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Engineering With Nature Workshop



October 5-6, 2016
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Proceedings from the U.S. Army Corps of Engineers (USACE) and the National Oceanic and Atmospheric Administration (NOAA)

Engineering With Nature Workshop

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Abstract

This proceedings report summarizes the activities of a collaborative workshop conducted on the topic of Engineering With Nature (EWN) by the U.S. Army Corps of Engineers (USACE) and the National Oceanic Atmospheric Administration (NOAA)-National Marine Fisheries Service (NMFS). The workshop was held October 5-6, 2016, in Gloucester, Massachusetts. EWN is defined as sustainable development of water resources infrastructure through the beneficial integration of engineering and natural systems (*www.engineeringwithnature.org*). It is this intentional alignment of natural and engineering processes that efficiently and sustainably delivers economic, environmental, and social benefits through collaborative processes. Thirty-eight workshop participants represented USACE and NOAA. The objectives of the workshop were to (1) provide an overview of EWN, review progress to date, and establish a path forward for application in the coastal zone; (2) discuss USACE and NMFS opportunities/challenges with respect to applying EWN; (3) use tools developed in conjunction with workshop format to guide EWN project teams (i.e., breakout groups) towards the identification of specific EWN-based opportunities; and (4) prepare detailed opportunity statements for the highest-value EWN collaborative projects/solutions. The workshop included a plenary session where USACE and NMFS leaders presented their respective organizational overviews and legislative mandates concerning EWN implementation in the coastal zone. Interactive breakout sessions were also convened to gather input on priority opportunities for collaborative EWN projects along with associated initial steps, potential concerns, and possible challenges. Over the course of the two-day workshop, a total of six short- and long-term opportunities emerged. It will be essential to capture and share lessons learned as the two organizations plan and implement selected EWN projects/initiatives.

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Preface

This report summarizes the activities of a collaborative workshop conducted on the topic of Engineering With Nature (EWN) by the U.S. Army Corps of Engineers (USACE) and the National Oceanic Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS). The workshop was held October 5-6, 2016, in Gloucester, Massachusetts.

Dr. Todd Bridges, Dr. Jeff King, and Cynthia Banks from the U.S. Army Engineer Research and Development Center (ERDC) and Cathy Tortici, Mark Murray-Brown, and Daniel Marrone from NMFS organized the workshop; Dr. Bridges and Ms. Tortici served as workshop chairs; and Ms. Banks and Mr. Marrone led logistics. Dr. King, Monica Chasen (USACE Philadelphia District) and Mr. Murray-Brown facilitated breakout sessions. The workshop organizers would like to acknowledge the many individuals who provided on-site computer and facility support. Additionally, the organizers wish to thank all of the workshop participants who shared their knowledge and experience to identify potential collaborative opportunities for USACE and NOAA so that these two organizations may advance their mutual EWN practice.

At the time of publication of this report, Dr. Beth Fleming was Director of the ERDC Environmental Laboratory. COL Bryan S. Green was Commander of ERDC and Dr. David W. Pittman was Director of ERDC.

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Executive Summary

As a follow-on action to a U.S. Army Corps of Engineers (USACE)/National Oceanic and Atmospheric Administration (NOAA)-National Ocean Service (NOS) collaboration workshop (March 2016) on Natural and Nature-Based Features, USACE and NOAA's National Marine Fisheries Service (NMFS) conducted a collaboration meeting to identify opportunities to use the principles and practices of Engineering with Nature (EWN) to further the missions, projects, coordination, and Endangered Species Act Section 7 and Essential Fish Habitat consultations undertaken by the two agencies.

