case Study

Metthea Yepsen, NJDEP

Metthea Yepsen of the New Jersey Department of Environmental Protection (NJDEP) Division of Science, Research and Environmental Health, presented a case study reviewing three pilot projects implemented to test the beneficial use of dredge material for marsh enhancement through thin layer placement. The projects were funded through a Hurricane Sandy Coastal Resiliency Grant, the United States Army Corps of Engineers and New Jersey Department of Transportation Funds. The project objectives included implementing a range of projects across multiple sites; collaboration among resource agencies; monitoring the projects to document successful strategies and challenges; and to disseminate lessons learned to facilitate future projects. The three projects were constructed in Fortesque, Avalon, and Ring Island, New Jersey from 2014 -2016. The projects included extensive monitoring at each site. Yepsen discussed issues with sediment grain size effects on hydraulic spreading; the importance of communication with permitting agencies, stakeholders, and contractors; and the need to fund monitoring beyond three years post-construction. NJDEP is currently developing a findings report for the comprehensive project.

Facilitated Questions – Peter Francis, CTDEEP

Peter Francis from CTDEEP conducted a question and answer session following Metthea Yepson's presentation.

Peter Francis: "What determines success for a project?"

Caitlin Chaffee, RI CMRC: Vegetation is often used as a proxy for a successful outcome. The return of vegetation, in particular, high marsh plants, was the target goal of the RI project. Returning the site to what was there historically. Vegetation and other metrics can be imposed to assess the performance of a project site.
Metthea Yepsen, NJDEP: It is essential that the project is built as it was designed. The goal is to have ecological factors return to baseline conditions. It is important to apply adaptive management strategies to project sites.
Audience Question: " Was the Fortesque, NJ Site planted?"
Metthea Yepsen, NJDEP: It was experimentally planted with natural vegetation, primarily *Spartina alterniflora*.
Audience Question: "What models were used in the planning of the Rhode Island Ninigret project? Did you reference anything similar to the Sea Level Affecting Marshes Model (SLAMM) or wave analyses?"
Caitlin Chaffee, RI CMRC: Rhode Island conducted a salt marsh assessment program including vegetation transects for comparison, in addition, Beth Watson with Drexel/ USEPA provided elevation tidal frames. She based these on a rich repository of reference site, and provided a map of tidal frames. A huge driver for selecting the project site was the dredge project location.
(Link to overview of the Strategy for Developing a Salt Marsh Monitoring and Assessment Program for the State of Rhode Island: http://www.crmc.ri.gov/news/pdf/SMMAP_RI_Strategy.pdf)

Beneficial Use of Dredged Materials for Resilient Tidal Marsh Restoration and Creation: Jamaica Bay Marsh Island Restoration

Peter Weppler and Lisa Baron, USACE New York District
Peter Weppler, Chief of the Environmental Branch of the Planning Division of the USACE New York District, and Lisa Baron, Project Manager of the USACE New York District, presented a case study of the Jamaica Bay Marsh Restoration Project. Section 204 of WRDA 1992 and Section 207 of WRDA 1996 encouraged USACE to incorporate beneficial uses of dredged material into constructing, operating, and maintaining its Civil Works navigation. The Harbor Deepening Program in New York Harbor required 42 million cubic yards of dredged material to be removed between 2004 and 2014. Ecosystem restoration in the Jamaica Bay Marsh Islands was completed as a component of the Program. The goal of the Jamaica Bay project was to restore salt marsh island habitat combatting a loss of 2,034 acres of tidal marsh from 1924 – 1999, while evaluating construction and planting techniques to inform future restoration efforts. The Elders East restoration was completed between 2006-2011. 43 acres of marsh were restored and the project cost approximately $17 million. The Elders West project restored 40 acres of tidal marsh and cost approximately $12 million.
Monitoring results for the restorations are available here: Davis, D.S., et al., Elders Point East Marsh Island Restoration Monitoring Data Analysis, ERDC/EL CR-17-1, (http://www.dtic.mil/dtic/tr/fulltext/u2/1039569.pdf) September 2017.
According to the report, monitoring of baseline, during-, and post-construction conditions included a variety of physical and biological parameters and performance indicators. Following post-construction monitoring most vegetation structural characteristics (i.e., plant height, stem density, percent cover and aboveground biomass) were comparable values obtained from a reference marsh site. Belowground biomass, however, remained lower than measured reference conditions. This observation was consistent with the longer functional equivalency trajectory associated with mature root system development at other marsh restoration sites in the region. With regard to the development of marsh structural attributes that support fauna, the Elders Point East Marsh in 2012 appeared to be providing suitable habitat for characteristic macroinvertebrate and fish assemblages. In particular, the high relative abundance of juvenile fishes indicated that the marsh served as nursery habitat. Lessons learned

