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Proceedings from the US Army Corps of Engineers (USACE) 2021 Beneficial Use of Dredged Material Virtual Workshop

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Final report

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Abstract

On 13–15 July 2021, 58 representatives from Headquarters, US Army Corps of Engineers (USACE), 2 USACE Divisions, 14 USACE districts, and US Army Engineer Research and Development Center’s (ERDC) Environmental (EL) and Coastal Hydraulics (CHL) Laboratories came together and participated in a virtual workshop on the beneficial use (BU) of dredged material. The overall goal was to organize the BU community across USACE and develop a path forward to increase BU practices. Talks and discussions focused on the current status of BU across USACE, including success stories on innovative BU projects, challenges related to regulatory issues, state and federal policies, technical logistics, and stakeholder engagement, as well opportunities for expanding current practices to include more regular and innovative applications.

The workshop was cohosted by Dr. Amanda Tritinger (CHL) and Dr. Kelsey Fall (CHL) on behalf of the Engineering With Nature®, Coastal Inlets Research Program, Dredging Operations and Environmental Research, and Regional Sediment Management research programs. The workshop concluded by introducing and awarding the first annual Timothy L. Welp Award for Advancing Beneficial Use of Dredged Sediments to recognize teams (with members across and outside of USACE) that have advanced progress on BU through collaboration, partnering, and innovation.

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Preface

This effort was conducted for the US Army Corps of Engineers (USACE) under Funding Account Code U4388010; AMSCO Code 190119.

The program managers during this effort were the following: Dr. Todd Bridges, Dredging Operations and Environmental Research; Dr. Katie Brutsché, Regional Sediment Management; Dr. Tanya Beck, Coastal Inlets Research Program; and Dr. Jeff King, Engineering With Nature®.

The organizers appreciate Dr. Jacob Berkowitz (US Army Engineer Research and Development Center, Environmental Laboratory) and Mr. Jase Ousley (Headquarters, USACE) for their insightful presentations, and Dr. Danielle Szimanski (USACE Baltimore District), Dr. Julie Rosati (ERDC-CHL), Ms. Monica Chasten (USACE Philadelphia District), Ms. Elizabeth Godsey (USACE Mobile District), Dr. Burton Suedel (ERDC-EL), and Dr. David Perkey (ERDC-CHL) for moderating the discussions, and Ms. Courtney Chambers (ERDC-CHL) for setting up and managing the virtual meeting space, and Dr. Danielle Tarpley (ERDC-CHL). Additionally, the organizers appreciate all the workshop attendees who shared their knowledge and experience in effort to increase beneficial use across USACE.

The following were involved in this effort: Field Data Collection and Analysis Branch of the Navigation Division, ERDC-CHL, the Coastal Processes Branch of the Flood and Coastal Division, ERDC-CHL, and the Wetlands and Coastal Ecology Branch in the Ecosystem Evaluation and Engineering Division, ERDC-EL.

At the time of publication of this report, within the Field Data Collection and Analysis Branch, Mr. William Butler was branch chief; Ms. Ashley Frey was division chief; and Mr. Charles E. Wiggins was the technical director for the Navigation Division. Within the Coastal Processes Branch, Mr. Victor Gonzalez was chief; Dr. Cary Talbot was division chief; and Dr. Julie Rosati was the technical director for the Flood and Coastal Division. Within the Wetlands and Coastal Ecology Branch, Ms. Patty Tolley was branch chief; Mr. Mark Farr was division chief; and Dr. Jen Seiter-Moser was the technical director for the Ecosystem Evaluation and Engineering Division. Dr. Ty V. Wamsley was the director of ERDC-CHL,
and Mr. Keith Flowers was deputy director; Dr. Edmond Russo was the
director of ERDC-EL, and Dr. Brandon Lafferty was the deputy director.

The commander of ERDC was COL Christian Patterson, and the director
was Dr. David W. Pittman.

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1 Introduction

1.1 Background

Using dredged sediment beneficially is an important component of the US Army Corps of Engineers (USACE) dredged material management strategy, which ultimately aims to achieve 70% beneficial use (BU) on an annual basis by 2030. Despite many past successes (Berkowitz et al. 2021), currently less than 40% of dredged material in the United States is used beneficially (Searcy Bell et al. 2021). A myriad of challenges exist that discourage increased BU, including limited federal budgets, insufficient state and local sponsor budgets, incompatible project timing, and volume inconsistencies between dredging projects and BU projects. The best way to tackle these challenges and establish BU as standard practice is to organize BU across the USACE community. With support from Engineering With Nature® (EWN®), Coastal Inlets Research Program (CIRP), Dredging Operations and Environmental Research (DOER), and Regional Sediment Management (RSM) research programs, the inaugural Beneficial Use of Dredged Material Workshop was organized in effort to support and advance BU applications.

On 13–15 July 2021, 58 representatives from Headquarters (HQ), USACE, 2 USACE divisions, 14 USACE districts, and the US Army Engineer Research and Development Center (ERDC) Environmental Laboratory (EL) and Coastal and Hydraulics Laboratory (CHL) came together and participated in this virtual workshop (Appendix A), which was cohosted by Dr. Amanda Tritinger (ERDC-CHL) and Dr. Kelsey Fall (ERDC-CHL) (Figure 1 and Figure 2). The overall goal was to organize the BU community across USACE and develop a path forward to increase BU practices. Presentations given by HQ USACE, districts, divisions, and technical directors as well as related discussions focused on the current status of BU across USACE including success stories on innovative BU projects, challenges related to regulatory issues, state and federal policies, technical logistics, and stakeholder engagement, as well as opportunities for expanding current practices to include more frequent and innovative BU applications.
Figure 1. Attendee distribution for the 2021 Beneficial Use of Dredged Material Workshop.

![2021 BU Workshop Attendee Distribution](image)

- Districts: 43%
- ERDC CHL: 24%
- ERDC EL: 21%
- Division: 5%
- HQ: 7%

Figure 2. A screen shot captured by Dr. Julie Rosati, Coastal and Hydraulics Laboratory (CHL), of a few of the workshop attendees discussing action items on Day 3.
1.2 **Objective**

There were five primary objectives associated with the workshop:

1. Develop and document the status of BU across USACE.
2. Organize a BU community across ERDC and USACE.
3. Develop effective communication and collaboration on BU.
4. Identify obstacles and levers for BU.
5. Identify and initiate actions for increasing and advancing BU.

1.3 **Approach**

The approach taken by the workshop was to assemble top BU practitioners and leaders across the USACE to share their thoughts on the current status of BU and how it can be increased in the future. The structure of the workshop was designed to encourage open communication among participants with the use of presentations and guided discussions. Embedded within the listed objectives are targeted outcomes that can support the development of an organized and shared vision of ways in which BU practices can be advanced within USACE. Included in this vision is a series of actions that if coordinated and implemented across USACE have the potential to lead to a meaningful increase in BU annually. Subsequent sections of this special report provide details and outcomes from the workshop, including the announcement of the Timothy L. Welp Award.
2 Agenda and Workshop Summary

Following is a brief summary of the workshop presentations and discussions and is intended to serve as a highlight of the major points made during the guided discussions. The full workshop agenda can be found in Appendix B. For more detailed information, please see the full presentations in Appendix C.

2.1 Day 1 Summary

The first day of the workshop was an internal discussion amongst ERDC scientists and engineers on the status and future needs of BU research at ERDC as well as needs for developing successful partnerships with USACE districts. The day opened with presentations on the state of BU from the perspective of program managers who fund related research (i.e., RSM, CIRP, and Ecosystem Management and Restoration Research Program) (Appendix C).

This was followed by two guided discussions on the status of BU at ERDC. The first discussion was moderated by Dr. David Perkey and addressed the following topics concerning BU:

- Definitions
- Different types
- Obstacles
- Levers
- General opportunities to expand current practices

The engineer manual EM 1110-2-5026 (HQ USACE 1987) describes a range of “productive and positive uses of dredged material” that impart environmental, engineering, and social benefits. However, identifying what counts as BU in practice has been more challenging. For example, practices that keep sediment in the system, such as marsh creation and beach restoration, are generally regarded as BU while practices that remove sediment from the system, such as construction applications, are not as widely recognized. Therefore, one of the outcomes of this discussion was to create a BU Working Group that meets semiregularly and is tasked with documenting the evolution of BU definitions and practices along with benefits realized from historical projects to develop a more updated and robust understanding of BU.
Although the engineer manual EM 1110-2-5026 (HQ USACE 1987) includes some guidance for different types of BU, some of this guidance may be outdated or missing altogether for newer or less obvious applications. The BU Working Group should further refine this by developing a typology to organize practices into more specific subcategories (e.g., in water vs. out of water; land enhancement vs. construction material).

A clear understanding of obstacles to BU needs to be addressed before it can become a more widely accepted practice. The ERDC group identified legal obstacles and regulatory restrictions, cost, and lack of communication as the primary factors preventing expansion of current practices. Cost was the most common obstacle identified, which can preclude BU activities since it is not usually recognized as the least-cost method partly because there is no clear way to quantify the benefits. Lack of communication was also recognized as one of the most significant barriers to BU. Improved internal (ERDC) communication is necessary to facilitate collaboration amongst researchers, and improved external communication is needed to provide clear and consistent guidance on BU as well as for building district interest and capacity. One of the first tasks for the BU Working Group is to overhaul the existing BU website to help improve communication (https://budm.el.erdc.dren.mil/buworkinggroup.html).

There need to be strong proponents for BU to expand future opportunities. Regional experts, interagency groups, and active, well-informed stakeholders and partners can be important levers. In addition to these advocates, pilot projects that demonstrate and document the long-term beneficial outcomes of BU will provide additional evidence of their value. Furthermore, placing BU opportunities in the context of climate change (i.e., rising sea level) may also help highlight the need to understand long-term benefits.

One of the goals of this workshop was to identify opportunities to expand BU to transition the small-scale, demonstration applications to the default practice. Workshop participants identified improved communication and increased partnerships as the main ways to expand current practices. Specific communication opportunities included developing high-impact and effective communication products that describe a wide range of successful applications, including cost justification, the production of short videos that showcase how BU projects are implemented, and the hosting of
a national conference. BU projects also present an opportunity to develop new partnerships with districts, other federal, state, and local agencies, and private industries, which will ultimately expand the number of groups invested in project success.

Dr. Burton Suedel moderated the second guided discussion that addressed the following topics:

- How do we create synergy across ERDC on BU?
- What is important to share with district partners?
- What do we want to know from district partners?

Many discussion points from the previous guided discussion were continued with regards to creating synergy across ERDC on BU. Establishing and formalizing a BU Working Group with regular meetings could be an important step towards building synergy across ERDC. This group could be responsible for consolidating disparate sources of BU information into a single website, including a list of current ERDC BU projects, facilitating ERDC interactions through a Microsoft Teams site, and developing high-impact communication products. The BU Working Group can also ensure that the research is better aligned across ERDC (at principal investigator, program, and lab levels) by coordinating webinars and workshops.

Strong communication between ERDC and district partners is essential for developing a unified USACE BU agenda. ERDC needs to establish, cultivate, and maintain relationships with districts and ideally have district BU champions and regional experts to better coordinate activities and opportunities. However, both ERDC and district personnel likely have limited capacity and therefore need strong support from leadership to ensure success. ERDC needs to demonstrate how districts can leverage program-funded activities as well as be engaged with reimbursable projects.

To be a good partner, ERDC personnel need to better understand district needs. Districts need to communicate the types of BU projects they would like to pursue and need to be transparent on their wants and needs from ERDC. Districts need to communicate the type of R&D they are interested in pursuing and the involvement they would like ERDC to have (i.e., help with the Statement-of-Need process, convincing difficult stakeholders,
performing adaptive management planning and evaluation, and developing communication products).

2.2 Day 2 Summary

On Day 2, Dr. Jacob Berkowitz presented “Evaluating ecological functions and engineering benefits at historic dredged material management sites” (Appendix D). This presentation focused on research involving the long-term benefits of early BU projects through the process of revisiting and studying specific sites that were constructed in the 1970s. Emphasis was placed on the need to directly link the ecological functions (e.g., habitat, energy dissipation, nutrient cycling) of BU sites to engineering benefits (e.g., shoreline stabilization, storm-surge reduction, landscape evolution), specifically on the long-term scale to provide a holistic life-cycle analysis, expand EWN and BU, and help justify the cost of these projects.

The next presenter was the dredging program manager for USACE, Jase Ousley, who presented on the guidelines in the Water Resources Development Act of 2020 (WRDA 2020) as well as introduced the Institute for Water Resources navigation sediment-placement web tool and explained the key differences between 204(d) and 125 legislation guidance (Appendix D). Future goals included setting national goals for BU, establishing reporting metrics in the Dredge Information System, identifying and addressing future challenges, and aligning multiple efforts among different teams.

Next was a guided discussion on the status of BU throughout USACE, which was moderated by Ms. Monica Chasten, a project manager, coastal engineer, and EWN and RSM lead at the USACE Philadelphia District (NAP) Operations Division. This discussion extended the following BU topics from the previous day:

- Definitions and discussion of different types of BU
- Obstacles
- Levers
- General opportunities for expanding current practices

In this discussion, key points to defining BU were stated such as focusing on its reuse, emphasizing the ecological benefits that it can provide, and recognizing that BU is often intentional by nature. The different
viewpoints and definitions that were expressed during this discussion solidified the idea that the definition of BU is constantly evolving and that the goal should not be to insist on one static definition but instead to accept a dynamic definition that enables its future progress.

Participants discussed many obstacles to BU ranging from technical difficulties to monetary and scheduling obstacles. Some of the technical obstacles discussed included expensive sediment testing, difficulty meeting *beach placement* standards, having dredges that are too large for small sites, and the timeliness of dredging need and the availability of BU sites. Some of the monetary obstacles discussed included difficulty estimating cost due to down time and the precision of placement, the cost of required cultural resource surveys, and the cost associated with potentially exposing contaminants. Participants also discussed the scheduling obstacles to BU such as having to work with long project time frames due to resource agencies requiring three-plus years of premonitoring, for instance. In contrast, short time frames can also be an obstacle because of the haste in which project tasks need to be accomplished. In addition to this, obstacles can arise due to having to acquire the correct permits, not having enough funding for operation and maintenance, and difficulty quantifying ecological benefits after a project has been finished.

Next, participants discussed the different levers of BU. Some of these discussion points included ecological levers in which quantifying the ecological benefits of BU can be used as an additional incentive for implementation. Many participants also stated communication and collaboration levers such as having better coordination among the community, researchers, and stakeholders to enable mutual understanding of BU and the shared risk of sites in need of it. Furthermore, creating relationships with monitoring partners and the navigation community can be an impactful long-term resource where others help facilitate the design and long-term monitoring of sites.

The final topic in this guided discussion was general opportunities for expanding BU. Participants discussed the advantages of learning how other states and agencies embrace BU and how that can help expand their current practices. In addition to this, setting funds for maintenance aside from the beginning can help expand restoration efforts in the long term. Increased awareness of climate change was also stated as another
opportunity for expansion. Former practices are no longer sufficient, and this could be a key point to encourage stakeholders to use BU. Last, involving partners throughout the whole process can encourage them to want to collaborate in the future.

The final event of the day was a guided discussion on identifying the need for successful partnering between USACE (ERDC plus districts) and beyond (federal agencies, academia, etc.). This was moderated by Ms. Elizabeth Godsey, the Coastal and Regional Sediment Management engineer technical lead for the Mobile District and the USACE EWN coastal practice lead. This guided discussion included the following topics:

- What are ingredients for successful partnering and collaboration between ERDC and districts?
- How do we create synergy across USACE on BU?
- What are ingredients for successful partnering between USACE and others?
- How can we share successes and best practices most effectively across the USACE enterprise?

Participants discussed strategies for collaboration between ERDC and districts. A recurring theme in this conversation was the emphasis on communication. Specifically, the idea that early and consistent communication among partners can significantly increase the success of a collaborative project. This includes strategizing early and effectively communicating that strategy. Project managers are an asset when collaborating between agencies since they can aid in facilitating this conversation among partners. Furthermore, the more-involved researchers are in the implementation in the field increases the chances of a positive and successful outcome. When all invested parties are involved to some extent with each step of the process, the project proceeds with more ease.

The next subject of the guided discussion was ways to create synergy across USACE on BU. Constant communication is an important key factor in this, but also having regular project development team meetings can facilitate synergy on a collaborative project. Leveraging the Research Area Review Group/Statement-of-Need process to test innovative solutions to add value to more district projects was also discussed. Last, finding a
mutual passion in research focuses among partners can go a long way in keeping everyone motivated and engaged on the project.

Next, participants discussed factors that increase the chance for a successful partnership between USACE and other agencies. Some key points in this discussion included the necessity to consider all parties as equal partners, emphasize the motivation of the project throughout the process, and ask for input from all partners of the project to produce a solution together. Again, this topic reiterated the importance of communication throughout the duration of the project. Having everyone informed of the challenge at hand and aware of the motivation and goal of the project helps the overall success of the collaboration.

The final topic in this guided discussion was how to share successes and best practices most effectively across the USACE enterprise. One suggestion was to have a working group that meets regularly to share these past success stories. Creating a website or ArcGIS storymap is another useful tool to communicate positive experiences with others. This is especially useful for communicating with outside agencies and partners. The overall emphasis of this discussion was to communicate experiences widely in such a way that the conversation spans from highly technical to broad language to reach a broader audience. The more people that are exposed to a successful collaborative experience and the path leading to success, the more likely people are to achieve a successful project of their own in the future.

### 2.3 Day 3 Summary

On Day 3, Dr. Todd Bridges presented on “The Beneficial Use” imperative as a call to action for expanding BU to unprecedented levels to enhance environmental sustainability (Appendix E). The final guided discussion was led by Dr. Julie Rosati and Ms. Danielle Szimanski and included the following topics:

- Determine the BU big picture needs.
- Create action items.

Before BU practices are more widely adopted, ERDC, USACE, and HQ need to identify the main aspects that preclude its expansion. Workshop participants identified the potential negative response to unintended
impacts as a barrier to using more innovative BU approaches. This can be addressed through relationship building and knowledge sharing. Some districts are more successful with BU projects, and thus it is important to share lessons learned as it pertains to partnerships (i.e., how to partner with aggregate groups or how to give other resource agencies project ownership) and implementation logistics. Obtaining new permits for placement locations and aligning planning steps (i.e., internal agreements, environmental windows, set operation and maintenance [O&M] schedules) to ensure timely execution are also major challenges. BU is often considered as cost prohibitive since it is usually not the least-cost option in the short term and requires a funding source for the incremental cost. However, there is a cost associated with not implementing it, such as shoreline erosion, which is not considered in decision making. Therefore, it is necessary to better quantify the benefits of these BU projects (which is not currently a requirement for O&M dredging) using a standardized approach to account for long-term savings. There is currently a disconnect in the equipment required for channel dredging (big dredge) and BU restoration projects (small dredge). Also, specialized equipment, such as improved pump-ashore options, is needed to minimize double handling of material to keep costs down. The dredging industry needs to adopt more innovative practices to address these modern concerns.