The USACE/NOAA-NMFS EWN Workshop was attended by 38 participants representing USACE (Headquarters, Engineer Research and Development Center, North Atlantic Division, and New England, New York, Philadelphia, Baltimore, New Orleans, Galveston, Los Angeles Districts) and NOAA (NMFS's Office of Habitat Conservation, Office of Sustainable Fisheries, and Office of Protected Resources-NMFS-Headquarters, Greater Atlantic Regional Fisheries Office and Southeast Regional Office, and National Ocean Service's (NOS) National Centers for Coastal Ocean Science and the Office for Coastal Management). Participants' backgrounds included leadership experience at differing levels, a variety of functional role experience in USACE and NOAA, and a diversity of project and programmatic experience. Over two days, the participants gained a greater understanding of organization missions and opportunities to use EWN to develop solutions that are directly relevant to mission execution for USACE and NOAA-NMFS. The workshop included plenary and breakout group discussions designed to identify solutions and prioritize future actions.

The high quality of engagement among participants was evidenced by focused, creative, and productive dialogue that resulted in the identification of high priority opportunities, solutions, and follow-on actions. Workshop participants shared perspectives on their missions, mandates, and constraints and — as a result — identified numerous solutions and actions to apply the EWN approach. These collaborative actions were subsequently refined and prioritized based on impact-to-mission execution for the two agencies and near-, mid- and long-term tasks were identified for joint teams. High priority EWN collaboration opportunities/actions included establishing:

1. Mechanisms to facilitate communication and information sharing across the two agencies;
2. Joint guidance for enhancing and conserving NOAA trust resources using EWN;
3. Decision-support capability for designated critical habitat development and recovery of Atlantic sturgeon through beneficial use of dredged material;
4. Expanded dredged material management site options in Chesapeake Bay that support development of blue crab habitat;
5. Habitat enhancement opportunities, methods, and demonstrations for hard structures; and
6. Demonstration of thin-layer placement of dredged material in New England.

The immediate next steps that will be taken following the workshop include:

1. Preparing and disseminating a joint executive summary of the workshop (present document);
2. Preparing and jointly publishing a workshop proceedings report by December 2016;
3. Incorporating NOAA-NMFS staff into relevant, ongoing USACE project teams; and
4. Initiating collaborative teams on the highest priority actions for solution development.

1 Introduction

The U.S. Army Corps of Engineers (USACE) and the National Oceanic and Atmospheric Administration (NOAA)'s National Ocean Service (NOS) participated in a collaboration workshop March 1-3, 2016, on Natural and Nature-Based Features (NNBF). The workshop was held in Charleston, South Carolina (Bridges et al. 2016), and the ideas resulting from this activity have generated many successes. As a result of the continued interest in USACE/NOAA collaborations — as evidenced by the ongoing, active communications between the leaders in both organizations — a second workshop was held. For this second event, the USACE and NOAA's National Marine Fisheries Service (NMFS) organized a joint Engineering With Nature (EWN) workshop at the Greater Atlantic Regional Fisheries Office (GARFO) October 5-6, 2016, in Gloucester, Massachusetts.

The workshop was designed to further the respective missions, identify collaborative projects, and strengthen coordination between the two agencies. By hosting this workshop, the two agencies were also afforded a venue to exchange ideas and recommend approaches for applying EWN alternatives that integrate design and construction considerations compliant with Section 7 consultations under the Endangered Species Act and Essential Fish Habitat consultations as part of the Magnuson-Stevens Fisheries and Conservation Management Act.

Figure 1. NOAA's GARFO Building in Gloucester, Massachusetts.



Figure 2. Lobby of NOAA's GARFO Building.



Recent advances in the fields of engineering and ecology offer many opportunities to combine these fields of practice into a single collaborative and cost-effective approach for infrastructure development and environmental management. The USACE, NOAA-NMFS, other federal and state agencies, non-governmental organizations (NGOs), academia, and elements of the private sector are pursuing this initiative in an effort to better align and integrate engineering and natural systems to produce more socially acceptable, economically viable, and environmentally sustainable projects (Bridges et al. 2015; Bridges et al. 2014; National Science and Technology Council 2015; NOAA 2015; and Sutton-Grier et al. 2015). EWN is defined as sustainable development of water resources infrastructure through the beneficial integration of engineering and natural systems (*www.engineeringwithnature.org*). It is this intentional alignment of natural and engineering processes that efficiently and sustainably delivers economic, environmental, and social benefits through collaborative processes (Figure 3).