from the project provide the opportunity to exchange knowledge of the approaches in an adaptive management context.

Connecticut- Status of the Feasibility Assessment Wetlands and Wetland Island Creation Using Dredged Matierial

Jennifer O'Donnell, UCONN Department of Marine Sciences

Jennifer O'Donnell of the UCONN Department of Marine Sciences provided an overview and status update for the UCONN Project "Scoping of Dredge Material Islands and Wetlands for Green Infrastructure Resiliency Projects Along the Connecticut Shoreline in Fairfield and New Haven Counties" funded through the Connecticut Department of Housing Community Development Block Grant – Disaster Relief (CDBG-DR) Sandy Recovery Program. O'Donnell described the motivations, technical challenges, and social challenges for implementing these types of projects. Project elements include a review of marsh ecosystem services, literature review of physical, biochemical and engineering aspects of marsh restoration/creation using dredged material, evaluation of design alternatives, review of regulatory and permitting needs, outreach to state and federal agencies, evaluation of the impact on health and safety of vulnerable populations, and ultimately guidelines for state and municipal agencies. One of the most challenging aspects of these projects is that they integrate two different project and regulatory processes for dredge material management and wetland restoration or creation, respectively. Marsh restorations and creation projects are funded and regulated as a form of habitat restoration. Dredged materials used within these types of projects are often funded and reviewed from a regulatory perspective, as a beneficial reuse projects. It will be a challenge for project partners and state and federal agencies to develop a more efficient strategy for planning and implementation of these types of projects.

Tables of Interest – Working Lunch

The workshop included a working lunch, where participants were asked to participate in an active discussion with the members of their table. The lunch table topics were provided to participants prior to the workshop. Participants independently -selected a seat at the table labeled with their topic of interest when they arrived.

Marsh Creation/Restoration for Community Resilience

Facilitator: Dave Hudson, The Maritime Aquarium

The attendees participated in a focused discussion on the green infrastructure and living shorelines strategies and flood and erosion control benefits associated with beneficial use of dredge material for wetlands restoration compared to habitat restoration and ecological services. Community resilience was defined to include both resilient infrastructure and housing and enhanced quality of life and health for residents.

The participants discussed that prior to Superstorm Sandy marsh restoration and coastal community resilience projects were addressed separately. The experiences communities had during high impact coastal storms identified a need to connect the concepts and projects.

The challenges faced in light of this topic include the need to balance tidal marsh restoration with coastal resilience. The concept of the "color of money" was discussed. There has been an overall focus and increase in funding for resilience with an overall decrease in funding for restoration projects following high impact storm events. A perception exists that resilience projects relying on hard structures are cheaper and have a higher level of reliability, therefore, resulting in the need to determine "How do we green the grey?"

Prioritization of projects will be a challenge, especially when determining proper marsh restoration locations combined with dredge location or making *a prioiri* decisions. It is essential to define the ultimate goal at project sites to be able to evaluate project success. A balance must be met between hardscape within urbanized areas and vegetation.

The United States Army Corp of Engineers is required to evaluate cost sharing for proposed projects through the completion of a cost analysis. Additional funds may be required for implementation of green options over grey strategies.