The workshop participants developed a list of action items to expand USACE BU practice. The top action item was to engage the Chief of Engineers (at the time of this writing, LTG Spellmon) to create a broad statement in support of BU to improve the internal USACE culture. Formalizing a BU Working Group is also a top priority to better organize the USACE BU community, connect with external groups (other agencies and private industry), and develop high-impact and consistent communication materials. The districts need to have access to BU practice leads and subject matter experts to help navigate BU project opportunities and challenges. The broad range of topics discussed in this workshop demonstrated the need to continue to have these discussions and to delve deeper into different topics through future web meetings and projects.

The meeting concluded with the Seven Mile Island Innovation Laboratory (SMIIL) Gull & Sturgeon Island Habitat Restoration and Marsh Protection Project receiving the inaugural Timothy L. Welp Award for Advancing Beneficial Use of Sediment, which will be given annually to recognize teams (across and outside of USACE) that have achieved progress on BU
through collaboration, partnering, innovation, and the creation of diversified value (Figure 3) (Appendix G). Honorable mentions that recognize projects leading BU practice were given to Swan Island, Maryland, Restoration Project, Removal of Beneficial Use Impairments at Duluth Harbor, and Middle Mississippi River Island Creation.

This award was created in memory of Timothy L. Welp (23 September 1957–18 June 2021). A member of the Coastal Engineering Branch in ERDC CHL and a veteran of the US Navy, Tim began his ERDC career in 1990 as a research hydraulic engineer. He was a noted expert in the field of dredging and dredged material management. His research projects and technical support reached across the USACE and beyond, and his activities were supported by programs within the USACE, the Department of Defense, the US Environmental Protection Agency, and the World Bank, as well as many others in the private sector. He was the focus area leader for Dredged Material Management in the DOER Program and played a leading role in shaping future research directions and technology development. Welp was also a valued and trusted technical advisor to colleagues across USACE. He earned a BS in Mining Engineering from the University of Wisconsin–Platteville in 1984 and an MS in Ocean Engineering from Florida Institute of Technology in 1989. Tim was a valued colleague, mentor, and good friend.

Figure 3. Timothy L. Welp (23 September 1957–18 June 2021).
3 Workshop Conclusions and Future Work

The following is a summary describing the feedback received during the workshop:

- Establish a Beneficial Use Working Group. A team comprised of representatives across USACE (HQ, districts, divisions, and ERDC) to lead the effort to increase and advance BU practices across USACE.
- Expand the current ERDC Beneficial Use website into an all-inclusive USACE-wide BU website. The expanded website will include an information portal dedicated to BU, including information regarding past and current BU practices and guidance.
- Document the 2021 Workshop in an ERDC Proceedings report. Included in this report will be details documenting workshop discussions, presentations, outcomes, and suggested path forward.
- Upload the Beneficial Use Fact Sheets (Appendix F) onto the BU website. Fact sheets describing relevant BU projects and R&D programs were requested and were made available to workshop participants. To date, 19 have been received and will be edited and published on the BU website (https://budm.el.erdc.dren.mil).
- Select a committee to produce the second biannual Beneficial Use Working Group workshop in 2023. Identify new research and projects across a broad spectrum of USACE practitioners, researchers, and partners and collaborators to expand knowledge, data, and community engagement.

This information will be used to guide a coordinated effort among agencies and partners moving forward and implemented to improve the efficiency of beneficial use of dredged material in the future.
References


## Appendix A: Conference Participant List

Table A-1 lists the conference participants and respective affiliations.

<table>
<thead>
<tr>
<th>First Name</th>
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Appendix B: Workshop Agenda

2021 Beneficial Use of Dredged Material Workshop

Applying the Full Range of Beneficial Use

Sediment “Recharge” via Dredging
Direct Wetland “Nourishment”
Wetland Creation
Island Enhancement or Restoration

Strategic Placement
Thin Layer Placement for Bottom Contouring
Beach and Dune Construction
New Island Construction

Engineering / Operational Effort

July 11–13, 2021

Virtual Workshop Hosted at USACE-ERDC

Approved for public release; distribution is unlimited.
BU Virtual Workshop Agenda
July 13th – 15th, 2021

OBJECTIVES –
1) Develop and document the status of BU across USACE,
2) Organize a BU community across ERDC and USACE,
3) Develop effective communication and collaboration on BU within USACE,
4) Identify obstacles and levers for BU, and
5) Identify and initiate actions for making progress on BU.

CALL IN INFO – https://usace1.webex.com/meet/courtney.e.chambers
***Participants are encouraged to be active users of the chat function to share thoughts and ideas***

AUDIENCE - ERDC (day 1), ERDC + Districts/Field (day 2), ERDC + Districts/Field (day 3)

POINT OF CONTACT – K. Fall (Kelsey.A.Fall@erdc.dren.mil); A. Tritinger (Amanda.S.Tritinger@erdc.dren.mil)

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!

July 13, 2021: ERDC Session: Provide opportunity for ERDC scientists and engineers to share information with each other and organize internally.

AUDIENCE - ERDC

1400 – Welcome & Opening remarks Amanda Tritinger (ERDC - CHL)
1410 – A Brief Description of the State of BU from the Perspective of Program Managers
1435 – Guided discussion: What is the status of BU at ERDC?
   Moderator: David Perkey (ERDC-CHL)
   1. Definitions of BU. (Include multiple definitions from various sources)
   2. Discuss different types of BU
   3. Obstacles to BU
   4. Levers for BU
   5. General opportunities for expanding BU
1525 – Guided discussion: What is needed for successful partnering between ERDC and Districts?
   Moderator: Burton Suedel (ERDC-EL)
   1. How to create synergy across ERDC on BU? (to be a good partner, we need to be united)
   2. What is important to share with district partners?
   3. What do we want to know from district partners?
1555 – Closing remarks Kelsey Fall (ERDC - CHL)
BU Virtual Workshop Agenda

July 13th – 15th, 2021

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A. Tritinger (Amanda.S.Tritinger@erdc.dren.mil)

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!

July 14, 2021: ERDC, District, and HQ Session: Provide opportunity to share information across the USACE enterprise.

AUDIENCE – ERDC + Districts/Field

1400 – Welcome & Opening remarks Kelsey Fall (ERDC - CHL)
1410 – A Historic Look at USACE BU Case Studies Jacob Berkowitz (ERDC – EL)
1420 – Overview of BU Guidance Jase Ousley (USACE - HQ)
1435 – Guided discussion: What is the status of BU at throughout USACE?
   Moderator: Monica Chasten (USACE - NAP)
   1. Definitions of BU. (Include multiple definitions from various sources)
   2. Discuss different types of BU – For USACE
   3. Obstacles to BU
   4. Levers for BU
   5. General opportunities for expanding BU

1525 – Guided discussion: What is needed for successful partnering between USACE (ERDC+ Districts) and beyond (i.e. Federal Agencies, Academia, etc.)?
   Moderator: Elizabeth Godsey (USACE – SAM)
   1. What are ingredients for successful partnering/collaboration between ERDC and Districts?
   2. How do we create synergy across USACE on BU? (to be a good BU stewards, we need to be united)
   3. What are ingredients for successful partnering between USACE and others?

1555 – Closing remarks Amanda Tritinger (ERDC - CHL)
BU Virtual Workshop Agenda
July 13th – 15th, 2021

OBJECTIVES –
1) Develop and document the status of BU across USACE,
2) Organize a BU community across ERDC and USACE,
3) Develop effective communication and collaboration on BU within USACE,
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CALL IN INFO – https://usace1.webex.com/meet/courtney.e.chambers

***Participants are encouraged to be active users of the chat function to share thoughts and ideas***

AUDIENCE - ERDC (day 1), ERDC + Districts/Field (day 2), ERDC + Districts/Field (day 3)

POINT OF CONTACT – K. Fall (Kelsey.A.Fall@erdc.dren.mil); A. Tritinger (Amanda.S.Tritinger@erdc.dren.mil)

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!

July 15, 2021: ERDC, Districts, HQ Develop Alternative Actions and Next Steps

AUDIENCE – ERDC + Districts/Field

1400 – Opening remarks and summary of past two days Kelsey Fall and Amanda Tritinger (ERDC - CHL)

1415 – Importance of BU to the Nation Todd Bridges (ERDC – EL)

1425 – Guided Discussion: What’s Next?
   Moderator: Julie Rosati (ERDC – CHL) and Danielle Szimanski (USACE – NAB)
   1. What are BU big picture needs?
   2. Create action items. (i.e. Statement of Need dev. plans)

1535– Final thoughts/Comments Kelsey Fall (ERDC - CHL)

1545 – Announce Award Katie Brutsche (ERDC – CHL)

1555 – Closing remarks Amanda Tritinger (ERDC - CHL)
Appendix C: Day 1 Presentations and Related Notes
Beneficial Use (BU) Virtual Workshop

ERDC + USACE + HQ

Engineering With Nature® (EWN®)
Regional Sediment Management (RSM)
Coastal Inlets Research Program (CIRP)

July 12th, 13th, and 14th, 2021
BU Virtual Workshop – Day 1 Agenda

July 13, 2021: ERDC Session: Provide opportunity for ERDC scientists and engineers to share information with each other and organize internally.

1400 – Welcome & Opening remarks Amanda Tritinger (ERDC - CHL)
1410 – A Brief Description of the State of BU from the Perspective of Program Managers
1435 – Guided discussion: What is the status of BU at ERDC?
   Moderator: David Perkey (ERDC - CHL)
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   2. What is important to share with district partners?
   3. What do we want to know from district partners?
1555 – Closing remarks Kelsey Fall (ERDC - CHL)
Welcome & Opening remarks

– Purpose –
This BU workshop will discuss common BU design and application tools and procedures, as well as success stories on innovative BU projects. We will discuss challenges and lessons learned related to engaging with stakeholders, regulatory issues, state and federal policies, the federal standard, programmatic guidance, and schedule coordination.

– Objectives –
1) Develop and document the status of BU across USACE,
2) Organize a BU community across ERDC and USACE,
3) Develop effective communication and collaboration on BU within USACE,
4) Identify obstacles and levers for BU, and
5) Identify and initiate actions for making progress on BU.

– Due Out –
The due-out of today is to create a united ERDC BU presence, so that we leave this first day, documenting the state of BU research at ERDC, what is needed to advance the practice, and to move forward with our partners.

At the end of this workshop, our goal is to have more BU.
The major due-out from this workshop is to define and assign specific implementable action items towards this goal.
State of BU from the Perspective of Program Managers

- Dr. Katie Brutsche
  - **Regional Sediment Management**
    - A systems approach using best management practices for more efficient and effective use of sediments in coastal, estuarine, and inland environments for healthier and more resilient systems.
  - SEDIMENT IS A RESOURCE!!

**RSM Goals:**
- Keep sediments in the system
- Mimic natural sediment processes
- Reduce unwanted sedimentation
- Environmental enhancement
- Maintain & protect infrastructure

RSM is not just BU, but BU is RSM
- R&D into types of BU
  - Pilot projects
- Quantification of BU
  - BU Database
- Case studies in BU
  - District projects
**Beneficial Use: Status and Opportunities**

“Beneficial use” is using dredged sediment to achieve additional benefits beyond its removal from a channel/waterway, including other economic, environmental or social benefits.

- **USACE has a long track record of BU**
  - ~30% of dredged material beneficially used over last 20 years (60 out of 200 mcy/yr)
  - >1.5 billion cy used in beach construction over last 100 years
  - 50,000 acres of wetlands created in south Louisiana since 1970s

- **BU supports:**
  - Climate change adaptation thru *Engineering With Nature*®
  - Habitat for fish and wildlife
  - Tribal equities, Threatened and Endangered Species
  - Social value to enhance resilience of communities and vulnerable/underserved populations

- **BU challenges:**
  - Budget constraints
  - Federal Standard interpretation
  - State policies/regulations
  - Advancing the ‘technology’
State of BU from the Perspective of Program Managers

- Dr. Brian McFall (on behalf of Dr. Tanya Beck)
  - Coastal Inlets Research Program Work Unit Lead
Example Results

1.0 m MSL no veg

1.0 m MSL veg

Morphology Change - 19 May to 20 May 2020

Dredged navigation sediment

UNCLASSIFIED

UNCLASSIFIED

BU and Flood & Coastal Systems R&D

Tools and knowledge

• to create NNBF infrastructure
• to maintain NNBF infrastructure
• to increase advocacy for NNBF infrastructure

FCS Goal – to understand, quantify, and reduce flood and coastal storm risk

Gathering

Risk-Informed Planning Process

Institute for Water Resources

www.iwr.usace.army.mil

Risk-Informed Planning Process

Gathering
State of BU from the Perspective of Program Managers

- Dr. Jennifer Seiter-Moser
  - CW ENV

**Ecosystem Management and Restoration Research Program**

*Research focus*: Aquatic Ecosystem & Floodplain Restoration
- General Investigations (GI) Appropriation
- **Focus Areas**: Multi-Objective Restoration, Integrity & Sustainability, Inland Resource Management, Coastal, T&E and Invasive Species Management, Modeling and Decision-Making Tools, Ecological Infrastructure

**Aquatic Plant Control Research Program**

*Research focus*: biology and ecology of invasive aquatic plants species; technologies to manage invasive aquatic plants
- Construction General (CG) Appropriation
- **Focus Areas**: Biological Control; Chemical Control; Ecological Assessments; Management Strategies and Applications; Harmful Algae

**Aquatic Nuisance Species Research Program**

*Research focus*: on invasive aquatic animals, as well as harmful algal blooms (HABs)
- Operations and Maintenance (O&M) Appropriation
- **Focus Areas**: invasive fish and mussels. Congressional Interests: HAB Research and Next Generation Ecological Models

**Wetlands Regulatory Assistance Program**

*Research focus*: provides science and technology support to the USACE Regulatory Program.
- USACE Regulatory
- **Focus Areas**: National Plant Wetland List, Ordinary High Water Mark and Stream Science, Wetland Delineation Science and Assessment Methodology
Env: State of BU from the Perspective of Program Managers

Benefits & Challenges of Beneficial Use of Sediment

- Needs & Benefits
  - Ecosystem restoration (ER) is a major mission area of the USACE
  - Acquiring required materials for ER activities can be limiting both in terms of expenses and accessibility
  - Beneficial use of sediment, when done successfully, can enhance the effectiveness of ER activities
    - Long lasting projects, enhancing native floral and faunal species through habitat restoration
    - Sustaining the landscape
    - Removing sediment from areas where it is accumulating and moving it to locations where it is either depleted or could be used advantageously, i.e. Thin Layer Placement

- Challenges
  - In order to effectively and routinely use sediments in ecosystem restoration projects, the USACE needs access to a steady supply of sediments
  - Sediment matching: physicochemical requirements of sediments for specific restoration needs: marshes, riparian restoration, beach restoration.
  - Moving sediment to places of need in an economically feasible and reliable way
## BU Considerations in CW ENV:

### Beneficial Use to Create Habitat for Threatened, Endangered, and at-Risk Species:

- Shoreline and streamline erosion causes loss of habitats in riparian and coastal environments central to species of concern.
- ER activities can serve as a mechanism either directly or indirectly for habitat creation.
- Beneficial use of sediments and rock can be an excellent source of sustainable source material for habitat restoration if it can be obtained using cost effective means and the material meets the required characteristics.

### Weighing Impacts of Beneficial Use on Ecosystems

- Positive and negative impacts of BU on ecosystems must be evaluated in order to be included in ER plans in sensitive ecosystems.
- Assessing both removal and placement of BU need to be completed
- Does the good outweigh the negative impacts?
- Are any negative impacts temporary or longer term?
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https://emrrp.el.erdc.dren.mil/
Guided discussion: What is the status of BU at ERDC?

**Moderator:** David Perkey (ERDC - CHL)

1. Definitions of BU
2. Discuss different types of BU
3. Obstacles to BU
4. Levers for BU
5. General opportunities for expanding BU

*Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!*

US Army Corps of Engineers • Engineer Research and Development Center
How do we define Beneficial Use?

Beneficial uses are defined as “productive and positive uses of dredged material, which cover broad use categories ranging from fish and wildlife habitat development, to human recreation, to industrial/commercial uses” (USACE Beneficial Uses of Dredged Material, Engineer Manual 1110-2-5026, 2015).

- **BU** = using dredged sediment to achieve additional benefits beyond the purposes related to its removal, including other economic, environmental, or social benefits.
- Results in some net quantifiable benefit
- Perception that BU is only marsh creation, beach restoration, what about inland?!?!! Keeping sediment in system as a goal vs. pulling out of system (ex. Graveyards WI). BU to utilize in construction (but do people consider that). Challenges with permissions to do this type.
- I think there would be value in producing a short TN on the history of the definitions of BU that have been used and the evolution of BU practice, to include everything between strategic placement to location-specific placement (e.g., to create wetlands). Both USACE, states, regulators, resource agencies must evolve their perspectives and concepts.
- Need to identify BOTH the environmental AND engineering benefits of BU. **ENVR** = habitat, nutrient cycling, energy dissipation. **ENG** = reduced storm surge, nav channel maintenance, shoreline stabilization. AND social benefits beyond economic/engineering benefits.
- Things we don't normally count as a benefit (e.g., using contaminated material capped with clean material to fill anoxic borrow pits to restore elevation and productive benthic habitat.)
- Upper Mississippi River Restoration calls it BU and uses up to 500,000 cy is a single restoration project. it facilitates offload of temporary storage sites.
- Not all BU is keep in system.
- How do we define the difference between "in-channel disposal" and "in channel beneficial reuse"?
- I heard lots of discussion on removing sediment from the "system" is not beneficial. But depends on the "system"...
- Getting the public behind BU has the potential to help increase the total amount of sediment that is used beneficially
- Social and recreational benefits have value, and raises the profile, and even allows us to address environmental justice issues
- Need a typology to help organize the categories of BU: in water vs out of water, use for land enhancement vs. construction material.
- Document different historic projects (Jacob Berkowitz, paper- Also talking tomorrow, so tune in!)
- **Outcome**-Create BU working group. Meet semiregularly, and work on this definition. (Working/living definitions to fit USACE Needs)
- Part of the value of the factsheets and case studies is to develop patterns, examples, models (generally) for how to create narratives and arguments about the benefits produced through a BU application. This growing library will itself be a lever to help move people and organizations to new ideas and approaches.

*Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!*

US Army Corps of Engineers • Engineer Research and Development Center
### Types of BU?