EWN's focus is on developing practical methods and providing an achievable path toward a holistic ecosystem approach to infrastructure development and operations. Consequently, EWN principles and practices are being applied across the United States and internationally through the development of strategic collaborations and partnerships between government agencies, private sector engineering firms, construction companies, universities, and NGOs. These efforts continue to achieve and expand common EWN-related goals.

Figure 3. The EWN approach provides overlapping benefits resulting in more sustainable projects.



The following four principles are critical to the overall success of any EWN initiative:

- To deliver science and engineering that produces operational efficiencies supporting sustainable delivery of project benefits
- To maximize use of natural processes, thereby reducing demands on limited resources, minimizing the environmental footprint of projects, and enhancing the quality of project benefits
- To adopt approaches that broaden and extend the base of benefits provided by projects, to include substantiated economic, social, and environmental benefits
- To pursue science-based collaborative processes to organize and focus interests, stakeholders, and partners in an effort to reduce social friction, resistance, and project delays while producing more broadly acceptable projects

The current focus of the EWN program is to expand partnerships and opportunities across the US. Building on the momentum established over the last five years, the vision for achieving greater success with EWN includes, but is not limited to:

- Systematically integrating EWN principles and practices into organizational cultures by continuing to expand its application across mission areas, while actively demonstrating and communicating its value;

- Broadening and deepening engagement, participation, and collaboration with colleagues across and among key agencies, organizations, and stakeholders; and
- Formally engaging with other organizations on EWN-focused R&D, training, and education.

USACE partnering with NMFS fosters creative opportunities to advance the use of EWN to solve problems and create engineering and ecosystem value within the coastal zone. With so many EWN projects underway in the coastal zone, and many future-anticipated opportunities on the horizon, the timing for this collaborative meeting between USACE and NMFS was ideal. Like USACE, elements of NOAA's mission also seek to identify opportunities to prioritize natural infrastructure alternatives with respect to coastal resilience initiatives. For example, the NMFS Office of Habitat Conservation's resilience planning efforts have encouraged the use of living shorelines as a stabilization technique to preserve and improve habitats and their ecosystem services at the land–water interface (NOAA 2015). Additionally, NOAA's National Ocean Service Roadmap (NOAA/NOS 2016) identifies "*Improve community understanding of the benefits of natural and nature-based infrastructure, and support implementation as a complement to or in place of built infrastructure, to enhance resilience to coastal hazards"* as a top priority for that line office.

With respect to coastal resilience and implementation of EWN, NNBF, and/or similar technologies, the USACE and NMFS recognize the need to encourage and sustain the resilience of our coasts in order to fulfill the mission of providing quality responsive service in the areas of navigation, ecosystem restoration, flood and storm damage reduction, and environmental stewardship. Developing EWN projects that take into consideration the legislative mandates of NOAA NMFS's Office of Protected Resources are also of great importance. Thus, approaching EWN from the standpoint of encouraging/promoting design and construction alternatives that align with Section 7 of the Endangered Species Act as well as Essential Fish Habitat (EFH) concerns as part of the Magnuson-Stevens Fisheries and Conservation Management Act, constitutes a high-priority for both agencies.

2 Workshop Objectives and Process

2.1 Objectives

The objectives of the collaborative workshop were to:

- Provide an overview of EWN, review progress to date, and establish a path forward for application in the coastal zone;
- Discuss USACE and NMFS opportunities/challenges with respect to applying EWN;
- Use tools developed in conjunction with workshop format to guide EWN project teams (i.e., breakout groups) towards the identification of specific EWN-based opportunities; and
- Prepare detailed opportunity statements for the highest value EWN collaborative projects/solutions.