Resource Conflict/Conversion/Trade-offs (a.k.a. Habitat Tradeoffs)

Facilitator: Harry Yamalis, CTDEEP

Attendees discussed decision conflicts from a resource management perspective concerning conversion of coastal habitat and effects on managed species, including fisheries resources, shellfish, and protected species and habitats.

It is possible to mistakenly identify a habitat as intertidal mudflat when it is actually a degraded tidal wetland. What if this intertidal "peat-flat" is functioning like a mudflat? The degraded condition of the habitat may provide habitat-based services. The questions become, is this possible? Do the interstitial spaces in the peat provide value? What fauna, if present in the material, or polychaetas and bivalves use the habitat? Is the condition "just" a decaying peat wetland or is it supporting an ecological community? Project professionals must demonstrate habitat function and use, e.g. are the birds congregating on "peat-flats" feeding here or constantly looking for food?

The living shoreline perspective should evaluate if fill is required in an existing tidal area. The project must be defined as a creation versus a restoration project. There may be required compensation of authorized impacts. Compromise is often necessary. For example, rather than filling a regulated tidal area, cut back into the upland portion of the property when possible. Sometimes there is no agreement between state and federal regulators on proposed living shoreline projects.

Design Standards Integrating Sea Level Rise

Facilitator: Rebecca French, UCONN CIRCA

Attendants discussed addressing sea level rise during the planning and implementation phases of projects by defining design standards, providing experiences and recommended approaches**.**
Overall, precision is not important, the project sites are already dynamic environments. Sediment load dominates design requirements. There is a need to account for marsh migration, will you have buyouts to make a new area or mitigate sea level rise in place? There is a need for more formal design standards for marsh restoration projects overall. Design parameters are often based on a continuum of elevations, which let the tides create a state of equilibrium and the sites naturally adapt to the conditions. There is a need to leave areas for water to go as a motivator for maintaining marshes. These areas must account for rolling back of barrier islands. Areas with low sediment load and low accretion rates are vulnerable. Degraded marshes can have compounded impacts from nutrients or chemical contaminant loads combined with stress from climate change. To decrease the vulnerability of the systems, nutrients or contaminant loads must be addressed, therefore improving overall resilience of the system.

Design Parameters

Facilitator: Jennifer O'Donnell, UCONN Marine Sciences

Participants exchanged experiences with developing and defining design parameters for wetland restoration/creation projects utilizing dredge materials and thin layer deposition approaches.
Case studies within the workshop provided many examples of design strategies for tidal marsh restoration using dredged material. Initial site selection is often based on the presence of existing or historic occurrence of wetlands. Is the question of restoration of an existing tidal marsh over creating a tidal marsh an arbitrary or philosophical debate?
Design parameters must consider wave climate, slope of the transition and upland areas, sediment containment load, and habitat trade-offs that must be justified. Management of funding is necessary in addition to adequately funding monitoring once project construction is complete - particularly for pilot studies- to collect data required to refine future design criteria.

Monitoring

Facilitator: Metthea Yepsen, NJDEP

Participants discussed the concept that the success of the beneficial use of dredged materials for resilient wetland restoration/creation must be evaluated through monitoring and data analysis. What are the highest priority parameters that should be identified in a monitoring plan, and how is monitoring funded?
Below ground metrics, such as evaluation of sulfates and measurement of below ground biomass were identified as valuable monitoring metrics. The cost and shear value of the data were less expensive than alternative monitoring approaches. Marsh evaluation, hydrology, and sediment accretion (evaluated through a marker horizon) can support monitoring based on proposed design criteria. Vegetation, particularly tidal marsh plants, and assessment of invasive percent cover are standard metrics that provide valuable data indicating the post-construction condition of the site. Benthic infauna is a common metric for evaluating ecological conditions. Salinity and water table measurements combined with soil evaluations are key to monitoring physical conditions required by tidal wetlands.
It is important to proceed with adaptive management approaches following the restoration or construction of tidal wetlands using dredged materials. Quantitative evaluations focusing on data collection using project metrics, along with qualitative site observations and site photo point monitoring, can provide important insights into site conditions. Monitoring protocols must take into consideration project goals and objectives, particularly target species identified within the restoration planning process, for example enhancement of avian nesting habitat or nekton habitat.
There is a need to link coastal community resilience metrics to tidal wetland restoration and enhancement projects in order to evaluate socioeconomic impacts and benefits.