<table>
<thead>
<tr>
<th>Dredged Material Sediment Type</th>
<th>Examples of BU Activities</th>
<th>Rock</th>
<th>Gravel &amp; Sand</th>
<th>Consolidated Clay</th>
<th>Silt/Soft Clay</th>
<th>Mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land creation</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Land improvement</td>
<td>X</td>
<td></td>
<td></td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Berm creation</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Shore protection</td>
<td>X</td>
<td>X</td>
<td></td>
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<td>X</td>
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<td>X</td>
<td>X</td>
<td></td>
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<td>X</td>
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<tr>
<td>Beach nourishment</td>
<td></td>
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<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Capping</td>
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<td>X</td>
<td>X</td>
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<td>X</td>
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</tr>
<tr>
<td>Construction materials</td>
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<td>X</td>
<td>X</td>
<td></td>
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<td>X</td>
</tr>
<tr>
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<td></td>
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<td>Fisheries improvement</td>
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<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Wetland restoration</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

What is missing?

|                           |                           |      |               |                   |                |         |
| What is missing?          |                           |      |               |                   |                |         |
|                           |                           |      |               |                   |                |         |
| What is missing?          |                           |      |               |                   |                |         |
|                           |                           |      |               |                   |                |         |
| What is missing?          |                           |      |               |                   |                |         |

Let us know if there are any BU activities we are missing.

Use the annotate feature to populate the table; add a shape to show us which type you use the most.
## BU - What works and what doesn't?

### Obstacles to BU

- How do we quantify benefits
- Obstacle - perceived liability by USACE Counsel
- Different regions of country view types of BU differently. This would lead to different definitions.
- Talking about types of BU engage districts, and get their types
- Overly conservative contamination thresholds
- Real Estate/Council, wanting to track material "cradle to grave"
- Communication
cost, regs, risk aversion, short term thinking, linking disparate projects to achieve regional/ecosystem long-term goals
- Promoting collaboration amongst busy researchers. Develop ways to share what is going on.
- District interest and capacity. Some are easy to work with, others more challenging.
- There's a need for clear and understandable requirements for material to be used for different types of habitat restoration.
- Some areas have not identified beneficial use options or there are none nearby
- The ERDC BU community needs effective ways for sharing information about ongoing research and demonstration projects across our community to facilitate self-assembled collaboration rather than top-down directed collaboration.
- I think we could do an overhaul of the BU Website or teams site that already exists (Due Out)

### Levers for BU

- Levers for BU - Stakeholder and partner engagement, early and often
- Interagency working groups
- Communication
- pilots to demo to nay sayers. Previously, had to demonstrate applications on regional basis.
- Dredge material as a carrier of other useful things
- climate change and rising sea levels should be a consideration for keeping sediments near- or onshore

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*Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!*

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US Army Corps of Engineers • Engineer Research and Development Center
General Opportunities for expanding BU

- Industry coalition public/private partnership for BU applications. Pilot scale demo opportunities or cost share/investment for support. They can help push for policy changes (they can talk to congress, we can't)
- High impact and effective documentation and communication products describing successful BU of a wide range of types.
- Establish ERDC regional experts who can participate with regional coordination committees like upper Miss and Great Lakes.
- Biggest opportunity = transitioning from demos and 'boutique' projects to BU as THE default practice. To do this and justify the cost we need to assess the FULL suite of positive project outcomes
- Education and outreach to prompt/grow/improve district relationships (as well as outreach to other partners/public)
- Engaging other organizations in the demos so they can also own credit for the success, e.g., NOAA-NMFS, USFWS, state agencies, etc.
- Newly formed Upper Mississippi Beneficial Use Working Group which include all states (WI, MI, IA, II, MO) DOT, DNR, US Fish and Wildlife, EPA, etc.
- Share contacts to make for outreach and partnering
- A National Conference on BU
- A library of 2-3 minute videos documenting BU projects and how they got done.
Guided discussion: What is the status of BU at ERDC?

Moderator: Burton Suedel (ERDC - EL)

1. How to create synergy across ERDC on BU? (to be a good partner, we need to be united)
2. What is important to share with district partners?
3. What do we want to know from district partners?

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!
BU - How to create synergy across ERDC on BU?

- BU working group!!!!
  - Formalize group. Establish regular meeting (quarterly) with potential annual or semi annual meeting for more intense discussions.
  - Identify action items and plan to act on them
- A library of 2-3 minute videos documenting BU projects and how they got done.
- High impact and effective documentation and communication products describing successful BU of a wide range of types.
- Lab level, program level, PI synergies
- Revamp BU workshop (Brook and Justin lead team).
  - Place to connect to different programs, so don’t take away from programs, but have them linked for easier communication. Facilitate communication within and outside of ERDC
  - The "ERDC" BU website should be evolved into the USACE BU website. No other entity in USACE will step up to doing this.
  - ACE-IT website?
- Developing and maintaining list of current ERDC BU projects: title, 3 sentence description and POC.
- Teams website-for ERDC interaction (living document, reduce meetings).
- Consider a push to consolidate the information to fewer websites. Lots of BU information is fragmented
- As program managers, we should think about whether many small projects or fewer large projects would bring more overall impact and value.
- I think there would be lots of value in putting the emphasis on sponsoring externally oriented events, like a webinar series, short virtual workshops, etc. that cast toward a national audience.

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!
BU Partnership Plan

What is important to share with district partners?

- Unified USACE Viewpoint
- ERDC needs to be unified to give clear reach back to the district partner. 
  COMMUNICATION all the way.
- Communicate ERDC capabilities to leverage the program funded activities AND get 
  engaged with reimbursable
- Should our deliverables change? (Communication tools):
  - PIs make sure districts are apart of the review process
  - Establish regional experts to coordinate personnel
  - We also have other potential partners, industry, other agencies etc.
  - The districts and divisions should have regional experts. They won’t pay us to be on 
    retainer.
- Turnover with ERDC employees- need to promote relationships between new employees 
  with district contacts
- Look to leadership for encouragement.
- ERDC needs to think about opportunity costs (researchers spread to thin)
- ERDC are too risk adverse in taking on small commitments and not being ready for the big 
  issues
- Establish District BU Champion (lead into the district) or BU ERDC group linked to district 
  or division (tough with schedules). Follow nearshore nourishment example, include 
  district in working group or have different neighborhoods of group.
- We need to think hard about what makes ERDC a worthy and valued partner for a District 
  or any other organization. (sometimes have to say no).
- How do we leverage some outside contractors, A&E firms, to have them help us deliver 
  impact. For example, the programs jointly funding a few large contracts.
- District: Operation vs planning.
- ERDC and/or District details- great way to learn and create connections
  - Need to send folks who can “cross-sell” across the labs and disciplines
  - FCS is implanting ERDC PIs in districts for planning WUs across the country. Could be for BU 
    as well

What do we want to know from district partners?

- Talking about types of BU engage districts, and get their types
- We need to be more aware about how some people in the field view ERDC.
  - Looking for money, always just trying to advance our “agenda”.
- How can we demonstrate we are a good partner?
- How can we better communicate?
- What makes ERDC a good partner in respect to BU?
  - Listen to what they need, talking early, reaching out.
  - Not overcommitting
- Early ERDC engagement in the planning and design phases

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!

US Army Corps of Engineers • Engineer Research and Development Center
What do we want to get out of Day 2, with the districts?

- What are your biggest problems or obstacles for doing BU, that I can help? Is it technical? Cost?
- How should we be communicating with Districts?
- What makes a good ERDC partner (stolen from last slide, but think this is something multiple people were interested in)
- How can we help them with their relationships with difficult stakeholders and nay-sayers?
- Understanding big project schedules is important. We can implement their adaptive management planning and evaluation with them.
- How do we transition from R&D to common practice?
- How do we create the R&D districts want/need?
- "when do you need help?", "what science can we provide to defend your position to stakeholders?"
- What projects do they have where they think applications or demonstrations of emerging tools and technology would be timely and helpful?
- What communication products from ERDC could help with their relationships and communication with stakeholders?
- How many people know ERDC exist and we are here to partner with them?
- Other avenues (along with DOTS) that they can pair up with us
- For tomorrow: Let's make sure they understand the SON process and how to partner.
- Also think bigger picture than SoN to project work plan requests.
- Every program has a responsibility for tech transfer. money is not as scarce as we think. Ask a PM.
BU Virtual Workshop Day 2 – See you tomorrow!

July 14, 2021: ERDC, District, and HQ Session: Provide opportunity to share information across the USACE enterprise.

1400 – Welcome & Opening remarks Kelsey Fall (ERDC - CHL)
1410 – A Historic Look at USACE BU Case Studies Jacob Berkowitz (ERDC – EL)
1420 – Overview of BU Guidance Jase Ousley (USACE - HQ)
1435 – Guided discussion: What is the status of BU at throughout USACE?

Moderator: Monica Chasten (USACE – NAP)
   1. Definitions of BU. (Include multiple definitions from various sources)
   2. Discuss different types of BU – For USACE
   3. Obstacles to BU
   4. Levers for BU
   5. General opportunities for expanding BU

1525 – Guided discussion: What is needed for successful partnering between USACE (ERDC+ Districts) and beyond (i.e. Federal Agencies, Academia, etc.)?

Moderator: Elizabeth Godsey (USACE – SAM)
   1. What are ingredients for successful partnering/collaboration between ERDC and Districts?
   2. How do we create synergy across USACE on BU? (to be a good BU stewards, we need to be united)
   3. What are ingredients for successful partnering between USACE and others?

1555 – Closing remarks Amanda Tritinger (ERDC - CHL)
Appendix D: Day 2 Presentations and Related Notes
Beneficial Use (BU) Virtual Workshop

ERDC + USACE + HQ
Engineering With Nature® (EWN®)
Regional Sediment Management (RSM)
Coastal Inlets Research Program (CIRP)

July 12th, 13th, and 14th, 2021
BU Virtual Workshop – Day 2 Agenda

July 14, 2021: ERDC, District, and HQ Session: Provide opportunity to share information across the USACE enterprise.

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1555 – Closing remarks Amanda Tritinger (ERDC - CHL)
Welcome & Opening Remarks

– Purpose –
This BU workshop will discuss common BU design and application tools and procedures, as well as success stories on innovative BU projects. We will discuss challenges and lessons learned related to engaging with stakeholders, regulatory issues, state and federal policies, the federal standard, programmatic guidance, and schedule coordination.

– Objectives –
1) Develop and document the status of BU across USACE,
2) Organize a BU community across ERDC and USACE,
3) Develop effective communication and collaboration on BU within USACE,
4) Identify obstacles and levers for BU, and
5) Identify and initiate actions for making progress on BU.

– Due Out –
The due-out of today is to create a united USACE BU presence; to document what is needed to advance the practice, and move forward as partners.

At the end of this workshop, our goal is to have more BU. The major due-out from this workshop is to define and assign specific implementable action items towards this goal.
Summary – Main Points from July 13

Outcomes from ERDC’s Discussion

- The definition of BU needs to be allowed to EVOLVE
- Need to transition from R&D to common practice, and create R&D that is wanted
- We all want to make BU standard practice
- COMMUNICATION needs to be a primary focus

Goals for Today’s Discussion

- Learn about USACE BU obstacles and identify how ERDC can assist
- How can we help support positive community/stakeholder engagement
- How does ERDC promote the Districts/HQ involvement more
- Define what USACE-Districts/HQ wants from ERDC partners
Evaluating ecological functions AND engineering benefits at historic dredged material management sites

Beneficial Use workshop July 14, 2021
Jacob F. Berkowitz, PhD, CPSS, PWS
US Engineer Research and Development Center
Jacob.F.Berkowitz@usace.army.mil
Tweets @wetlandsoil
Ecological functions at BU sites

- BU projects deliver ecological functions (e.g., habitat, energy dissipation, nutrient cycling)
- We can quantify BU ecological functions
- Long-term trajectory of BU projects remains unknown
- Need to link BU ecological functions with engineering benefits
  - Life-cycle analysis; expansion of EWN

![Graph showing tree basal area over time](image)
Projects constructed using dredged materials (1974-78)

Represent the oldest wetland BU sites with historic monitoring data

We re-created the previous studies to evaluate conditions at each location after >40 years
  - Also evaluated unaltered reference sites

Collaboration with SWG, NAB, SAM, NWP, NAE, LRE, SAS
Example: Buttermilk Sound, GA

- Originally a high, unvegetated sand mound
- Site was graded to intertidal elevation, planted, and fertilized in 1974
- Monitored through the early 1980s, then in 2019
- Currently displays a diverse array of habitats, ecological functions, and engineering benefits
40 years of wetland functional and engineering benefits

- BU sites persisted and continue to provide a range of wetland functions & engineering benefits
- More diverse vegetation and avian communities than reference areas
  - Elevation gradients and a wider range of substrates
- Restored sites became more similar to the reference areas over time
  - Remain on unique trajectories compared with unaltered natural wetlands
40 years of wetland functional and engineering benefits

- Similar response to changing ecological conditions as unaltered wetlands, despite differences in magnitude

Reference: BU sites

Functional responses differ across physical, habitat, & biogeochemical drivers

- Physical/hydrologic functions can be maximized through design → immediate benefit
- Habitat & Biogeochem require additional time
- Evolution of feedbacks
Linking ecological functions with engineering benefits

Physical functions

Water Storage
- Elevation Maintenance
- Dewatering Effects
- Landscape Evolution
- Water Quality Improvements

Sediment Retention
- Shoreline Stabilization
- Navigation Channel Maintenance
- Landscape Evolution
- Water Quality Improvements

Energy Dissipation
- Shoreline Stabilization
- Navigation Channel Maintenance
- Landscape Evolution
- Storm Surge Reduction
Linking ecological functions with engineering benefits

Habitat functions

- Habitat for Flora and Fauna
- Shoreline Stabilization
- Navigation Channel Maintenance
- Water Quality Improvements
- Storm Surge Reduction
- Landscape Evolution
- Elevation Maintenance

Biogeochemical functions

- Biogeochemical Cycling
- Elevation Maintenance
- Dewatering Effects
- Landscape Evolution
- Water Quality Improvements

*These relationships need to be refined and incorporated into quantitative frameworks in collaboration with practitioners*
Conclusions:
1) The target habitats have persisted for >40 years
2) Wetland conditions continue to improve, but have not (and may not) reach reference conditions
3) Despite this, the projects deliver valuable ecological functions AND engineering benefits
4) Additional work needed to quantify engineering projects to promote BU and EWN

Recommendations:
4) We should use natural processes to create sustainable wetlands
5) We should focus on maximizing the available functions and benefits
6) We should not focus on mimicking natural conditions to determine success/failure
Connect for questions and discussion:
Email Jacob.F.Berkowitz@usace.army.mil
Twitter @Wetlandsoil
EL BU meeting-
WRDA 2020 section 125
beneficial use

Beneficial Use workshop July 14, 2021
Jase Ousley
Dredging Program Manager
HQUSACE

14 July 2021
EL BU meeting-
WRDA 2020 section 125
beneficial use

- Jase Ousley
- Dredging Program Manager
- HQUSACE
- 14 July 2021
WRDA 2020 section 125

This section renews the Congressional commitment to beneficial use (BU) of dredged material by:

(a) establishing a national policy to maximize the beneficial use of material obtained from Corps projects; requiring the Corps to calculate the economic and environmental benefits of the beneficial use of dredged material when calculating the Federal Standard,

(b) amending section 204(d) of WRDA 1992 to direct that other-than-least-cost placements of dredged material for certain purposes be funded using appropriations available for construction or operation and maintenance of the water resources development project producing the dredged material

(c) increasing the number of beneficial use of dredged material demonstration projects to 35 projects,

(d) directing the Corps to develop five-year regional dredged material management plans, and

(e) emphasizing greater coordination across the Corps’ dredging contracts.
What is bu-nav

- Habitat Development
  - Marsh
  - Wetland
  - Wooded wetland
  - Upland
  - Island
  - Sea grass
  - Clam flats, oyster beds, mussel beds, other shellfish
  - Artificial reefs and underwater berms
- Construction and Industrial/Commercial uses
  - Harbor and Port facilities
  - Residential and urban use
  - Airports
  - Dikes, levees, and containment facilities
  - Fill material and roads
  - Islands and historic preservation
- Beach and beach nourishment
- Parks and recreation
- Agriculture, horticulture, forestry, and aquaculture
- Strip mine reclamation, solid waste landfill and alt uses
- Multipurpose concepts

- EM 1110-2-5025
- BU-RSM-EWN

- What are we counting?
- What are we not counting?
- ODMDS/rotational placement
- How are we tracking?
BU now and goals? .... 70/30? 100?

- https://rsm.usace.army.mil/budb/
Bu and our portfolio

*8% of our portfolio is 80% of sed.

National channel framework/CSA

Top 25 projects
204(d) vs 125

- 204(d) CAP - USACE can pay over the FS, cost shared with the sponsor with the delta paid from CAP
  - must be in feasibility
  - very engineered placements
  - no O&M – one and done
  - limited by $ 
  - moved us to 1122 then to 125

VS

- 125 – USACE can pay over the FS, no established cost share [adopt 204(d)?], overage can come from the O&M/Construction account
  - start it any phase of the dredging cycle
  - temporary vs permanent placement

- FY22 $4.3B O&M budget … and $11B in O&M packages

- How do you all as USACE leaders get stakeholders invested in making BU economical?
- BU is an exercise in opportunity–Get stakeholders ready to accept material at go time?
BU and our portfolio

- Not including all the economic/enviro benefits
5-yr Dmmp

- All projects have a preliminary assessment or DMMP
- Break into the dredging cycle for BU...
  - Think: operational
  - rolling spreadsheet
  - regional
- Get stakeholders involved
- You know your portfolio - project dredging cycles, typical volumes, FS placement costs, general sediment characteristics, etc
- Tool to increase BU opportunities
Path forward

- Reaffirm definition of beneficial use outlined in Engineer Manual 1110-2-5025
- Leadership to set national goals for beneficial use
- Establish reporting metrics in the Dredge Information System and increase visibility via RSM BU database
- Issue guidance for Section 125
  - include economic and environmental benefits
  - increase stakeholder engagement
  - submit budget packages
- Identify and address challenges
  - Real estate, timing, funding, environmental coordination
  - Memorandums of Agreement for rapid execution
- Align multiple efforts
  - Revolutionize USACE BU Tiger Team
  - ERDC Engineering with Nature and Regional Sediment Management
  - 1122 execution
What can you do today?

- DMMP’s underway or for mod: The DMMP lays out the 20 yr guaranteed placement option and establishes Fed Std. Per Sect 125 if stakeholder engagement identifies an alternative that is equal to or less than the Fed Std and retains capacity or has greater benefit- it can be used.

- Increase stakeholder engagement?

- Track BU better in DIS -> BU database

- Deeper dive into economics

- Communicate and elevate obstacles to MSCs/HQ

- Be creative
Bu references

- Regional Sediment Management, Beneficial Use Database: https://rsm.usace.army.mil/budb
- Engineering with Nature: https://ewn.el.erdc.dren.mil/
- Revolutionize USACE: https://www.usace.army.mil/Missions/Civil-Works/Infrastructure/revolutionize/
Guided discussion:

What is the status of BU at throughout USACE?