2.2 Participants

Thirty-eight participants from USACE and NOAA attended the EWN Workshop. The group of attendees was comprised of individuals representing USACE (Headquarters, Engineer Research and Development Center, North Atlantic Division, and New England, New York, Philadelphia, Baltimore, New Orleans, Galveston, Los Angeles Districts) and NOAA (NMFS's Office of Habitat Conservation, Office of Sustainable Fisheries, and Office of Protected Resources from NOAA Headquarters, Greater Atlantic Regional Fisheries Office and Southeast Regional Office, and NOS's National Centers for Coastal Ocean Science and the Office for Coastal Management). Please see Appendix I for listing of workshop participants and their respective organizations and positions.

2.3 Agenda and Workshop Structure

The workshop was structured with both plenary and breakout group sessions (as indicated in the workshop agenda, Appendix II). This first day of the workshop included an opening plenary session that allowed USACE and NMFS leadership an opportunity to communicate expectations. During the opening session, background EWN information was also provided by USACE that focused on associated challenges, opportunities, and solutions. Additionally, NMFS and USACE provided overviews of their respective mission areas.

Figure 4. Workshop participants in plenary session during Day 1.



Introductory plenary presentations can be found in Appendix III. The afternoon plenary session on the first day included USACE and NMFS presentations focused on EWN projects in various Corps districts across the U.S. Additional presentations in the afternoon integrated EWN themes with the Endangered Species Act, the Magnuson-Stevens Conservation Act, and the Coastal Zone Management Act (please see Appendix IV).

Following the plenary sessions, participants were assigned to one of three predetermined breakout groups (three groups of 10-12 individuals). Please see Appendix V for a listing of individuals who participated in Breakout Groups A, B and C. These breakout groups remained intact for the duration of the workshop. Participants were provided an "EWN Opportunity/ Discovery" workbook for use in the breakout groups. Questions located in the workbook were reviewed and subsequently answered by each of the participants. In turn, individuals shared their responses with their respective breakout groups, which generated considerable discussion among members. Next, each of the three breakout groups identified a spokesperson who presented his/her respective group's thoughts and ideas when all participants reconvened at the end of Day 1 and for the Day 2 breakout sessions.

Figure 5. Dr. Todd Bridges provides overview of EWN during the morning plenary session of Day 1.



Figure 6. Ms. Cathy Tortorici provides participants with overview of NMFS's mission and legislative mandates during morning plenary session of Day 1.



There was a total of three breakout sessions (Sessions 1-3) that corresponded to the worksheets located in the EWN Opportunity/ Discovery workbook. Each breakout session was followed by a plenary session where each of the three breakout groups reported their findings. Appendices VI-VII provide raw data of the results from breakout sessions for Breakout Groups A, B and C, respectively. The following describes each breakout group's approach to stimulating and focusing discussion:

- Breakout Session 1: Each participant was asked to identify up to three potential EWN demo projects and/or current projects to incorporate the EWN key elements. Next, each individual was asked to rate his/her opportunities as high, medium, or low potential; to provide a rationale for giving that priority; and to define the timeframe for the respective opportunity (i.e., immediate: now - 3 years; short-term: 3-5 years; long-term: 5-10 years). Upon completion of these actions, the facilitators asked each individual in the breakout group to read aloud a high priority opportunity, including the rationale for prioritization and the timeframe for implementation.

Figure 7. Group A develops responses to initial questions during Breakout Session 1.



Following that exercise, the group recorded their top five or six opportunities and subsequently selected the two highest priorities. Each of the three breakout groups then worked together to develop opportunity statements for their two highest priorities. Finally, each breakout group nominated a speaker who presented results during the following plenary session. It should be noted that all of the information derived in Breakout Session 1 was collected for inclusion in the workshop proceedings document.