Successful Project Table: What defines Success?

Facilitator: Katie Lund, CIRCA

Participants discussed establishing project objectives and goals as an important component of project development, particularly in working to secure funding and permits. The group shared experiences on what defines a successful project.
Tidal marsh restoration and creation projects involve multiple stakeholders. Goals and comprehensive objectives for projects often target a return to baseline condition, function, form, or structure. Some designs consider multiple elevations to enhance habitat composition.
It is essential to set short-term, mid-term, and long-term goals and objectives, taking into account projected sea level rise.
Communication must occur often and early with multiple partners. A pre-application meeting and agency engagement enhances the planning stages of projects. Municipalities may have their own needs and regulations that must be addressed. It is important to have public buy-in and gain volunteers to support components of the projects, such as planting events. Team members and collaboration increases the potential for a successful and well-rounded project. Projects can build in aspects of public use within the design. It is important to consider post-construction elements, and address these over the long-term timeframe based on monitoring results through adaptive management strategies.
The motivation and objectives for projects should define metrics that are monitored (e.g. sparrow habitat). Conversely, is there a universal definition of success based on monitoring elements?
Success can be defined by meeting a specific percentage of project goals. Goals should be well-defined with project design. Success should be broad, but clearly defined within the proposed project timeframe. Baseline condition inventories, compared to metrics monitored post-construction, can provide data to evaluate project objectives.

Regulatory Themes

Facilitator: Peter Francis, CTDEEP

This group had a focused discussion of the regulatory challenges, strategies and potential barriers associated with the beneficial use of dredge material for wetland creation/restoration.
The challenges faced by these projects involve a lack of proven success of projects. Funding has been provided from various sources, but there is a limited track record of project costs. It is difficult to change and adjust regulations that inhibit coordination of restoration and dredge projects or resiliency focused projects. Essential fish habitat concerns present a significant challenge to permitting these projects.
Barriers to beneficial use of dredge material for wetland creation/restoration include policy issues associated with habitat conservation, overall lack of funding, and concerns of contaminants associated with dredged materials. Sediment testing must be a component of the dredge activities and risk analysis based on the proposed use of the sediment. Permitting such activities is constrained by strictly written authorizations.
Strategies can include flexibility with the permitting process. Pre-application meetings are essential to keep all regulatory agencies aware of the progression of the project and provide early design and construction recommendations. Adaptive management on a short and long-term scale must be addressed within permits.

Funding: Linking Resilience to Economic Development

Facilitator: Jessica Fain, The Science and Resilience Institute of Jamaica Bay

Participants discussed how a link between resilience and economic development can be defined in a way that encourages innovative funding strategies for the beneficial use of dredge material for wetland restoration/creation.
Overall, participants agreed that connecting resilience to economic development and funding are lacking. The funding available does not line up with the timeframe for projects. The group discussed the concept of a dredging tax, dedicated to resiliency and analysis of the benefits. The USACE cost-sharing analysis creates challenges to funding beneficial reuse projects.

There are various co-benefits between wetland restoration projects and dredge projects. The key is to meet halfway and coordinate project objectives. There needs to be an initiative to support research required to provide accurate design criteria and evaluation metrics. Education on the topic is essential. Developing evaluation methods that include environmental goods and services in a cost/benefit analysis approach would also help.