**Moderator:** *Monica Chasten (USACE – NAP)*

1. Definitions of BU/Discuss different types of BU
2. Obstacles to BU
3. Levers for BU
4. General opportunities for expanding BU

*Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!*

US Army Corps of Engineers • Engineer Research and Development Center
How do we define Beneficial Use?

Beneficial uses are defined as “productive and positive uses of dredged material, which cover broad use categories ranging from fish and wildlife habitat development, to human recreation, to industrial/commercial uses” (USACE Beneficial Uses of Dredged Material, Engineer Manual 1110-2-5026, 2015).

- Anything that changes the view of sediment as the problem to viewing sediment as a resource that can be used to solve another problem.
- BU is PURPOSEFUL -> We can find examples of BU dating back to the start of Navigation channel dredging, but these were not always intentional by the definitions.
- Def: ecological, engineering, and social benefits (including environmental justice and recreation) should be considered
- Not all BU is “keep in system. “
- Compare BU with Reuse (I.E. KEEPING sediment in the system)
- Having a definition that speaks to ecological vs. economical systems
- How do we include the SOCIAL benefit of BU
- There is a big push from resource agencies on the Upper Mississippi to remove material from the system
- Purposeful (intentional) placement to perform ecosystem goods and services
- What does BU mean in different systems? At different scales?

- The def. here is missing ecosystem restoration; are we missing the business lines of flood risk or sediment management?

- The definition should EVOLVE; the goal is not to insist on one definition "to rule them all" but to use language to help us make progress on beneficial uses of sediment. -> This will be an action item for BU WORKSHOP ATENDEES!

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!
BU - What works and what doesn't?

Obstacles to BU

- When people retire, and we want a sustainable practice to move forward, we need the POLICY to back that up. That is going to have vary by REGION.

- **Technical Obstacles:**
  - Use of Fine Grain Materials
  - Sediment testing is expensive (ESP with QUALITY of material)
  - Timing of dredging need and availability of BU site
  - Mixture of beach quality sand with a small percentage of fine material, but too much to meet state "beach placement" standards
  - Lack of mentoring
  - Smaller BU sites but too large of dredges

- **Quantifying the ecological benefits through research will aid in those policy and regional obstacles**

- **Stake Holder Obstacles:**
  - Different flavors of "risk aversion" within different organizations or functional areas within organizations.
  - Willingness for non-fed sponsor
  - Placing material on someone else's site (clean-up) because of perceived liabilities

- **BU project perceived as more risky and more expensive**

- **Scheduling Obstacles:**
  - Long and Short time frames are an obstacle, but also a lever
  - Resource agencies needing to understand the timeframe and not need to require 3+ years pre monitoring before allowing placement

- **$$ Obstacles:**
  - Cost, potential contaminants, commitment from cost-share partners
  - Cultural Resource survey requirements and costs
  - Cost/cy because of down time, precision of placement, etc.

- **permitting via state regulating agencies**

- **Monitoring (can be a lever! But can be an obstacle)**

- **O&M not having funding for that funding**

- **Potential liability if private groups remove material from a upland placement site??**

- **Time Obstacles:**
  - Timelines to reach standard USACE agreements

- **NOISE-IE Guidance, un-aligned :/**

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Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!

US Army Corps of Engineers • Engineer Research and Development Center
BU - What works and what doesn't?

Levers for BU

- Quantify the actual value delivered by BU projects
- One "solution" for those with contaminant focus, would be to get them focused on the bigger problem "predator" chasing them
- Bring in potential monitoring partners early and often as soon as there is an idea for BU, once relationships are established they can be used as a resource over and over again. Bring those monitoring partners in for design aspects as well
- Demo or Pilot type projects can help with bringing Resource Agencies on board and they can play a larger part in the planning
  - What is the right word for Pilot? -> Talk about “Standard Practice”
- Adaptive Management -> this works with many, very helpful to work with navigation community
- Collaboration, Communication Levers:
  - Coordination that enables mutual understanding and shared risk.
  - Align implementation with research.
  - Communication Opp.s creating from events
  - Managing stakeholder expectations - these are natural systems that SHOULD change and evolve in response to environmental perturbations
  - communication of the negative impact and outcome of non-BU action scenario

- How other Districts handle the potential liability if private groups remove material from a upland placement site; is there an opportunity/lever there? The liability is a opportunity.

- District BU managers and champions!

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!

US Army Corps of Engineers · Engineer Research and Development Center
General opportunities for expanding BU

- One potential solution for addressing timing issues is to expand flexibility through open-water temporary storage. MVN has been doing this on the Miss River for many years. But there are other contexts where this could work, including in bays (e.g. SF Bay).

- Maryland just established an Innovative Reuse set of Guidelines in 2017 to remove sediment from the CDFs to allow for greater capacity.
  - Learn how states are embracing BU, how are other agencies embracing BU? How can we learn from these guidelines.

- In water management -> Handling the material and having in STAY in the system is an OPPORTUNITY
  - Need to communicate the benefit of this.
  - Persistence. How have districts/BU champions been successful doing this? Build on that; working with our CORPS regulatory committee has been helpful in doing this.

- Restore proposals going in to set funds aside to maintain all the restoration sites. Partnerships will align these sites with the source of material within our channels.

- Climate Change has increased awareness, and thus created opportunities.
  - Status Quo is not an option anymore.

- We have leveraged our Biological Opinion program partners to identify the habitat types needed in the Miss. River. Still trying to get those habitats created through dredge placement.

- There is a huge need for BU nourishment when lake levels are high, which happens to coincide with reduced dredge activity (higher water levels reduce need for nav. projects).

- RSM program has enabled us to put some science behind our assertions of the value of BU - this has built us a lot of trust and value with our stakeholders for partnering when they do have to cost share

- Working with ERDC, and bringing the science to our projects!

- Resource agency becoming our partners, developing the plans and having shared ownership.

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!
Guided discussion:

What is needed for successful partnering between USACE (ERDC+ Districts) and beyond (i.e. Federal Agencies, Academia, etc.)?

**Moderator:** Elizabeth Godsey (USACE – SAM)

1. What are ingredients for successful partnering/collaboration between ERDC and Districts?
2. How do we create synergy across USACE on BU? (to be a good BU stewards, we need to be united)
3. What are ingredients for successful partnering between USACE and others?

*Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!*

US Army Corps of Engineers • Engineer Research and Development Center
What are ingredients for successful partnering/collaboration between ERDC and Districts?

- ERDC is not a contractor, we are a partner. Find where the research aligns with implementation side; that is where you can share positive OUTCOMES and SUCCESSES.
- When we try to push the boundaries, when Districts are interested in doing something new, stepping outside of the comfort zone, that is when we have a successful collaboration!
  - When we are not afraid of failure, but hopeful for state-of-the art expansion!
- If we make it more common, to strategize BEFORE a project, this could be a more efficient/cleaner path to progress.
  - We need streamlined ERDC+District connections; pick up the phone, engage EARLY EARLY EARLY.
- Having Program Managers is really helpful for TRUST with the agencies.
- ERDC Researchers coming out, boots on the ground, to help with research implementation; application.
  - This is how ERDC can effectively become a PARTNER.
- Communication and Consistency are key;
  - There are so many challenges (funding cycles, workload cycles, attention to the problem cycles). Consistency in communication is the key. And if consistency in funding is possible, that is a huge help.
  - early and constant communication between ERDC and district team members. Elizabeth, I agree we are a team, partners, all USACE. So I guess my question for district personnel on here, how is best to communicate?

- There is a challenge with communication inside and outside the USACE. Doing that well -> Leads to Success
  - COMMUNICATION THROUGHOUT THE PROCESS

*Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!*
How to create synergy across USACE on BU?

- **District Customer & ERDC Customer**: Partners
  - Communicate as Partners
  - Have a mutual understanding; share early, share often
- Have ERDC team members participate on regular PDT meetings.
- Leverage the RARG/SON process to test innovative solutions to add value to more District projects.
  - Hmmmm Action Item?
- Where do we find limiting factors or OPPURTUNITIES within Districts
  - Contracting and council -> Jase’s work is an opportunity to move this forward
  - Districts have to administer a contract, so there has to be balance between ERDC Research and Contracting; there needs to be oversight, make sure we keep trust by keeping in constant communication
  - Getting your OPPS folks and your Contract Adim. To agree, is an issue, but we are starting to move past this by using the word PARTNERSHIP
  - RE has been an issue for MVR
  - Real-Estate can be an issue to getting the synergy we all want….
- We don’t speak “one language”
  - Regulatory feels like it is stifling bu
  - How do we get ONE MESSAGE, unite on ONE FRONT

communication, I think it works best on an individual level. If an ERDC expert can find a District person that does something they are very interested in, then I think individual check-ins (monthly, quarterly) would be best. Likewise, if a District person can find an ERDC expert doing something they are interested in. Often when things go up and across through leadership chains, the motivation/excitement/engagement in the topic of solving the problem gets lost.

*Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!*
What are ingredients for successful partnering between USACE and others (i.e. Federal Agencies, Academia, etc)?

- How do we tend to perceive Fed. Agencies, Academia, INDUSTRY (not just dredge industry- material managers as well), that we are sometimes “just required” to work with
  - Each partner has a different motivator, how do we motivate each
  - Industry: Seems like motivation is $$, but also SCALE, and a large enough INITIATIVE
  - The industry will get motivated any time they can tell a GOOD NEWS STORY
  - How do we get industry to help us implement new research tech into application?
    - ENGAGEMENT WITH THEM: invite them to planning meetings, that have value in being there, and when they are able to add that value, they’ll have buy in.
    - We explain the WHY of research, they will embrace that challenge

- Bring them to the table. COMMUNICATE what the issues are, make sure we reach an understanding.
  - Share the PURPOSE. Share the PROCESS. Share the BENEFIT.
  - Don’t barge in and say “this is what we HAVE TO DO” but say “this is what we can’t do..” -> Helps us find the solution together

- How do we work through policy changes (or staff changes)? What happens when our champions move on?
  - Vertical Chains of Communication -> create sufficient vertical relationships that create consistency
  - This is where it has been helpful to have PMs and Program Leads at the Hill Level
  - Have relationships at District, but also DIVISION level
  - We have to keep engaging UP

- USACE NEEDS TO DECLARE A GOAL FOR BU
  - This is gives our partners/champions the tools to fight for us
  - We can’t reach this declared valued without industry (without these partners)

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!
How can we share successes and best practices most effectively across the USACE enterprise?

- What communication products or pathways or platforms for doing this?
- Example of Successful Tech Transfer: Planning Community of Practice has bi-weekly seminars (Kimberly Townsen)
  - -> I.E. FRM, Planning Relating Topics
  - USACE only? Open Access? Combo? There have been outside presenters, but mostly internal.
  - There is definitely need for this! Find our United Front and have more open communications
  - Need to have a source to communicate updates with Partners as well
- Good way to share successes: Coastal Working Group -> Heather Schlosser
- We need to speak simply about complicated things, and share this with a broader audience
- Work on revamping the BU website; Be a good communication source on BU
  - Reach out to Brooke Stevens!
  - What are the district needs from this website?
  - Goal: Get Public Buy In from Stakeholders; show the work that the USACE is doing, build awareness, but also hear from industry/other agencies, meet the needs of the corps overall

- We aren’t great at telling our own stories at the district, it is our goal to implement.
  Build Story Maps that tell the story (from beg to the end).
  Share Vertically, Share Outward.

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*Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!*
BU Virtual Workshop Day 3 – See you tomorrow!

July 15, 2021: ERDC, Districts, HQ Develop Alternative Actions and Next Steps
AUDIENCE – ERDC + Districts/Field

1400 – Opening remarks and summary of past two days Kelsey Fall and Amanda Tritinger (ERDC - CHL)
1415 – Importance of BU to the Nation Todd Bridges (ERDC – EL)
1425 – Guided Discussion: What’s Next?
   Moderator: Julie Rosati (ERDC – CHL) & Danielle Szimanski (USACE – NAB)
   1. What are BU big picture needs?
   2. Create action items. (i.e. Statement of Need dev. plans)
1535– Final thoughts/Comments Kelsey Fall (ERDC - CHL)
1545 – Announce Award Katie Brutsche (ERDC – CHL)
1555 – Closing remarks Amanda Tritinger (ERDC - CHL)
Appendix E: Day 3 Presentations and Related Notes
Beneficial Use (BU) Virtual Workshop

ERDC + USACE + HQ

Engineering With Nature® (EWN®)
Regional Sediment Management (RSM)
Coastal Inlets Research Program (CIRP)

July 13th, 14th, and 15th, 2021
BU Virtual Workshop – Day 3 Agenda

July 15, 2021: ERDC, Districts, HQ Develop Alternative Actions and Next Steps
AUDIENCE – ERDC + Districts/Field

1400 – Opening remarks and Summary of the workshop so far Kelsey Fall and Amanda Tritinger (ERDC - CHL)
1415 – Importance of BU to the Nation Todd Bridges (ERDC – EL)
1425 – Guided Discussion: What’s Next?
   Moderator: Julie Rosati (ERDC – CHL) & Danielle Szimanski (USACE – NAB)
   1. What are BU big picture needs?
   2. Create action items. (i.e. Statement of Need dev. plans)
1535 – Final thoughts/Comments Kelsey Fall (ERDC - CHL)
1545 – Announce Award Todd Bridges (ERDC – EL)
1555 – Closing remarks Amanda Tritinger (ERDC - CHL)

As we wait for attendees to get seated, re-introduce yourself with your ONE BIG BU WISH LIST
Welcome & Opening Remarks

– Purpose –

This BU workshop will discuss common BU design and application tools and procedures, as well as success stories on innovative BU projects. We will discuss challenges and lessons learned related to engaging with stakeholders, regulatory issues, state and federal policies, the federal standard, programmatic guidance, and schedule coordination.

– Objectives –

1) Develop and document the status of BU across USACE,
2) Organize a BU community across ERDC and USACE,
3) Develop effective communication and collaboration on BU within USACE,
4) Identify obstacles and levers for BU, and
5) Identify and initiate actions for making progress on BU.

– Due Out –

At the end of this workshop, our goal is to have more BU. The major due-out from this workshop is to define and assign specific implementable action items towards this goal.
Summary

- Consistent communication is key; collaboration across USACE, upward, and outward (start early, do often)

- BU overall varies across regions, scales, and benefits. The definition of BU needs to be allowed to change; we need a team to help develop this definition.

- Communication of progress and state of BU is important (for funding, for buy in, to get outside groups to the table, to get public support); we need a team who can lead this.

- We need to create opportunities for knowledge sharing (as SMEs and Champions retire, we need that experience to transfer), and to build connections, and to be PRESENT (i.e. ERDC puts boots on the ground for District project)

- There is a need to build a BU network; database, ask questions, share experiences…
The Beneficial Use Imperative

Dr. Todd S. Bridges
Senior Research Scientist (ST), Environmental Science
National Lead, USACE Engineering With Nature®
US Army Corps of Engineers
Todd.S.Bridges@usace.army.mil

USACE BU Workshop
July 15, 2021
The San Joaquin Valley, California
Beneficial Use: Status and Opportunities

“Beneficial use” is using dredged sediment to achieve additional benefits beyond its removal from a channel/waterway, including other economic, environmental or social benefits.

- USACE has a long track record of BU
  - 30% of dredged material beneficially used over last 20 years (60 out of 200 mcy/yr)
  - >1.5 billion cy used in beach construction over last 100 years

- BU supports:
  - Climate change adaptation thru Engineering With Nature®
  - Habitat for fish and wildlife
    - Tribal equities, Threatened and Endangered Species
  - Social value to enhance resilience of communities and vulnerable/underserved populations

- BU challenges:
  - Budget constraints
  - Federal policies/regulations/business practices
  - State policies/regulations/business practices
  - Advancing the ‘technology’
  - Synchronizing government and the private sector
A “Sustainability Ledger” for Sediment Management: A Mindset

Sustainability is achieved by efficiently investing resources to create present and future value

**Efficiency**
- Reducing sedimentation in channels & reservoirs
- Reducing transport distances for dredged material
- Reducing dredging time
- Expanding operational flexibility
- Linking multiple projects
- Reducing resource consumption and impacts

**Value Creation**
- Restoring natural sediment processes to sustain landscapes
- New nature-based features that reduce flood risks
- New habitat for fish and wildlife
- New features that provide recreational and other social value
- Budget space for additional infrastructure work
Applying the Full Range of Beneficial Use

- Sediment “Recharge” via Dredging
- Direct Wetland “Nourishment”
- Wetland Creation
- Island Enhancement or Restoration

Engineering / Operational Effort

- Strategic Placement
- Thin-Layer Placement for Bottom Contouring
- Beach and Dune Construction
- New Island Construction

US Army Corps of Engineers • Engineer Research and Development Center
Dredging for Sustainable Infrastructure

Integrating Dredging with Sustainable Development

By Todd Bridges and Tiedo Velinga

Guiding Principles

1. Comprehensive consideration and analysis of the social, environmental and economic costs and benefits of a project is used to guide the development of sustainable infrastructure.

2. Commitments to process improvement and innovation are used to conserve resources, maximize efficiency, increase productivity, and extend the useful lifespan of assets and infrastructure.

3. Comprehensive stakeholder engagement and partnering are used to enhance project value.
- A Call to Action -

An Imperative for the 21st Century:
“Revolutionary” Amounts of Beneficial Use

Beneficial Use Innovation: There’s something for everyone to do!

- Government Agencies Doing Dredging: Doing business differently
- Ports / Navigation Sector: Multi-purpose projects
- Regulatory Agencies: Efficiently pursuing win-wins
- Dredging / Engineering Companies: Innovative engineering and operations
- Environmental NGOs: Facilitating P3s

The Key: Affordability, Affordability, Affordability
San Joaquin River National Wildlife Refuge

SJRNWR, March 2017

Dos Rios
Guided discussion:

What is Next?

Moderator: Julie Rosati (ERDC – CHL) & Danielle Szimanski (USACE – NAB)

1. What are BU big picture needs?
2. Create action items

Please make extensive use of the WebEx chat feature – we want to capture all of your ideas!
Increase BU material (sediment, rock, etc) use, how? What is that one thing that holds you back?