- Breakout Session 2: During Breakout Session 2, groups were asked to refine the opportunity statements for their two highest priority projects and agree on the scope of the opportunity, the desired outcome, and how success will be measured. Participants were asked to consider the current issues/situation concerning the proposed opportunities along with the goals of EWN – enhancing the benefits of a project and producing a win-win-win (i.e., economic, environmental, and social). All three breakout groups advanced quickly through this stage, which allowed for additional time in this session to focus on more specific details. For example, the breakout groups utilized most of the time to establish a working project title and refine the opportunity statement(s) to include key actionable steps that would lead to sequential and tangible outcomes. As the end of this session neared, each breakout group nominated a speaker who presented results during the next plenary session. All of the information derived in Breakout Session 2 was collected for inclusion in the workshop proceedings document.
- Breakout Session 3: During this final session, the breakout groups further refined the key actionable next steps associated with their two priority opportunities and identified points of contact for ensuring next steps were achieved.

Figure 8. Group C refines actionable next steps associated with priority opportunities during Breakout Session 3.



Once the groups decided that the requested information for each priority opportunity was satisfactorily discussed and recorded, they were then asked to brainstorm responses to the following general questions: *How will we monitor success? How will we share data? How will we measure benefits derived from NNBF with respect to coastal storm risk reduction?* Like the previous sessions, each breakout group nominated a speaker that presented results during the following plenary session. All of the information derived in Breakout Session 3 was collected for inclusion in the workshop proceedings document.

3 Key Outcomes

3.1 Breakout Session 1

Breakout Session 1 offered the participants a chance to identify and share ideas specific to 5 EWN new projects or existing projects that would allow for incorporation of EWN key elements. More than 30 total ideas for EWN-based projects emerged from the initial discussions in Breakout Groups A, B, and C. Each of the breakout groups then reported their top 5 projects. Table 1 illustrates the top 5 results from each group. Upon review of these top 15 projects (i.e., 5 per breakout group), several common themes emerged. Enhanced communication between USACE and NOAA was identified as a high priority, which could take the form of shared lessons learned, enhanced distribution of technical knowledge, creation of an EWN catalog of various projects, and/or development of regional guidance documents specific to EWN and NOAA trust resources. Finding ways to expand the beneficial use of dredged material also emerged as a common priority among the groups. For example, using dredged, hard substrate for creation of additional Atlantic sturgeon habitat was identified as a priority. Likewise, placement of dredged material for the purpose of creating more blue crab habitat was also identified as an opportunity for USACE and NOAA-NMFS to work together. There were also several cross linkages that emerged with respect to the priority projects and the need for stronger communication, advancing the practice of beneficial use of dredged material, and the management of NOAA trust resources.

Table 1. Top 5 priority project ideas from each breakout group.