Dredge or Restoration: The Chicken or the Egg

Facilitator: Steven Jacobus, NJDEP

The sequence of identifying project goals and objectives, whether from a dredge management or wetland restoration/creation standpoint, can affect the regulatory and permitting requirements and funding options. Participants discussed what the benefits and drawbacks to identifying wetland restoration/creation opportunities prior to sources of suitable dredge materials, or vice versa, could be. Dredging projects are known by federal and state agencies. There is a need to develop design concepts for tidal marsh and wetland restoration projects to identify the volume and type of material required. Material will have different parameters based on the project approach, for example thin layer placement versus wetland creation. The regulatory process within the federal and state levels must adapt to these combined project approaches.

Community and Stakeholder Engagement

Facilitator: Carolyn Lin, UCONN Department of Communications

The group discussed strategies to bring key stakeholder groups and the public to the table to participate in project development and implementation.

Communities must be educated about the difference between dredging and tidal marsh restoration. Project partners have to be able to provide a “proof of concept,” and justify the cost effectiveness associated with these projects with regard to coastal resilience and ecological restoration. The public needs to understand how marshes contribute to the local economy using different communication tools, e.g. maps, visualization, emotional connection, history, and dynamic presentation. Practitioners, resource managers and regulators need to change the “message.” Terminology matters when addressing communities and the public, e.g. dredge spoil vs. beneficial use. Stakeholders, including municipal officials, can assist in outreach to the community for a public discussion, aided by local NGO’s, neighborhood associations, etc. An adaptive communication strategy is essential. Words matter. When discussing “science,” project partners can use emotional storytelling or interactivity. One excellent example is The Nature Conservancy’s “Keeping the Jersey Shore Wild” campaign.

Foundation Partners Panel

The goal of the panel was to bring together organizations that have actively funded tidal marsh restoration and creation projects using dredged materials in the states of New York, New Jersey, Connecticut and Rhode Island to share their perspectives on how to implement these projects. The panel was moderated by Dr. Rebecca French from UConn CIRCA. She introduced each panelist and provided an opportunity for the panelists to introduce funding opportunities through agencies or organizations for beneficial use of dredge materials for tidal marsh restoration and creation.

Walker Golder, Director, Atlantic Flyway Coast Initiative, North Carolina Audubon

Walker Golder began by discussing that by 2100 over 490 communities will be faced with chronic inundation. Many avian and wildlife species rely on salt marsh and specifically high marsh habitats. The use of dredged material to create or restore wetlands is beneficial. Dredge materials have been used to build islands, which are habitats for many species (avian), and these materials provide the opportunity for creating/restoring marshes or underwater habitats. A few examples include the Maryland-Blackwater National Wildlife Refuge, which utilized the Conservation Fund, through the USFWS. Hydrology of marshes were assessed to address chronic inundation for future conditions. The National Audubon Works with USACE (North and South Carolina). Louisiana is the poster child for marsh habitat loss. Various sources of funding for these types of projects include the USFWS, other federal sources, USACE, state, local communities, private funds, and individual support.

A successful project will restore natural form/stature, restore ecological services, provide community benefits (usually aiding in the project being more successful), and restore the needs of marsh species. Project implementation allows for learning what works and what does not work. We need innovative techniques to lower costs and well as a broader and comprehensive strategy to address a changing marsh and get communities out of harm's way. Active engagement of the Agencies, NGO's, and community are required for success. Often trade-offs in habitat and social interests are required to make these types of projects work.

Larry Oliver, Chief, Evaluation Branch, New England District USACE

The USACE develops the Dredged Material Management Plans that assess the disposal needs for a region over the next twenty years. A Dredged Material Management Plan has been developed for Long Island Sound. The plans include an assessment of potential beneficial uses for environmental purposes and enhancement or hurricane and storm damage reduction where environmental beneficial use of dredged material is the least costly and environmentally acceptable method of disposal. Section 204 of the WRDA 1992 bill provides USACE the authority for aquatic restoration of environmental shoreline erosion benefits when that is not the least costly method of disposal. WRDA 2016, Sect. 1122 authorizes a pilot program for the beneficial use of dredged material. That legislation authorized the creation of ten pilot programs around the country focused on habitat restoration. These projects will include thin and thick layer deposition projects.