- **What is that one thing that holds you back?**
  - Fear of unintended impacts.
    - To overcome this it takes demos, personal relationship (trust), which is hard to build with employee turnover.
    - Can we demo or quantify degree of impacts? Education that is easily accessible (cough Brooke et al-website), publish, conference, share!
    - What about showing similar project elsewhere? The key is make it personnel, how can we do that?
    - There is a lot of knowledge out there, but having more, EASY to access, be able to really “strut our stuff” would be HUGELY useful. Overwhelm them. (outside USACE firewalls).
  - Partnerships with aggregate users could help. Logistics are challenging.
    - Upland there are opportunities to give away material, but getting to them in challenging.
    - Logistics associated with having these conversations, making the “deals” (regulatory fine tape?)
    - Are testing standards high enough? Is it safe? Tough to get material to those to show this. Time consuming.
    - How is NJ/NY harbor doing it? They seem to have do it well. (follow up with NAN?)
    - We (SAM) are finding that when we are the material donor and the resource agencies are the owners of the restoration project we move things forward on scales never seen before
  - Straying from the historical/prior placement locations (upland DMMAs, etc) that are already permitted and ready to go
    - New placement site permit hold it up, getting the correct documents in order
  - Timeliness of planning documents in order to align with dredging needs
    - Environmental placement windows
    - Things that I have see hold us back are logistics on dredging and the restoration site needs and getting internal agreements executed in timeframes that allow work to move forward with willing partners.
    - O&M projects are on a set schedule, extra planning for BU (additional testing and env requirements) takes more time than offshore disposal and PM and Division level don't want to risk delays in execution
  - Cost
    - Cost and the federal standard (who pays the incremental cost- and is that the right question). Commitment by Districts to look for and plan for reuse opportunities (even it if costs more in the short term)
    - Federal Standard - BU sites may be considered an incremental cost. Opportunity - Section 125 to help redefine Federal Standard (perhaps).
    - Cost associated with not doing BU (erosion shoreline). We look at the short term cost and benefits when making decisions and not the long term benefits
Increase BU material (sediment, rock, etc) use, how? What is that one thing that holds you back? (cont.)

- Cost cont.
  - Mechanism to incorporate BU site for federal cost and not incremental cost. Guidance on what you need to do to incorporate this in their project. Is it DMMP? Or is it the last decision document.
  - We need to build up benefit side (to overtake the cost). Is this Post creation monitoring? Models for the region?
    ▶ Develop regional frameworks for quick and efficient quantification of benefits and costs.
    ▶ O&M dredging isn’t required to document benefits. Often you have $$ for design, contract, not necessarily funds to document benefits. Build, walk away and forget about it” is not smart or sustainable practice in 2021 and beyond.
    ▶ Couple with restoration group and collaborative projects with monitoring in the plan been shown useful (get them at the beginning)
    ▶ Adaptive management- buy down risk
    ▶ Adaptive design, as well.
  - Educate-

- Equipment needs (Do you have everything you need to do this?)
  - A limitation in the industry and us in lining up the equipment needs for BU construction as we are focused on the needs of the channel dredging.
  - Technology is there but doesn’t align, Big channel, big dredge need, but small restoration with small dredge need. How can we get these to match up?
  - Inventory of regional resources used for BU?
  - On the west coast we need more pumpashore options. We are trying to think about minimizing double handling of material to keep costs down. Also, in a shallow bay, we need a scow that can get closer to shore.
  - Industry concern- Performance SPECS, risks to industry to take on these BU projects. Get smarter in owning sharing the risks. How do we share in the risks on these types of projects.
    ▶ Tolerance and field fits are a good way to lower the risk and reduce the cost.
  - A serious discussion with the dredging industry about innovation. I would propose that there has not been substantive innovation in the dredging industry in more than a 100 years. Just making a dredge bigger is NOT innovation.
  - St Paul District will be experimenting with agricultural land amendments plowing/discing to loosen clay soil. lots of different types of plots will be studied. Also may experiment with sprinklers for thin layer placement or manure injection to reduce labor.
Solutions and Action Items

- How do we educate? What do we need?
  - Story map, list of ongoing monitoring, books, podcasts, training?
  - Videos (2-3 min target man on the street)
    - ~10k for a very well done video and graphics from ITL team. Peanuts
    - Videos for different audiences
    - Field video
    - Time lapse of BU
    - Video on top of dredge-with music- youtube (example from MVN)
  - Not just outside, but internal shift on BU
    - Would demonstrated case studies help. What is needed to get too that?
      - Top down, bottom up approach. Need to get other folks in our business line to understand BU worth. Corps wide advertising*
      - Can we get the big wigs to show BU is next step, but there are challenges, but we are USACE we can overcome it.
Action Items

1. Gen LTG Spellmon to create a wallet-side CORE (Corps) VALUE: Just Do BU in Corps (Todd you got this 😊)
   - It got to be more then a broad statement. We have to change a culture and lay the ground work so that each time we do it there is not a new internal obstacle to overcome.

2. Establish Beneficial Use Work Group (A/K will be contacting all of you to follow up 😊)
   - MVR and MVP has stood up a Beneficial Use Work Group, state and federal partners, NGOs, and hopefully in the future industry and contractors
   - BU website revamp (USACE BU website)- utilize BU practice leads
   - Plan how to have conversations with the dredging industry about innovation. I would propose that there has not been substantive innovation in the dredging industry in more than a 100 years. Just making a dredge bigger is NOT innovation.
     - WEDA conference (Laurel Reichold) workshop with industry. Help form agenda.
   - Organize documents:
     - shares best practices (best practice library)
     - A roll-up of regional issues, topics, opportunities to the national view. There will be common and unique elements for collective awareness, planning and action.
     - Inventory of regional resources used for BU?

3. BU Practice leads: Experienced folks that are available to help districts navigate challenges on particular projects to get more success stories (Any volunteers- let us know!)
   - Our BU group in Mississippi are great with years of experience and lessons learned (A and K will follow up with- Elizabeth Godsey)
   - BU subject matter experts- regulatory POC, real estate POC, contracting challenges POC etc.
   - Districts having a BU lead a must!
   - Research area review group teams-good resource.
   - I'm happy to volunteer as a ecological assessment/monitoring SME if needed. (Jacob Berkowitz).

4. Organize the out from this very productive discussion this week into a number of follow-up topics that could form the basis of future focused web-meetings and/or projects. (Kelsey and Amanda -with counsel from Todd, Katie, Tanya)

5. Innovation with Industry (POC- David Moore)- Create way to share with industry, perhaps similar to the WEDA conference suggestion, can we get industry partners in the room with us?
What is next?

Create action items.

- Create USACE BU Working Group
  - Create Communications Team
  - Need to create Research Implementation Teams
  - Create Research Implementation Strategy
First Annual, Innovative Beneficial Use Project Award
The Timothy L. Welp Award for Advancing Beneficial Use of Sediment is given annually to recognize teams (across and outside of USACE) that have achieved progress on BU through collaboration, partnering, innovation and the creation of diversified value through BU.
The Timothy L. Welp Award for Advancing Beneficial Use of Sediment

The Timothy L. Welp Award for Advancing Beneficial Use of Sediment is given annually to recognize teams (across and outside of USACE) that have achieved progress on BU through collaboration, partnering, innovation and the creation of diversified value through BU.

Winner: Seven Mile Island Innovation Laboratory (SMIIL) Gull & Sturgeon Island Habitat Restoration and Marsh Protection
The Timothy L. Welp Award for Advancing Beneficial Use of Sediment is given annually to recognize teams (across and outside of USACE) that have achieved progress on BU through collaboration, partnering, innovation and the creation of diversified value through BU.

Honorable mentions to recognize projects leading BU practice:

- Swan Island, MD Restoration Project
- Removal of Beneficial Use Impairments at Duluth Harbor
- Middle Mississippi River Island Creation
BU – Thank you for attending!
Appendix F: Beneficial Use Best Practices
Fact Sheets
BU Characterization

Ecosystem Restoration Plantings, Riverine

Project Purpose

US Army Corps of Engineers (USACE) ecosystem restoration (ER) and beneficial use of dredged material (BUDM) projects frequently construct islands from navigation channel and harbor dredging sand and cap them with fine sediment dredged from backwater aquatic habitat restoration. The “layer cake” methods are generally successful but there is variation among sites and plant species response. Upper Mississippi River ER and BUDM uses adaptive management to improve their project design but evaluations are limited to vegetative response and there is little knowledge of soil development and soil-vegetation relationships.

The Upper Mississippi River Restoration Program (UMRR) has completed dozens of projects using dredged material with little evaluation beyond observing vegetation community development. There is little as-built information on soils so determining the mechanism for vegetation success or failure is uncertain.

In collaboration with UMRR and Upper Mississippi River USACE districts, ERDC evaluated soils physical, chemical, and microbial characteristics which are critical to plant survival. Pilot studies were supported by USACE St. Paul District (MVP) and ERDC’s Dredging Operations Technical Support Program (DOTS).

Project Description

Project planners (UMRR, ERDC, participating USACE districts) designed several projects to evaluate vegetation response to different restoration soils and ERDC evaluated characteristics of soils from these restoration sites and soils from a reference site.

Several experimental plots were investigated in this one project:

- Conway Lake Habitat Rehabilitation and Enhancement Project (HREP), to evaluate vegetation response to different depths of fine sediment placement over sand
- McGregor Lake HREP is testing a blended soil methodology over multi-acre project features.
- In Rock Island District inexpensive annual cover crops are being used to condition soils prior to planting expensive native seed mixes.

- ERDC researchers documented construction methods and collected soil characterization data.
- Pilot studies characterizing floodplain soils started in 2020. The collaboration documented differences in native soils, dredged material placement sites, and restoration soils.

Project Benefits

- Understanding the mechanisms of plant growth on restoration soils will help optimize ER/BUDM project design which will save costs and improve outcomes for vegetative plantings and habitat outcomes on USACE projects.
- Clear documentation and dissemination of ER/BUDM project features will support technology transfer and make future project planning and implementation more efficient and cost-effective.

Points of Contact:

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Innovations and Advancements

Upper Mississippi River Restoration is a leader in river habitat restoration design and implementation. Restoration islands have evolved over time to optimize their geomorphic and hydrodynamic function, but little attention was paid to the role of substrates/soils on project success. Many soil treatments have been applied, but typical design includes fine backwater sediment placed 1 – 2 feet over a sand base. UMRR and other restoration projects use adaptive management to improve their Habitat Rehabilitation and Enhancement Project (HREP) design. This project evaluated a range of factors related to dredge material capping and soil blending at different locations. Guidance from the results will improve future project design for USACE projects managing soft substrates in ecosystem restoration projects and provide the basis for long-term project evaluation at these sites.

Lessons Learned

Soil science has not been a significant component of USACE ecosystem restoration projects where outcomes are evaluated as habitat and biological response. Concerns over vegetation response to ecosystem restoration measures identified problems and research needs. An adaptive management approach incorporating several projects was adopted to address learning needs.

Partnering

Upper Mississippi River Restoration is a strong partnership of state and federal agencies collaborating on restoration design and evaluation. ERDC support to the program adds new research capabilities to investigate the mechanisms for USACE project success.

Outcomes

ERDC and Upper Mississippi River USACE districts have developed a strong research partnership where local data, resources, and projects can be accessed and augmented by ERDC research and development capabilities to improve project outcomes.

Additional Information?

Upper Mississippi River Restoration:

What is next?

USACE BUDM and ecosystem restoration are highly compatible activities that can provide valuable dredged material for efficient navigation operations and project delivery. Activity on the Upper Mississippi River is highly transferable to other projects in the region and beyond where the USACE manages sediment. Pilot studies characterizing floodplain soils started in 2020 through an ERDC-U/MVP/DOTS collaboration documented differences in native soils, dredged material placement sites, and restoration soils. New projects starting FY21 will review project design and construction methods and collect as-built baseline soils data on completed projects.
BU Characterization

Back bay, Tidal Wetlands, Near shore

Project Purpose

Thin layer placement (TLP) is the purposeful placement of thin layers of sediment (e.g., dredged material) in an environmentally acceptable manner to achieve a target elevation or thickness. TLP objectives include infrastructure maintenance and the creation, maintenance, enhancement, or restoration ecological function. Wetland TLP is experiencing a renaissance due to a confluence of various forcing functions such as rising sea levels, degrading wetlands, limited dredged sediment placement and disposal areas, etc., but there is a dearth of definitive operational and environmental guidance on how to conduct it, what to monitor for, and what ecological results look like. Regulatory agencies, including the US Army Corps of Engineers (USACE), have significant concerns with TLP with regard to the “do no harm” principle and uncertainty in how to permit and adaptively manage these projects. Guidance is required to optimize acceptance and the success of TLP as a solution to wetland degradation and dredged material placement.

Project Description

The objectives of this research task are to distill knowledge and information from three sources:

1. Past and currently developing TLP projects.
2. Ongoing pertinent TLP research and development activities.
3. Field practitioners who have worked on TLP pilot projects in a variety of environments.

These elements will be synthesized into guidance documents designed for use by both USACE and stakeholders to optimize the planning, permitting, design, construction, and maintenance of TLP projects.

Project Benefits

Guidance provided by this research task will improve the planning, permitting, design, construction, and maintenance of TLP projects to facilitate the acceptance and expansion of TLP in using dredged material from navigation projects beneficially to restore degraded wetlands.

Innovations and Advancements

While no new research was conducted as part of this effort, many TLP pilot projects occur in a vacuum or with limited communication to external parties. The state of the practice workshop proved to be an excellent problem-solving forum and helped clarify the multiple points-of-view TLP stakeholders may have.
Lessons Learned

Guidance documents need not be definitive, especially in emerging areas. However, common sense and best practices may help future projects prevent pitfalls. Additionally, great value comes from clearly defining terms for types of projects where multiple scientific and engineering disciplines interact. Education and communication amongst stakeholders is key to project success.

Partnering

The research is a collaborative effort co-authored with researchers from ERDC’s Environmental (Candice Piercy) and Coastal Hydraulics (Tim Welp) Labs and Texas A&M University (Ram Mohan). Additionally, Federal, state, NGO, and industry partners provided input via a workshop on the state of the practice of TLP. All workshop participants had experience with TLP projects in some capacity.

Outcomes

Final document is under review with anticipated release date by end of calendar year 2021.

What is next?

- This document will hopefully aid districts in their pursuit of further developing TLP projects and increase BU.
- The biggest immediate hurdle remains the ability to substantially scale TLP projects in size and application. Many remain pilot or one-off projects. The goal is to advance TLP practice such that it is a common tool to be used for BU.
BU Characterization
Back Bay Island Restoration, Marsh edge protection

Project Purpose
Gull Island, in Cape May County, NJ, along with adjacent Sturgeon Island, supports nesting for 25 percent of the wading birds in New Jersey. Habitat suitability has declined at Gull Island in recent years, with remnants of historical dredge placements supporting the only remaining suitable habitat. Low marsh and inland tidal flats along the southern portion of the island were selected for dredged material placement to build elevation on the marsh platform, as well as along the subtidal flats that protect the marsh edge from erosion and support habitat. Philadelphia District (NAP) partnered with USACE Engineer Research and Development Center (ERDC), the State of New Jersey and The Wetlands Institute (TWI) to place dredged material from the NJ Intracoastal Waterway through the Seven Mile Island Innovation Laboratory (SMIIL) and evaluate beneficial use of dredge material management practices for marsh restoration and marsh edge protection. Research, supported through various research programs, including the Dredging Operations and Environmental Research Program (DOER) and Regional Sediment Management program (RSM), is being conducted to evaluate the effectiveness of dredged material placement processes.

Project Description
In the Fall of 2020, approximately 40,000 cubic yards were dreged from the NJ Intracoastal Waterway (NJ IW) and placed on Gull Island. Material was pumped to a Y-valve which directed flow to two separate placement locations:

1. Dredged slurry was pumped to an interior location on the southern portion of the island. A sandy mound was created near the discharge with the fines distributing farther covering about 20 acres of the marsh platform.
2. Material was directed to pipeline attached to a floating platform along the southern edge of Gull Island, discharging material in open water to create a sandy marsh-edge bar which will serve as edge protection from storm- and boat-induced waves.

- Elevation monitoring is being conducted to evaluate consolidation of the placed material and the extent to which elevation goals have been met. A mass balance is also being perfomed to qualitatively evaluate how sediment was transported and contained across the site and within the surrounding mudflats.
- Submerged Aquatic Vegetation (SAV) and benthics are being monitored to evaluate benefits from the dredged material placements.
- The site will be monitored over time to capture long-term consolidation, vegetation establishment and habitat suitability and use.

Project Benefits
Productive and positive uses of dredged material for this project include (1) raising marsh elevation to create high marsh areas for salt marsh sparrow and wading birds, (2) restoration of unvegetated interior mud flats, (3) enhancing tidal flats for SAV and fish habitat and reducing marsh edge erosion. Additionally, results from the mass balance approach will help in developing a better understanding of sediment transport and consolidation, that will inform future placements for setting project expectations and determining the need (or lack of) for containment for meeting project goals.


Points of Contact:
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Innovations and Advancements

Innovative practices implemented at Gull Island include unconfined placement, which is not typical for fine-grained dredged slurries. The decision to forego confinement techniques reduces costs and limits disturbance to the marsh for installation and removal of containment features, and promoted benefits across multiple island regimes including mounding near the discharge, elevation enhancement of interior tidal flats, and slurry transport through tidal channels and direct placement to build tidal flats. Unconfined placement also allows for creation of natural slopes. Demonstration of the benefits of unconfined placement and a lack of ecological impacts could result in cost savings and more efficient dredged material placement for future projects. Additionally, a newly developed tool, the Sediment Profile Imaging (SPI) scanner, was employed for real-time monitoring of placement in subtidal areas. The SPI scanner is inserted into the sediment bed and captures high quality images of the seabed and the overlying water column. The images are used to evaluate bed composition and benthic habitat recovery. It was found to be a useful tool for monitoring placements.

Lessons Learned

From the slurry placed on the marsh platform, much of the sand appears to have deposited within a mound near the pipe discharge, while the fines slurry spread over a larger area with some material making its way to tidal outlets, intentionally creating tidal deltas that have persisted. Both indirect placement through tidal channels and direct placement along the flats appear to be effective strategies to shallow the flats above MLLW into a zone more suitable for SAV. While additional monitoring is needed to determine the project’s success, early observations indicate successful elevation enhancement and creation of a marsh-edge bar, and did not reveal significant ecological impacts as a result of unconfined placement.

Due to difficulties accessing the site immediately post-placement, remote monitoring techniques are needed. There are also challenges associated with obtaining accurate survey data, such as inability to access the site via ground-based techniques, and interference from vegetation and water coverage for lidar based methodologies.

Partnering

This project represents a collaboration among the consortium of stakeholders within the SMIIL, which includes NAP, TWI, ERDC, the State of New Jersey, academic institutions, and private parties. The SMIIL stakeholders worked together to design and vet placement strategies, and monitor sediment placement and subsequent changes over time. Multiple ERDC teams contributed to the overall success and lessons learned through a range of research and monitoring objectives, evaluating evolution of the mudflats and marsh platform, turbidity and sediment transport, wave and current dynamics, and benthics and SAV.

Outcomes

Success of the dredged material placements at Gull Island is still being evaluated. Field data collection in July 2021 will inform the mass balance, and consolidation behavior as well as stability of the marsh platform. Spartina has begun to reestablish on the interior flat suggesting sufficient elevation was attained to support vegetation. The placement area was previously very low and converting from marsh to mud flat; reversal of that trend will be evaluated as an outcome. Long-term success will be measured in terms of habitat suitability and use by wading birds, SAV establishment, and marsh edge stability.

Additional Information?

Additional information on SMIIL and marsh restoration can be found at: https://wetlandsinstitute.org/smiil/ and https://www.nap.usace.army.mil/Missions/Civil-Works/Coastal-Dredging-Beneficial-Use/.

What is next?

Monitoring elevation of Gull Island will be continued and will be used to determine whether additional dredged material is needed and how it should be placed to build elevation to support nesting habitat and a sustainable marsh. Demonstrated success may allow elevation enhancements at other locations across the 287-acre island.
BU Characterization

Riverine; Island Creation

Project Purpose

To meet the anticipated disposal requirements for future channel maintenance from the Horseshoe Bend region of the Atchafalaya River, the US Army Corps of Engineers New Orleans District evaluated the mounding of material at mid-river open water placement sites within a 350-acre (142 ha) area immediately adjacent to the navigation channel and upriver of a small naturally forming island. Beginning in 2002, strategic placement of between 0.5 to 1.8 million cubic yards of sediment was conducted every 1 to 3 years which influenced and contributed to the development of an approximately 35 ha island mid-river (Horseshoe Bend Island). To help understand how and why the island was formed over the last 12 years, the USACE conducted studies to better understand the hydrology of the river used to transfer the mounded material onto the island.

While the strategic placement of dredged sediments upriver of a naturally-occurring island was initially conducted to reduce dredging costs and promote island growth, additional environmental, navigation, and climate change benefits were realized using this innovative placement practice.

This research was funded by the Dredging Operations and Environmental Research (DOER) program. Ongoing research being funded by the Monitoring Completed Navigation Projects (MCNP) program is applying hydrodynamic models to determine the hydrodynamics and sediment characteristics required to successfully apply this best practice elsewhere.

Project Description

The study used a multi-factor ecological assessment including: 1) landscape geomorphology, 2) ecosystem classification, 3) floral communities, 4) avian communities, 5) aquatic invertebrates, 6) soils and biogeochemical activity, and 7) hydrodynamic and sediment modeling.

Project Benefits

Monitoring associated with this project found:

- Horseshoe Bend Island provides habitat and biogeochemical functions at rates comparable or exceeding those at a traditional dredged material supported island and a natural reference island in the area.
- Horseshoe Bend Island supports complex communities of vegetation, invertebrates, soil microbes, and higher organisms, including >85% native species.
- The island's development increased flow velocity and sediment transport, allowing for channel realignment, thereby reducing fuel use and travel time and increased navigation safety.
- The project **substantially** reduced a $4.3M annual dredging requirement to once every 4 to 5 years.

Innovations and Advancements

- The Horseshoe Bend Island project exemplifies what can be achieved through the application of Engineering with Nature (EWN) concepts and practices.
- Investigations quantifying the multiple environmental and other benefits of using dredged material to create riverine islands provides a more complete understanding of the island's formation so this concept can be integrated into other dredging projects.

**Points of Contact:**

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Burton Suedel (ERDC EL), burton.suedel@usace.army.mil
**Lessons Learned**

- The practice of strategically placing dredged sediments upriver of a naturally-occurring island aided the island’s growth to **produce greater environmental benefits** than using more conventional placement practices.
- Ecological components comprising primary producers, microbial communities, invertebrates that form the basis of aquatic food webs, and higher organisms were studied, providing a comprehensive assessment of dredged material supported wetlands. This **framework can be used in future studies** examining the ecological, societal, and economic value of the strategic placement of dredged material applied in this manner.

**What is next?**

Current research involves applying hydrodynamic models of the area of the river surrounding Horseshoe Bend Island to determine the hydrodynamics needed to successfully apply strategic placement strategies. The successful results at Horseshoe Bend are being applied elsewhere in coastal Louisiana and beyond.

**Additional Information?**

Several technical reports are peer-reviewed documents have been produced documenting the results of the project. The project has been internationally recognized and awarded by the Western Dredging Association (WEDA) and others.


**Partnering**

Before sediment was placed in mounds upriver of the sandbar, the project team consulted with state and Federal environmental agencies to obtain feedback on the proposed innovative sediment placement approach as a more sustainable alternative compared to filling in wetlands or dumping the sediment in Atchafalaya Bay. In-kind support was provided by the U.S. Fish and Wildlife Service who provided visual inspections of the island and Great Lakes Dredge and Dock provided photo documentation support.

**Outcomes**

We demonstrated that each of the factors examined at Horseshoe Bend Island proved comparable or exceeded the other study areas examined, including the naturally formed riverine island and a traditionally created dredged material supported island. Sediment dredged from the adjacent Federal navigation channel during routine maintenance over 12 years was dispersed by the river’s currents to self-design the island over time. This **innovative beneficial use** of dredged material for creating Horseshoe Bend Island can be applied in other riverine project scenarios to demonstrate the success and potential benefits of this application of the EWN practice of utilizing natural process for improving wetland creation and restoration outcomes.

**Points of Contact:**

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BU Characterization

Riverine; Island Creation; Habitat Creation

Project Purpose

There is a history in the United States of closing off side channels to concentrate flow in the main channel for the purpose of maintaining navigation dimensions. This has greatly reduced the availability of island and side channel habitat compared to what would exist on un-managed waterways. Furthermore, the widespread use of bank stabilization and denial of channel cutoffs have removed the natural mechanism for new island creation. The loss of side channels was documented as a major finding of the 1976 Environmental Impact Statement for the navigation project for the Middle Mississippi River (or MMR, the portion of the Mississippi River between the confluences with the Missouri River and Ohio River). A white paper written by St. Louis District (MVS) river engineers in 2011 documented flexible pipe usage, inventoried MMR islands, and discussed means for potential stabilization for an island created from dredged material. The objective of this project was to use dredged material to create ephemeral islands to test the ability to artificially construct island/side channel habitat on the MMR. These efforts were funded by the Biological Opinion program (established to offset impacts to threatened and endangered species from the navigation program) and ongoing District Operations and Maintenance for the navigation channel.

Project Description

- Approximately 100,000 cubic yards (cy) of material were placed at RM 103 by the Dredge Potter using flexible dredge pipe in November 2011. This created an ephemeral island approximately 10 acres in size. This location was monitored periodically for the next ~2.5 years until the placed material had eroded.
- Three additional efforts at different locations in the MMR totaling approximately 413,000 cy of material were completed in September 2013, including placement behind a chevron river training structure. Periodic monitoring revealed that the material had eroded in under 3 years.

Project Benefits

Ephemeral island sandbar habitats support a variety of fish species. In this area trawling and electro-fishing collected 625 fish comprising 18 different species. These islands are also a documented habitat type for the formerly listed Least Tern.

Innovations and Advancements

- Ephemeral island creation could be done successfully on the Middle Mississippi River.
- Material placement was successfully done behind an innovative river training structure.
- A permanent spill barge was constructed to aid in the placement of material to higher elevations and in more difficult locations. New connections were purchased for the flexible dredge pipe to speed assembly time to aid usage and reduce cost.
- A new web-based dredging scheduling tool was developed to aid in identifying potential beneficial use windows. The tool takes advantage of long-range Water Control forecasts and pre-dredge surveys to better approximate when dredging locations will become critical for maintaining navigation.
Lessons Learned

- Timing is critical – additional beneficial use island creation efforts are desired, but high water events, the need for a dredging issue in a desired habitat area, and the additional flexibility required for scheduling a non-critical dredging location conflicting with “just-in-time” dredging has prevented further efforts thus far.
- The ephemeral island habitat did not last very long (2-3 years), and additional measures would be necessary to lengthen the benefit of the gained habitat. These additional measures would need further study, test case implementation, and monitoring.
- A consistent, ongoing effort is needed between partners and project leads to identify opportunities.

Partnering

The decision to try ephemeral island creation was a product of collaboration among the River Resources Action Team, a coordination group consisting of the U.S. Army Corps of Engineers – St. Louis District, U.S. Fish and Wildlife Service, Illinois Department of Natural Resources, and the Missouri Department of Conservation focused on sustainable management of the Mississippi within the St. Louis District. The environmental agencies recommended locations where they would like to see habitat enhancement, and St. Louis District responded with where projects would work due to channel geometry and dredging need, along with the funds to accomplish the dredging and survey monitoring. Fish population monitoring was done by the St. Louis District’s environmental partners.

Outcomes

Ephmeral island sandbar habitat was created that lasted over two years. Fish sampling showed that these islands did serve as habitat for a variety of species. After 2-3 years, the created island habitat had fully eroded away, due to its dependence on the hydrograph (susceptibility to flood events).

Additional Information?

This effort is documented as a case study in a pending Technical Report:


The white paper referenced above:


What is next?

Additional island creation is planned. The MVS dredging project has created and maintains a dredging “master plan” of potential sites for future island creation and creation of other ecologically important habitats. Furthermore, district environmental partners have requested that engineers research means to help stabilize beneficially-placed dredge material to create permanent islands. As such, discussions have begun between MVS and ERDC personnel about the correct way to research the conversion of river training structures into islands and structural means to make beneficial use dredge islands permanent.
BU Characterization

Riverine; Costal; Island and Marsh Creation; Habitat Improvement

Project Purpose

Dredged materials can be used to improve environmental outcomes while maximizing engineering benefits and supporting the Navigation mission. Few studies document mid- to long-term project benefits and USACE success stories remain poorly advertised. The purpose of the work unit was to “fill the gap” between recently restored systems and their mature counterparts, providing a framework to develop restoration trajectory curves allowing for extrapolation of EWN project benefits throughout a projects lifespan (Fig 1).

This research was funded by the Dredging Operations and Environmental Research (DOER) and Engineering With Nature (EWN) programs.

Project Description

The study used a multi-factor ecological assessment including analysis of 1) landscape geomorphology, 2) ecosystem classification, 3) floral communities, 4) avian communities, 5) soils and biogeochemical activity, and 6) associated engineering benefits such as navigation channel maintenance, shoreline stabilization, water quality improvements, and elevation maintenance.

Monitoring occurred at 6 historic (i.e., >40 year old) dredged material placement locations across the nation, representing some of the oldest beneficial use project sites for which historic monitoring data is available (Fig 2). Project sites included a wide array of habitat types and landscape settings.

Project Benefits

Monitoring associated with this project found:

- The beneficial use sites generally achieved the target habitat types designed through landscape evolution and ecological succession.
- The projects have persisted for decades without the need for additional intervention or the use of hard infrastructure.
- The study locations are stable features that will effectively provide ecological functions and engineering benefits into the future.
- The analysis highlights the capacity of beneficial use projects to yield favorable outcomes at decadal timescales.
- These study locations can inform ongoing efforts to incorporate EWN and BU concepts into common practice.

Innovations and Advancements

- These projects exemplify what can be achieved through the application of Engineering with Nature (EWN) concepts and practices, especially when design, implementation, and monitoring couple ecological and engineering perspectives.
- The development of restoration ecological and engineering trajectory curves informs practitioners designing projects and establishing project milestones to ensure that the full suite of habitat and engineering benefits are captured during life-cycle analysis.

Points of Contact: Jacob Berkowitz (ERDC EL), Jacob.F.Berkowitz@usace.army.mil
Lessons Learned

- The variety of ecological functions and engineering benefits identified occur at different timescales that vary regionally and across different landscape settings.
- This study provides tools to further incorporate engineering benefits into project life-cycle analysis.

What is next?

We are currently publishing our results and will continue to conduct technology transfer to inform practitioners on this topic.

Additional Information?

Several technical reports, conference presentations, and peer-reviewed documents have been produced documenting the results of the project.


Hurst NR, Berkowitz JF. 2021. Evaluating the Long-Term Success of USACE Wetland Creation Projects: 45 Years in the Making. 13th International symposium on biogeochemistry of wetlands. Virtual. (Oral Presentation)


Partnering

The construction of the historic dredged material habitat improvement projects were supported by the Dredging Research Program and the Dredging Operations Technical Support Program. The current monitoring effort was conducted in coordination and with outstanding support from project collaborators from 7 USACE Districts.

Outcomes

We demonstrated that a combination of ecological functions and engineering benefits can be documented for beneficial use projects and that those positive outcomes persist for many years when projects integrate both ecosystem and engineering features into project design, implementation, and management. More research is needed to understand the variable time-scales and response rates observed across a variety of functional/engineering categories (Fig 4).
**BU Characterization**

All types of dredged material placement

**Project Purpose**

The National Placement Data Manager concept stems from a request from USACE headquarters to provide a database of the Nation’s Dredged Material Placement areas (NPDM) along with their corresponding capacities and life spans. An up-to-date database would provide readily available information as an alternative to the delayed gathering of information through time consuming data calls. Although the intent of the original request was to develop this database for decision-making by headquarters, such a tool would provide utility to Districts for dredged material management and beneficial use facilitation.

Funding was provided from the Dredging Operations Technical Support Program (DOTS) to generate a beta version of a database/web tool entitled National Placement Data Manager (NPDM).

**Project Description**

This beta version was designed to gather information from the Dredging Information System (DIS) regarding historical placements of dredged material, and a database of existing placement areas was provided in ArcMap. However, input was also required by the USACE districts to provide information regarding existing capacity and projected use of the placement areas as well as any plans that would impact capacity, such as site expansion or closure. The collected information was compiled to provide the projected capacity over time and life span of each placement area. Unfortunately, the beta version of NPDM was generated using outdated software, which is no longer supported. The web tool became inoperational before it could be implemented beyond initial beta testing. Funding has not been provided in recent years to regenerate the web tool.

Redevelopment of the tool is being considered under NavPortal where it could be readily incorporated into other tools. Potential exists to utilize the database to optimize dredged material management based on transportation costs, and perhaps ecosystem benefits.

**Project Benefits**

It is envisioned that this tool, if fully developed, would be useful toward facilitating beneficial use of dredged material:

- The tool would not only incorporate traditional dredged material disposal facilities, but would also include identified beneficial use sites, both those used historically and sites potentially available for future use.
- Background information about each site would be provided such as site capacity, placement area type, ownership and restrictions such as material type accepted.
- The ability to view the placement areas on a map, overlaid with our navigation channels would allow for rapid identification of potential placement areas.
- Aggregation of past placements allows analysis of trends with respect to dredged material placement and beneficial use.

**Points of Contact:**

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Innovations and Advancements

NPDM would provide a database of dredged material placement areas which would provide visualization of placement areas with respect to maintained channels, and convenient access to placement area information for planning purposes.

A database of this information is not known to exist. Ready access to accurate, up-to-date placement area information will facilitate dredged material management and optimization of resources for beneficial use.

Lessons Learned

Feedback from Districts on the beta version of the web tool revealed:

- Data collection should be automated to the extent possible, and time requirements by District personnel to input data should be minimized.
- The web tool should be intuitive for users to allow streamlined, accurate data collection.
- Coordination with other programs with similar websites or databases collecting information on beneficial use is needed to reduce redundancy and maximize benefits of the database.
- Based on the lack of utility of the original web tool developed with outdated software, it is important to scrutinize all software tools and expected long-term stability of any databases which will be relied upon for data input.

Partnering

Funding to date for NPDM has been provided by the DOTS Assistance Program. ERDC researchers worked with Teresa Parks of Mobile District on development of the web tool. A portion of the data collected by the web tool comes from IWR’s DIS. Several Districts also provided useful feedback on the beta version of NPDM. Future work should be coordinated with the Regional Sediment Management Program and other relevant programs to ensure the database provides utility to others that might utilize the information. The new version of NPDM would likely be developed within USACE Navigation Portal which will allow seamless linkage of data and tools for navigation related purposes.

Outcomes

Further project development is needed to demonstrate the utility of a placement area database.

What is next?

It is recommended that the NPDM database/web tool be developed as described. Coordination is needed with potential District users as well as programs focused on dredged material management and beneficial use to ensure maximum functionality.
BU Characterization

Nearshore Nourishment

Project Purpose

Ogden Dunes, Indiana, Indiana and Indiana Dunes National Park are on the southern Lake Michigan shoreline and are threatened by erosion due to changing lake levels and coastal storms.

A beneficial use solution that has been applied in this region is to place sediments routinely dredged from the Port of Indiana and the intake for the Northern Indiana Public Service Company (NIPSCO) power plant in the nearshore to nourish the beach profile and mitigate beach erosion.

The purpose of this project was to evaluate nearshore nourishment in this area and to ensure it fulfills its primary design purpose, erosion mitigation.

This project was funded by the USACE Regional Sediment Management (RSM) Program and Chicago District (LRC).

Project Description

ERDC-CHL combined a monitoring effort of the 2016 placement with analysis of historic data to evaluate nearshore nourishment:

- Historical shoreline position from aerial and satellite imagery was compared to placement records.
- The site was qualitatively analyzed with the Sediment Mobility Tool (SMT).
- The 2016 placement (140,000 yd³ of dredged sediment) was monitored to identify the transport direction of the placed sediment, shoreline response, and reduction of wave energy on the beach. This was done with bathymetric surveys and wave and current gauges.
- The 2016 nearshore nourishment was also numerically modeled with the Coastal Modeling System (CMS).

Project Benefits

- Beneficial placement in the nearshore provides shoreline protection, and maintains ecological habitat and human recreation areas at Indiana Dunes National Park.
- Monitoring of the 2016 placement found placed sediments are being transported shoreward and in the alongshore direction; highlighting the nourishment of the beach profile at the placement area and down drift of the placement area.

Innovations and Advancements

- First study to evaluate the nearshore placement approach in this area (e.g. sediment was placed in the nearshore using bottom-dumping scows with hanging gates in small discrete mounds).
- First study that directly measured the wave energy attenuation due to a nearshore nourishment in this area.
- The transport direction of the placed sediment was quantified during the monitoring period, and the most appropriate CMS modeling parameters were established for the project area.
**Lessons Learned**

- The lake froze over one month after the completion of the nearshore nourishment, which significantly limited the monitoring time. Schedule future nearshore nourishment projects earlier for improved monitoring prior to lake freezes.
- One of the current and wave gauges was buried before the nearshore nourishment construction was completed. Regularly downloading data from monitoring gauges or real-time data transfer could reduce the chance of data loss.

**Partnering**

The US Geological Survey - Central Midwest Water Science Center conducted the bathymetric surveys and deployed/retrieved the current and wave gauges. Several of their researchers co-authored the monitoring technical report. The research for this project was funded by the USACE Regional Sediment Management Program and by the Chicago District (LRC).