Dr. Sacha Spector, Program Director for the Environment
Doris Duke Charitable Foundation Environment Program

The Doris Duke Foundation Environment Program is essentially the money behind the climate adaptation fund in New York. The Program currently funds sixty projects around the country; eleven of these are coastal projects.

The Foundation evaluates projects by asking the following questions:

- Is it new and responsive?
- Is it based on science?
- Will it deliver habitat benefits?
- Is this a resistant strategy or a truly adaptive solution?

The definition of success for a funder depends on the program. Private foundations are able to fund higher risk projects. The projects must provide a demonstration of impact incorporating innovation, new techniques, and new structural approaches. Projects need to "get to scale" (and prove out concepts). The Foundation is in search of projects that attack key barriers, spread the knowledge gained for case studies and drive down the cost curve, addressing the critical-repetition of projects. It is important to evaluate the long-term sustainability of projects. For example, what does it look like to restore something that won't look like the past? Does sea level rise limit the project? The Foundation targets "thought leadership" through the Environmental Program.

James Turek, Restoration Ecologist, NOAA Restoration Center

The NOAA Community-Based Restoration Program (CRP) funds coastal and marine habitat restoration grants. Coastal Ecosystem Resiliency Grants provided funding opportunities over the last several years, with increasing interest. In fiscal year 2015, 58 proposals were received, 52 in fiscal year 2016, and 167 in fiscal year 2017. Within the Fiscal Year 2017, 51 proposals were focused on habitat restoration projects (totaling approximately $43 million), 116 focused on strengthening coastal communities (totaling approximately $93 million), however, with limited funds only 10 percent of proposals were approved.

The Damage Assessment, Remediation and Restoration Program is another potential funding source through NOAA. The program funds project implementation linked specifically to natural resource injury restoration.

NOAA's perspective on project success is defined by a net increase in ecological services, and greater ecological and community resiliency. Projects must be "ripe" in that design and permitting must be in place for funding to be granted. An understanding of baseline conditions is essential for the "road to restoration." Essential fish habitat, regulated under the Magnuson-Stevens Act, must be understood for the project site. A site assessment, including evaluation of marsh health, substrate conditions, and dredged sediment characterization (including an understanding a dredge material grain size, water content, and contaminant analysis) must be conducted prior to the restoration design and implementation. Overall there is a need to be a local driver to make a project happen.

The Way Forward – Closing Remarks

Dr. Carolyn Lin of UCONN Communications Department and Kimberly Bradley, Project Specialist with CIRCA developed a summary of key points discussed within the workshop and invited participants to discuss the "take-aways" they had from presentations and discussions throughout the day.
Lin and Bradley summarized key takeaways from the workshop as follows:

- Projects involving the use of dredged sediments for the creation and restoration of tidal marshes combine two different sets of project objectives. Marsh restorations and creation projects are funded and regulated as a form of habitat restoration. Dredged materials used within these types of projects are often funded and reviewed from a regulatory perspective, as a "beneficial reuse project."
- Challenges to these projects will involve identification and inventory of tidal restoration projects and integration with dredging needs, aligned with a diversification of funding sources that recognize the benefits of the combined approaches.
- Success of tidal marsh restoration or creation projects using dredged materials will depend on a solid interdisciplinary approach, involving up front partnership with local communities, federal, and state government partners. Projects partners must be engaged within the site selection, baseline evaluation, and initial design phases of projects.
- Design standards need to be developed and reviewed based on implementation and monitoring observations and data.
- Close coordination of dredging and restoration implementation will be essential for designing more efficient approaches leading to project cost reduction.
- Project designs should consider climate change within coastal systems and hold up to an anticipated shift in future baseline conditions.

Adaptive management strategies from technical and communication perspectives must be implemented a