**Outcomes**

- Historical analysis has shown that placing sediment in the nearshore has a positive effect on Lake Michigan’s shoreline. The highly erosive conditions of high water levels and several storms in the mid-1980s caused significant erosion, but the shoreline positively accreted when nearshore nourishment practices were implemented.
- Monitoring of the 2016 nearshore nourishment captured the onshore and alongshore sediment transport.

**Additional Information?**


Journal Paper: Transport of Placed Dredged Material in Surf and Nearshore Zone - [https://doi.org/10.1061/(ASCE)WW.1943-5460.0000624](https://doi.org/10.1061/(ASCE)WW.1943-5460.0000624)

**What is next?**

Future projects are recommended to adjust the contract documents by reducing the placement depth to attenuate more wave energy and by reducing the size of the placement area to construct an artificial bar or nearshore berm, rather than small discrete mounds. Both modifications are expected to increase shoreline protection.
BU Characterization

Riverine Embayment; Remediation and Restoration

Project Purpose

The Duluth Harbor is part of the designated St. Louis River Area of Concern (AOC) in the Great Lakes with a number of identified beneficial use impairments associated with sediment contamination. The goal of the projects were to remediate the sediment contamination to remove fish consumption restrictions, reduce fish tumors and deformities, cease degradation of benthos, and restore habitats. The projects were formulated to accelerate delisting of the AOC.

The sediment remediation projects were performed through the Great Lakes Restoration Initiative under EPA’s partnership with the Minnesota Pollution Control Agency (MPCA) and the U.S. Army Corps of Engineers (USACE) Detroit District in collaboration with U.S. Army Engineer Research and Development Center (ERDC). The habitat restoration projects were performed through a creative partnership among EPA, USACE, MPCA, Minnesota Department of Natural Resources and other local agencies using the regular annual harbor maintenance dredged material beneficially to restore critical aquatic habitat in the St. Louis River AOC.

Project Description

The projects included sediment remediation of three active harbor slips and habitat restoration of two areas of the Duluth Harbor.

- The active slips were remediated by capping about 18 acres of contaminated sediment with a two-foot protective layer of local sandy dredged material selected for its properties to sequester heavy metals, dioxins, PCBs and PAHs from the bioactive sediment layer and the water column. The caps were armored and sloped to provide long-term stability considering the erosive nature of prop wash from vessels using these active slips.

- Following an innovative three-year pilot program to determine that navigational material from the Duluth-Superior harbor was clean and safe enough to place in open water, dredged material was placed over a total of 680 acres between 21st Avenue West and 40th Avenue West. Approximately one million cubic yards of dredged material has contributed to habitat enhancement through the creation of gradually sloped shorelines, the addition of shoals or islands, and the reduction of acreage exposed to excessive wave energy.

Project Benefits

- The sediment remediation projects are contributing to the removal of restrictions on fish and wildlife consumption and degradation of the benthos. Eighteen acres have been restored and the waterfront is cleaner for both fish and humans.

- The habitat restoration projects are contributing to removal of beneficial use impairments including loss of fish and wildlife habitat and restrictions on dredging activities and dredged material placement in the largest freshwater port in the Great Lakes. The habitat restoration provided a low-cost placement alternative in an area with diminishing upland placement capacity.

- The benthos have re-established itself in the the project area, however, the full benefits have not been fully realized at this time as vegetation is still being established and fish tissues concentrations are still declining.
Innovations and Advancements

Fine-grained dredged material was placed hydraulically in shallow areas inaccessible for barge placement operations using an innovative modification to the discharge pipe designed to limit entrainment of water, dispersion of the dredged material and turbidity releases from the placement operations and to eliminate the need for silt curtains surrounding the placement operations. A down-pipe with a baffle plate, which descended to the sediment bed, was added to the end of the discharge pipe so as to discharge within the bed of placed material instead of the water column. This method of placement rapidly dissipates the energy of the discharge, prevents the entrainment of water from the water column into the discharge, filters the solids from the carrier water as the solids settle and consolidate, reduces the volume of water released from the placed material and decreases the release of turbidity by about seventy percent.

Lessons Learned

The willingness to include innovation and use of pilot projects can expand the opportunities for beneficial use, reduce costs and improve performance.

Partnering

The cleanup of the slips was performed under the Great Lakes Restoration Initiative’s sediment remediation component, the Great Lakes Legacy Act, with matching funding from State of Minnesota Bonding Funds. Minnesota Pollution Control Agency worked with our Federal Partners, the U.S. Environmental Protection Agency’s Great Lakes National Program Office and the U.S. Army Corps of Engineers to complete this important cleanup. MPCA performed Focus Feasibility Studies and selected the remedial alternative, ERDC developed designs, and USACE Detroit District developed plans and specifications and oversaw construction.

Outcomes

Eighteen acres of contaminated sediment were successfully capped and 680 acres of habitat enhancements were created.

Additional Information?

https://www.epa.gov/great-lakes-aocs/st-louis-river-aoc#restoration
https://www.greatlakesmud.org/minnesota1.html

What is next?

The success of these projects is leading to additional projects in the harbor, including capping of two additional slips.
BU Characterization

Data collection/evaluation; development of comprehensive BU database which encompasses a broad area of BU characterization (e.g., Beach Restoration, Littoral, Riverine, Wetlands, etc).

Project Purpose

The Regional Sediment Management (RSM) Program has encouraged the beneficial use of dredged sediment in lieu of disposing of the sediment in offshore or upland disposal sites. While USACE Districts have been incorporating beneficial use strategies in their projects, quantifying the prevalence and the additional benefits through this have been challenging to document using existing DIS data alone.

This project, funded by the ERDC RSM Program, inventories Federal navigation projects nationwide to determine the extent to which RSM goals and beneficial use of dredged material have been implemented across the USACE Districts at the project and District levels. Data is organized into a comprehensive database, providing an essential tool for evaluating dredge disposal activities and supporting the continued development of the beneficial use strategies regionally and nationally.

Project Description

Data from the USACE Institute for Water Resources (IWR) Navigation Data Center’s Dredging Information System (DIS) is utilized and refined using intra-agency outreach to obtain District-managed information and data. The data viewer categorizes the dredge placement efforts between disposal and beneficial use for beach, in-river, littoral, open water, upland, or wetland zones. This data is quality checked and uploaded on a yearly basis and includes USACE dredging data from 1998-Present.

Project Benefits

- Having an enterprise-wide database solution with single project as well as district, division and national interactive viewing capabilities makes this data more accessible and valuable, supporting the spread of beneficial use strategies regionally and nationally.
- The public-facing database allows any user (federal agency, resource agency, stakeholder, local government, etc.) to determine total project dredge volume over time, project iterations, beneficial use placement areas, and the percentage of beneficial use opportunities realized.

Innovations and Advancements

This data viewer is an all in one viewer for dredge placement activities, and is a public-facing website, allowing anyone to access and query dredge disposal activities.

Lessons Learned

There is a continued need for more in depth data in regards to dredge disposal operations. The additional of geotechnical information, along with known dredge disposal sites will allow for more analysis of beneficial use practices.
Partnering

ERDC partners with the USACE Districts across the country to perform QC operations for all DIS data, and provide supplemental data as needed to determine actual quantities removed, and placement method.

Outcomes

- Public Facing Web-application enhances ability for USACE to promote its beneficial use program to congressionals, stakeholders, partners, and public.  
  https://www.arcgis.com/apps/MapSeries/index.html?appid=0ea8fc0a956f46068428c862e7497233

- Quantification of beneficial use by placement type will allow USACE to continue to assess which placement methods are having the most success, and identify future opportunities for continued use.

- Quality Checked (QC) database of USACE DIS data containing dredged placement totals, filterable by project, district, division, and placement method. ERDC utilizes existing DIS data in conjunction with district supplied supplemental data to create database for this project.

What is next?

CHL will continue to add perform QC operations of District data and load date into the viewer on a yearly basis. Future endeavors include utilization of RMS data to integrate material type into the database along with placement sites in conjunction with type of placement.
**BU Characterization**
Back Bay Island Habitat Restoration, Marsh Edge Protection

**Project Purpose**
Sturgeon Island, in Cape May County, NJ, along with adjacent Gull Island, support nesting for 25 percent of the wading birds in New Jersey. Habitat suitability has declined at Sturgeon Island in recent years. Low marsh and pool areas on Sturgeon were selected for *elevation enhancement via dredged material placement* to create suitable nest areas above storm flood elevations. Philadelphia District (NAP) partnered with USACE Engineer Research and Development Center (ERDC), the State of New Jersey and The Wetlands Institute (TWI) to design placement of dredged material from the NJ Intracoastal Waterway (NJIW) on Sturgeon Island as part of this effort. Research, supported through various research programs, including the Dredging Operations and Environmental Research Program (DOER), is being conducted to evaluate the effectiveness of dredged material placement processes aimed toward habitat restoration through elevation enhancement.

**Project Description**
- In March 2020 approximately 4,200 cubic yards of dredged sediment was placed on Sturgeon Island prior to interruption due to COVID 19. Material from the NJIW was pumped to a Y-valve on the island which split flow between a pipe with a nozzle and an elevated sediment distribution pipe (see figure above). The distribution pipe was tested by ERDC to evaluate its ability to separate the flow for construction of a sand berm. Partial containment was accomplished using a 14-inch water-filled pipe along the lower side of the island, along with efforts to plug the tidal creek within the placement area.
- An additional 15,000 cubic yards of dredged sediment was placed in Fall 2020. Material was initially placed within the interior of the northern portion of the island using the sediment distribution pipe. Later, the discharge was repositioned to place sediment along the northern edge of the island to protect against marsh edge erosion.
- Elevation monitoring is being conducted to evaluate consolidation of the placed material and the extent to which elevation goals were met by these placements. A mass balance is being performed to quantify sediment volumes contained on the site and within the surrounding mudflats.
- Monitoring around the sediment distribution pipe is being performed to evaluate its effectiveness in separating sand from the dredge slurry.
- Submerged Aquatic Vegetation (SAV) and benthics are being monitored to evaluate benefits from the placements.
- The site will be monitored over time to capture long term consolidation, vegetation establishment and habitat suitability and use.

**Project Benefits**
- Federal channels along the New Jersey Intracoastal Waterway near Sturgeon Island required dredging to maintain authorized depths. This project used those channel sediments to increase elevation to offset erosion, subsidence, and sea level rise on Sturgeon Island. Sediments which did not remain on the island were captured on the mudflats. The mudflats not only provide habitat for submerged aquatic vegetation and fish, but also enhance marsh edge protection for the steep scarp which is subject to erosion from storm- and boat-induced waves.
- The project provided excellent opportunities to study the dynamics of unconfined and partially confined dredged material placement and the use of a sediment distribution pipe for building localized elevation.
- Developing a better understanding of sediment transport and consolidation will inform future placements for setting project expectations and determining the need (or lack of) for containment for meeting project goals.
- Evaluation of the sediment distribution pipe will determine its potential effectiveness for future use to build berms for containment or other purposes.

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Innovative practices implemented at Sturgeon Island include the use of a sediment distribution pipe to segregate sand, and use of a water-filled dredge pipe as a containment feature.

Cone penetrometer testing (CPT) was conducted prior to placement; future CPT could be employed to indicate how the site is recovering compared to pre-placement conditions.

Lessons Learned

Existing topography caused the dredged material slurry to short circuit to the tidal channel and efforts to plug the channel using hay bales, coir logs and marine plywood were largely ineffective. However, sediment losses from the island resulted in useful sediment deposits to the surrounding mudflats.

The water-filled pipe as a simple containment method proved to be reasonably effective. Significant seepage was observed beneath the pipe in areas where the local surface was not smooth and dredged sediment build-up on the discharge side of the pipe exerted enough load to move the pipe laterally in some locations. Both issues can be resolved relatively easily by placing a mat beneath the pipe and providing some lateral support for the pipe. The pipe also remained in place for about five months post-placement. While the presence of the barrier provided continued containment and time for the sediment to stabilize, it also prevented drainage and desiccation of the dredged fill.

Due to difficulties accessing the site immediately post-placement, remote monitoring techniques are needed.

Partnering

This project represents a collaboration among the consortium of stakeholders within the Seven Mile Island Innovation Laboratory (SMIIL), which includes NAP, TWI, ERDC, the State of New Jersey, academic institutions, and private parties. The SMIIL stakeholders worked together to design and vet placement strategies, and monitor sediment placement and subsequent changes over time. Multiple ERDC teams contributed to the overall success and lessons learned through a range of research and monitoring objectives, evaluating evolution of the mudflats and marsh platform, sediment distribution pipe effectiveness, construction-related turbidity, and benthics and SAV.

Outcomes

Success of the dredged material placements at Sturgeon Island is still being evaluated. Field data collection in July 2021 will inform the mass balance, and consolidation behavior and effectiveness of the sediment distribution pipe. Long-term success will be measured in terms of habitat suitability and future use by wading birds.

Additional Information?

Additional information on SMIIL and marsh restoration can be found at: https://wetlandsinstitute.org/smiil/ or https://www.nap.usace.army.mil/Missions/Civil-Works/Coastal-Dredging-Beneficial-Use/

Publications to date:


What is next?

Additional dredged material placement is planned for Sturgeon Island in Fall 2021. Monitoring habitat and elevation changes will continue as we evaluate the need for additional dredged material and how it should be placed to build elevation to support nesting habitat.

Points of Contact:

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BU Characterization

Bay; Island Creation

Project Purpose

Coastal islands and marshes of the Chesapeake Bay are disappearing along with the critical ecosystem services and shoreline protection benefits they provide. At Swan Island, high rates of shoreline erosion and subsidence have deteriorated the island's natural habitat and its ability to shelter the nearby town of Ewell from wave energy. In 2015, O&M funding was provided to the USACE Baltimore District to support maintenance dredging the Twitch Cove and Big Thorofare federal navigation channels, which provide access to towns on Smith Island. In 2019, the USACE Baltimore District restored Swan Island with the sediment dredged from these nearby channels. Historically, efforts focused on strategic placement of dredged sediments upriver of the islands in an effort to reduce dredging costs and promote island growth through sediment migration. However, additional environmental, navigation, and climate change benefits were realized by directly placing sediment on the island.

Project Description

Approximately 80,000 cubic yards of sediment were dredged from Big Thorofare & Twitch Cove Channels in 2019 and beneficially used to restore Swan Island. The sediment consisted roughly of 65% sand and 35%. Approximately 12.2 acres of island were restored, which consisted of 0.8 acres of dune, 7.6 acres of high marsh, and 3.8 acres of low marsh. Vegetation was planted during the restoration and included Am. Breviligulata on the dunes; P. amarum, Sp. patens, and P. virgatum on the high marsh; and Sp. Alterniflora on the low marsh.

Project Benefits

The project provided an opportunity to keep sediment in the Chesapeake Bay and beneficially use it to restore Swan Island. By pursuing the project in this way, Swan Island was restored, which resulted in diverse types of habitat being created as well as preservation of a bird rookery on the western side of the island. In addition, restoration of the island produced a natural breakwater that is reducing erosion and providing storm risk reduction benefits to nearby Smith Island.

Partnering and Collaboration

USACE Baltimore District, ERDC, NOAA’s National Centers for Coastal Ocean Science (NCCOS) scientists, US Fish and Wildlife Service and the Maryland Department of Natural Resources partnered to develop a research plan focused on the restoration of Swan Island. This group, with their specific skillsets and expertise, are collecting the physical and ecological data necessary to evaluate the performance of the island and associated benefits derived from this restoration project. Other efforts include assessing the impacts of Swan Island restoration on nearshore benthic communities (oysters and seagrasses), intertidal marsh habitat, and long-term resilience of the island to erosion and sea level rise.
Innovations and Advancements

- The Swan Island Restoration Project is a multi-agency collaboration effort that is leveraging diverse resources, skillsets and expertise to advance Engineering with Nature (EWN) concepts and practice.
- Preliminary pre- and post-construction data suggests multiple ecological, social, and engineering benefits are being achieved.
- Quantifiable data is being used to develop models that will inform the design and construction of future islands projects.
- Models are being develop in conjunction with landscape architectural renderings to depict the maturation of island systems over time. Outputs will be more broadly understood by public and inform future adaptive management actions.

Lessons Learned

- Environmental and ecological response to BU placement can vary seasonally.
- Year-round data is needed to truly estimate the impact of changes to sediment loads in these systems.
- Restored islands are highly dynamic and require considerable attention during the construction phase of a project.
- Setting appropriate elevations and incorporating planting into construction phase greatly accelerates function and accrued benefits.
- Vegetative planting designs should be accompanied by landscape architecture renderings for the best planting outcomes.

What is next?

Ecological and hydrodynamic models will continue to be refined and advanced to more fully characterize and understand the natural processes surrounding Swan Island how it performs following restoration. Models will be applied to other islands in a variety of systems to further calibrate outputs and enhance their predictive capabilities. Research specific to vegetation planting is also being pursued to better understand how the low marsh species respond to various planting techniques.

Additional Information?


Outcomes

The collaborative research team is still actively collecting data and evaluating results. However, findings to date reveal a diverse suite of ecosystem service functions being more prevalent on the island following restoration. Swan Island is also a critical piece of land due to the presence of a heron rookery at the west end and serving as a tie-in for the USACE owned and operated jetty at the mouth of the Big Thorofare channel, which provides critical access to Smith Island from the west. Restoration of the island has prevented future loss and degradation of these critical resources as well. Finally, restoration of Swan Island is providing increased ecosystem service provisions, increased resilience of Swan Island to future sea-level rise, and abatement of erosive losses for the town of Ewell. This project is producing environmental, economic and social benefit, which are the three pillars of what constitutes and USACE Engineering with Nature project.
BU Characterization

Back bays, Tidal Wetlands

Project Purpose

Beneficially using dredged sediment from navigation channel maintenance can potentially fulfill the need for sediment at coastal restoration projects. Despite high demand for sediment to fill subsided San Francisco Baylands, perceived high cost and complicated logistics are barriers to changing status quo from disposal to beneficial use. The regional vision to restore 100,000 acres of tidal marsh aims to buffer climate impacts, adapt to sea level rise (SLR), and restore vibrant ecosystems is contingent on sufficient supply of sediment for initial restoration and renourishment.

This project is developing and demonstrating a framework for the combined use of modern geospatial tools with process-based ecological models, and optimization algorithms can facilitate more BU in support of coastal restoration efforts. The utility of the resulting method will be to identify the most beneficial and cost-effective coastal restoration beneficial use projects in light of navigation dredging needs and SLR. This research is funded by the Dredging Operations and Environmental Research (DOER) program.

Project Description

Optimization of dredge material removal, transportation, and placement entails definition of all potential sources, sinks, and routes, along with associated volumes, schedules, costs, and benefits.

- The volume available for beneficial use is being determined by historical activity and shoaling forecasting.
- Placement area sediment restoration needs are being defined based on geographic area and the modelled ideal elevation of each site. The method captures that need will be dynamic over time with SLR and considers multiple scenarios.
- Project costs are being developed from prior studies and with USACE experts. Benefits of BU placement, which do not usually play a role in placement decisions, will be accounted for, to the greatest extent possible. These components serve as the inputs to the optimization model, executed in the USACE-development model, Dredge Material Management Decisions (D2M2) software.

Project Benefits

- BU has been identified as a necessity in San Francisco baylands – to “protect billions of dollars of bay-front housing and infrastructure (including neighborhoods, business parks, highways, sewage treatment plants, and landfills)...purify the Bay’s water, support endangered wildlife, nurture fisheries, and provide people access to nature within the urban environment” (Dusterhoff et al. 2021).
- Prospective benefits of BU are being quantified with the objective of identifying placement options that maximize benefits and minimize costs, e.g., habitat units, carbon sequestration, transportation cost savings, and more.

The primary benefit of the project is to help overcome barriers to substantially scaling-up and normalizing BU by demonstrating a BU framework that can be applied at scale to promote sustainable BU practices, facilitating the delivery of social and environmental benefits while still fulfilling the US Army Corps of Engineers navigation mission. The framework applies logical feasibilities and can account for vast benefits that justify placement costs.

Points of Contact:

Dr. Candice Piercy (ERDC EL), Candice.D.Piercy@usace.army.mil
Dr. Brandon Boyd (ERDC CHL), Brandon.M.Boyd@usace.army.mil;
Innovations and Advancements

The framework utilizes process-based ecological models to forecast the sediment needs for healthy, functional ecological systems. Optimization is utilized to discover combinations of dredge sediment sources and placement areas to minimize cost and maximize benefit.

Dredge Material Management Plans (DMMPS) and Ecosystem Restoration Missions are not coordinated in the current state-of-practice. Research and development can play a role in support the transition to more efficient and effective mission execution.

Lessons Learned

- While several studies have been conducted analyzing the vulnerability and resilience of wetlands, some even estimating the quantity of sediment to maintain and restore those wetlands, the link between restoration and resiliency goals and navigational dredging has not been explicitly explored.
- There is untapped potential for using optimization in USACE District Operations. Demonstrations, model certification, and ERDC support are needed to promote the use of optimization for routine operational activities.

Partnering

The research is a collaborative effort of researchers in two ERDC labs. District personnel will be engaged for their expertise in dredge cost estimating and logistics. Research results will be aimed at San Francisco District, in particular the PDTs developing the 1122 BU demonstration project and the new dredged material management plan. The workflow will be applicable to all USACE districts.

Outcomes

While the project application to San Francisco Bay is ongoing, it is expected that the project will serve as an example of how systematic analysis of this kind can be used to align coastal ecosystem restoration and coastal resiliency goals with dredged material management in a mutually beneficial manner.

Additional Information?

Technical Report: Towards systematic beneficial use of dredged sediments in San Pablo Bay: Demonstration of a proposed framework for matching sediment needs with dredging requirements (in process)

Technical Note: Systematic beneficial use of dredged sediments: matching sediment needs with dredging requirements (in review)


Download D2M2 software: https://dots.el.erdc.dren.mil/models5.html (update expected Summer FY21)

What is next?

- The results and products of this study are anticipated to be applied across USACE to support sustainable long-term dredged material management strategies which support a more natural sediment budget and reduce dredged material transportation costs while minimizing adverse impacts associated with current practices.
- The analysis can guide partner agencies to target restoration projects in areas most conducive to beneficial use of dredge material and find other solutions for areas that are not.

1 Julie Beagle is serving as contact for this effort
BU Characterization

This project encompasses a broad area of BU characterization since the “Thin Layer Placement of Dredged Material Website and Map-Portal” includes a database and case studies where dredged material has been used beneficially for different purposes such as habitat restoration, sediment remediation, thin layer capping for contaminant isolation, marsh restoration, island creation, or wetland creation.

Project Purpose

Thin layer placement (TLP) is the purposeful placement of thin layers of sediment (e.g., dredged material) in an environmentally acceptable manner to achieve a target elevation or thickness. TLP is a versatile technique that can be used to restore many intertidal habitats, including all types of tidal marshes and beaches. Our overarching goal is to share resources that will help promote successful TLP projects.

The Thin Layer Placement of Dredged Material website and map-portal are a living resource of information and provide access to all available resources supporting the planning, design, and construction of beneficial use projects employing this technique. During the first year of this project, funding was received through both the Regional Sediment Management (RSM) and Dredging Operations and Technical Support (DOTS) programs, and after the first year it was funded through the DOTS program only. The website is frequently updated to incorporate new resources, design and modeling tools, and case studies. The site is publicly available; thus, facilitating the use of thin layer placement by disseminating information globally and capturing both domestic and international case studies, construction practices, and lessons learned.

The objectives of this effort are to continue maintaining and adding valuable information and resources to the Thin Layer Placement (TLP) of Dredged Material website and map portal.

Project Description

- A website was developed and released to the public that contains resources for TLP practices (https://tlp.el.erdc.dren.mil/). The website serves as a portal to the most readily accessible resources, including literature, available case studies, and external resources, and provides means for users to submit case studies for inclusion on the site.

- A GIS map-based portal for entry of case studies, placement site, and sediment source locations associated physical and chemical data, hydrodynamics, bathymetry, design drawings, reports, and other available information was also developed in conjunction with the website landing pages, providing geographically oriented information resource for project planning, permitting, design, construction, monitoring, and cost.

Project Benefits

- The TLP website documents the current state of knowledge regarding thin layer placement of dredged material (to minimize impacts of disposal or to achieve specific beneficial use objectives), compiling resources relevant to planning, permitting, design, cost estimating, construction, and monitoring. Data entered into the website database can be accessed by users for multiple uses, including planning, site design, and modeling.

- The site provides effective dissemination of current beneficial use practices and knowledge, as well as existing information relevant to all phases of individual projects.
  - Multiple layers will be displayed on the map based portal including the National Channel Framework, the location of placement areas, dredging schedules, sediment databases such as SAGA (when available), and other types of beneficial use sites.

Points of Contact: ERDC POC (ERDC EL), Damarys.Acevedo-Mackey@usace.army.mil  
Other POC (ERDC, EL), Burton.Suedel@usace.army.mil
Overlaying the navigation channels and placement areas with existing sediment data provides a robust resource regarding potential source material, and this will facilitate the interaction of beneficial use planning with navigation dredging operations and dredged material management.

- Collectively, these resources will facilitate and advance the practice and acceptance of beneficial use both within USACE as well as within other agencies and the private sector.

**Innovations and Advancements**

- This website is a vital source of information, knowledge, and experience on TLP. The site contains a growing body of searchable resources pertaining to all stages of dredged-material based beneficial use projects related to TLP.
- The ERDC team has continuously added case studies and resources available in the literature throughout the past few years. The website continues to grow, and collaboration with people working on TLP projects for including new case studies is key to continue disseminating informations and promoting successful TLP projects.
- A video, which has been developed, will be added to the welcome page to simply explain the TLP technique and its purpose.

**Lessons Learned**

New resources and case studies are added yearly. The case studies include pictures and a factsheet highlighting lessons learned from each particular project. Hence, the lessons learned from TLP projects are shared with the community of practice and information related to those case studies continues to be disseminated.

**Partnering**

The ERDC DOTS program has mainly funded this effort. The RSM program was funded during year one. USACE Districts, private firms, federal agencies, and state agencies have contributed for hosting workshops related to TLP of dredged material and for providing key literature used in the resources page, and also for the development of case studies factsheets.

**Outcomes**

- Aggregates the current state of knowledge regarding thin layer placement of dredged material
- Consolidates literature/references pertaining to all project phases – from design to post-construction monitoring
- Provides a centralized, accessible, and consolidated resource for case studies
- Provides a vehicle for collection of case studies worldwide

**Additional Information?**

https://tlp.el.erdc.dren.mil/

https://usace.maps.arcgis.com/apps/MapSeries/index.html?appid=a731fd32f85c44109b9269e7c8d9c68f

**What is next?**

Continue to add new resources and case studies to the website. Stimulate the community of practice to submit their own project factsheets and case studies.

**Points of Contact:**

ERDC POC (ERDC EL), Damarys.Acevedo-Mackey@usace.army.mil

Other POC (ERDC, EL), Burton.Suedel@usace.army.mil
BU Characterization

Riverine, Inland waterways, upland disposal

Project Purpose

On average, the USACE St. Paul (MVP) and the Rock Island (MVR) Districts combine for over 1.25 MCY of dredged material from the Upper Mississippi River each year. As this is a pooled system, the majority of this material is placed at upland placement sites, mostly owned by the Federal Government. In fact, MVP owns over 1500 acres to be utilized as material placement sites.

While the districts on the upper Mississippi have had some successful beneficial use projects, such as island creation and marsh restoration, there are other opportunities that could be realized by broadening the definition of beneficial use.

Utilization of the clean sands as construction material could provide an avenue to reuse much of the dredged material on the Upper Mississippi. As part of a broader “Navigation Strategic Vision” funded by the MVP, and with support from the Regional Sediment Management Program (RSM), CHL is exploring the ability to expand the definition of Beneficial Use, especially pertaining to inland systems.

Project Description

The objective of this project is to:

- Research dredged material disposal in similar US and foreign waterways
- Quantify financial impacts of upland disposal on MVPs Dredge Materail Management Program (DMMP) on dredge cost/cy
- Engage with stake holders and industry to find collaborative and innovative opportunities for dredged material use.

Project Benefits

- Expanding the definition of Beneficial Use for inland systems will provide districts with more opportunity for creative reuses of dredged material
- Finding alternative placement sites for dredged material will limit the footprint of these upland material placement sitesPartnering with construction industry to utilize clean material dredged from the river may have positive impacts and potential reductions of upland mining operations.

Innovations and Advancements

The St. Paul and Rock Island USACE Districts have created and held a kickoff meeting or the “Upper Mississippi Beneficial Use Working Group”, comprising of many state and federal agencies including: Department of Transportation (Iowa,Illinois, Minnesota, Missouri, Wisconsin), Department of Natural Resources (Illinois, Wisconsin, Minnesota, Missouri), EPA, NRCS, UMRBA, and USFWS to name a few. This large collaborative effort is a great advancement working towards successful benefical use applications.

Points of Contact:
- District POC (DIS), Zachary.r.kimmel@usace.army.mil
- ERDC POC (ERDC EL), Benjamin.e.emery@usace.army.mil
- Other POC (OTHER), Breann.k.popkin@usace.army.mil
Lessons Learned

The Upper Mississippi River Project was created with no project sponsor, limiting its ability for an outside funding source, and assistance with dredged material placement. In many other similar waterways of the US, project sponsors assist, or in some cases, are responsible for finding upland placement sources for dredged material.

Partnering

As mentioned previously, the ability to utilize the vast amount of clean sand on the upper Mississippi River is of importance to an array of local, state, and federal agencies. The outcomes from this effort can have significant positive impacts to other inland systems in the US.

Outcomes

Annual Meetings of the Upper Miss Beneficial Working

Expanded use of dredged material

Reduction of upland placement sites

Additional Information?


What is next?

- Continued engagement with stakeholders and partners to find new opportunities for utilization of dredged material.
- Seek ways to quantify the benefits of “non-standard” beneficial use projects.
- Continue to work alongside MVP, MVR and the Regional Sediment Management (RSM) program to implement these efforts.
Ben
ificent Use of Dredge
ed Sediments
Productive and postive uses of dredged material.

Recycling Dredge Material into Manufactured Top Soil

BU Characterization

Manufactured Topsoil

Project Purpose

- Illinois Waterway dredged material placement sites are filling and alternative sites or uses were needed.
- Manufactured soils using dredged material was proposed as an alternative in 2015.
- The investigations were started as an Regional Sediment Management (RSM) program project with Rock Island District (MVR) that led to a private-public-municipal meeting establishing an ongoing partnership.
- The project moved to ERDC and Dredging Operations Technical Support (DOTS) who supported a manufactured soil workshop with representatives from 6 states held in Peoria, IL in August 2019.
- The partnership led by the Tri-County Regional Planning Commission includes more than 30 agencies/companies from the Peoria region and State of Illinois. There has been Illinois Department of Transportation (IDOT) investments in beneficial use of dredged sediments (BUDM) utilization and MVR support for offloading sand from placement sites to beneficial use.

Project Description

Illinois Waterway beneficial use of dredged material was devised as an alternative to support Corps navigation and ecosystem restoration missions by developing a private-public partnership to manage dredged material.

- Sand from navigation channel dredging and fine sediment dredged for aquatic ecosystem restoration was blended together with additional organic enrichment (i.e., compost) to create high quality topsoil products that can be used in construction, stormwater management, and agriculture.
- Scientists from the USDA in IL worked with researchers from ERDC Environmental Laboratory to engineer top soils and evaluate their physical and chemical properties to determine their ability to sustain native plant growth and absorb contaminants.
- The objectives were to make space in dredged material placement sites and fund ecosystem restoration with profits from soil sales.
- Interest in the process ranges from a local composter who is selling bulk and bagged soil to international manufacturers who have researched and implemented soil manufacturing schemes.

Project Benefits

- This project has built an effective partnership that brings BUDM concepts to Illinois Waterway sediment management.
- The Corps leased a loader for a beneficial use site so users can easily access material. Over 10,000 yards of Corps sand and 6,000 yards of fine sediment from a private terminal were taken in the first year.
- Soil sales are not being tracked, but the composter sells to a bagger, who sells to big box stores in Central Illinois so the retail distribution is established and the commercial/minicipal network is accessible through existing relationships.
- There is an ongoing IDOT collaboration to create better performing materials for roadway stormwater management.

This project is a demonstration of the Technology Transfer opportunities for private-public partnerships in sediment management. Sediment provides valuable aggregate material that can be resourced into local markets as demonstrated.

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in Minnesota and now in Illinois. The approach applies widely and is being applied to Upper Ohio River lock replacements and marine deep draft dredging among other places.

**Innovations and Advancements**

The State of Minnesota is a leader in stormwater management who developed engineering specifications for highway drainage (e.g., shoulders, ditches, topsoil, etc.). Their drainage requirements were met well by the rounded river sand available in municipal dredged material storage areas. Through commercial utilization a stockpile of sand was relocated and new marine terminal facilities could be constructed to generate public and private revenue while maintaining a dependable placement site for Corps navigation operations.

The “Minnesota Model” is eminently transferable to other Corps areas of operation. Opportunities can be realized by creative thinking and broad partnerships to integrate BUDM opportunities.

Commercial use of dredged material is an innovative and cost effective alternative to traditional upland sediment placement requirements.

**Lessons Learned**

One partner stated that BUDM in manufactured soil is “logical, not easy”. It has taken many years to socialize the concept and find individuals with capacity to do the work. The process required significant coordination and dedication from disparate interests working at large and small scale. Interest and awareness is growing, and we were warned it takes five years for markets to mature. We are in the second season of soil manufacturing and competition and cooperation is increasing with awareness.

**Partnering**

This research started as a channel maintenance investigation that rapidly grew to include ecosystem restoration in the Peoria Lake Comprehensive Conservation Plan which was a Planning Assistance to States project that forged the partnership with Rock Island District, Tri-Country Regional Planning Commission and 30 other agencies/individuals.

**Outcomes**

BUDM planning and manufactured soil implementation in the Illinois Waterway will support Corps operations and boost regional economic development by selling sustainable aggregate products.

**Additional Information?**

Evaluation of engineered soils for bioretention areas containing dredged Illinois River sand, compost, biosolids, and pyrolyzed biosolids.


**What is next?**

We will continue to support expansion of Illinois Waterway dredged material in aggregate and manufactured topsoil markets. We are seeking distributors in the Chicago and St. Louis regions with larger material needs that can be easily reached. We are also investigating other sites and partners in the Illinois Waterway, Upper Mississippi River, Lake Red Rock reservoir sustainability, Ohio River lock replacement, and Miami deep draft harbor dredging.

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Appendix G: The Timothy L. Welp Award

The first annual Timothy L. Welp Award for Advancing Beneficial Use of Sediment is awarded to Monica Chasten (NAP) and her team to commemorate the restoration efforts through beneficial use at Sturgeon and Gull Island, two marsh islands located in Cape May County, New Jersey. Sturgeon and Gull Island are a part of the SMIIL (http://wetlandsinstitute.org/smiil), an initiative designed to advance and improve dredging and marsh restoration techniques in coastal New Jersey through innovative research, collaboration, knowledge sharing, and practical application. SMIIL was established through a partnership with USACE-NAP, the State of New Jersey, The Wetlands Institute, and ERDC.

Figure G-1. The Timothy L. Welp Award was given to Monica Chasten and her team for their significant contributions to marsh restoration in New Jersey.
Honorable Mentions

go to

Swan Island, Maryland, Restoration Project

Removal of Beneficial Use Impairments at Duluth Harbor

Middle Mississippi River Island Creation
## Abbreviations

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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BU</td>
<td>Beneficial use</td>
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<tr>
<td>CHL</td>
<td>Coastal and Hydraulics Laboratory</td>
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<tr>
<td>CIRP</td>
<td>Coastal Inlets Research Program</td>
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<tr>
<td>DOER</td>
<td>Dredging Operations and Environmental Research</td>
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<tr>
<td>EL</td>
<td>Environmental Laboratory</td>
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<tr>
<td>ERDC</td>
<td>US Army Engineer Research and Development Center</td>
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<tr>
<td>EWN®</td>
<td>Engineering With Nature®</td>
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<tr>
<td>HQ</td>
<td>Headquarters</td>
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<tr>
<td>NAP</td>
<td>Philadelphia District</td>
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<tr>
<td>O&amp;M</td>
<td>Operation and maintenance</td>
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<tr>
<td>RSM</td>
<td>Regional Sediment Management</td>
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<td>SMIIL</td>
<td>Seven Mile Island Innovation Laboratory</td>
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<tr>
<td>USACE</td>
<td>US Army Corps of Engineers</td>
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<td>WRDA</td>
<td>Water Resources Development Act</td>
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Proceedings from the US Army Corps of Engineers (USACE) 2021 Beneficial Use of Dredged Material Virtual Workshop:

The workshop was cohosted by Dr. Amanda Tritinger (CHL) and Dr. Kelsey Fall (CHL) on behalf of the Engineering With Nature®, Coastal Inlets Research Program, Dredging Operations and Environmental Research, and Regional Sediment Management research programs. The workshop concluded by introducing and awarding the first annual Timothy L. Welp Award for Advancing Beneficial Use of Dredged Sediments to recognize teams (with members across and outside of USACE) that have advanced progress on BU through collaboration, partnering, and innovation.

15. SUBJECT TERMS
Conference proceedings; Dredging—Environmental aspects; Dredging spoil—Management; Environmental engineering

16. SECURITY CLASSIFICATION OF:
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