Project #	Priority Project Ideas	Priority Rationale	Breakout Group A	Breakout Group B	Breakout Group C	Comparison
1	Improve Communication Across Agencies	Immediate needs include: share data for restoration; share lessons learned, and distribute technical knowledge. Can enhance communication through "buddy system" between organizations and implementing Digital Coast webinars			X	Similar to Idea #4, #11, #13, and #14
2	Proactive Conservation Planning 7(a)(1) with Team Approach	Examples include: collaboration and communication to create habitat restoration projects with hard substrata (ie, rock) and sediments (soft); Incorporate standard assessment models for living shorelines			X	Similar to Idea #6, #7, #8 and #11
3	Develop Ways to Quantify Risk Reduction, Costs and Benefits of EWN Projects.	Self-Explanatory			X	
4	Interagency Collaboration for Monitoring of EWN Projects	Advance understanding/application of EWN by leveraging technical expertise and sharing in data collection efforts			X	
5	Identify Opportunities to Create "Green" Structures by Collaborating on Initial Construction and Repair Efforts	Identify region specific implementation and identify USACE and NOAA staff willing to participate coupled with funding or funding prospect			X	
6	Reuse of Hard Material to Improve the Critical Habitat of Atlantic Sturgeon	Create artificial reefs for sturgeon spawning habitat. Has been completed in James River; but need to get permits in more desirable areas	X			Similar to Idea #2, #7, #8 and #11
7	Wolf Trap Overboard Placement Site vs. Blue Crab Sanctuary	Placement of dredged material creates more blue crab habitat. However, future recruitment of species could close placement site. Identify opportunities to create blue crab habitat. Choose correct placement sites	X			Similar to Idea #2, #6, #8, and #11
8	Beneficial Use of Dredge Material	Need better uses for the material besides ocean and CDF disposal; Maximize keeping materials in the system.	X			Similar to Idea #2, #6 and #7, #11, and #12
9	Need Reference Sites	Monitoring is required to determine success of EWN projects. It will be helpful to compare to other habitats. Propose creation of a pilot project for these activities.	X			
10	Habitat Mapping	Need better understanding of where critical habitat is located.	X			
11	Enhancing and Conserving NOAA Trust Resources Using EWN Principles for Project Design	Develop a guidance document that identifies opportunities during the planning/design phase to enhance NOAA Trust Resources by incorporating EWN principles for dredging activities and beneficial use of dredged material, shoreline protection and coastal resiliency.		X		Similar to Idea #2, #6, #7, and #8
12	USACE-NOAA Collaboration for a Thin Layer Placement Demonstration Project in New England	Determine potential locations for a thin layer placement demonstration project in New England.		X		Similar to Idea #8
13	Identifying EWN options through a 'catalog' (e.g., island creation)			X		Similar to Idea #1, #4, and #14
14	Regional Guidance Document			X		Similar to Idea #1, #4 and #13
15	Salt Marsh Restoration/Tide Gates (Oak Island),	Opportunity to be proactively involved, City-owned, provides flood benefits, upland to salt marsh (5-20 acres)		X		

3.2 Breakout Sessions 2 and 3

Breakout Sessions 2 and 3 offered each of the three working groups an opportunity to reconvene following presentations and discussions in the plenary sessions that proceeded. In Breakout Session 2, participants reviewed their top 5 priorities and refined the opportunity statements for their 2 highest priority projects then agreed on the scope of the opportunity, the desired outcome, and how success would be measured. During Breakout Session 3, groups further refined the key actionable next steps associated with their two priority opportunities and identified points of contact for ensuring next steps were achieved. The following list provides information specific to the priority opportunities that were recommended by each breakout group during the workshop. Appendix VI, VII, and VIII provide greater detail with respect to the identified action steps by Breakout Groups A, B, and C, respectively, associated with each project.

- Breakout Group A
    - Title: Develop a decision support tool for advance identification of suitable placement of rocky material for Atlantic sturgeon critical habitat

      Opportunity Statement: The project team (NOAA-NMFS, academic researchers, US Navy, states) will work to identify areas within Atlantic sturgeon critical habitat that are suitable for Atlantic sturgeon spawning/rearing habitat restoration or enhancement. These areas will be logged into a database for all elements of the USACE to draw from to identify locations for placement of beneficial hard substrate dredged material. Success will be measured by progress toward Atlantic sturgeon critical habitat restoration goals as outlined in the recovery plan.

    - Title: Identify alternative disposal sites adjacent to the Wolf Trap disposal site to increase blue crab habitat

      Opportunity Statement: The project team (NOAA-NMFS, USACE (Baltimore District-NAB and Norfolk District-NAO), Virginia Institute of Marine Science (VIMS), Virginia Marine Resources Commission (VMRC) will negotiate the identification and authorization of the disposal sites adjacent to the Wolf Trap disposal site for the benefit of blue crab overwintering and foraging habitat. The goal is to provide more habitat to increase the

population of this iconic species. The designation of the site will bring long-term disposal; it will be monitored to see whether it is cost effective. The site will be evaluated and the success transferred to other sites. It will serve as a model for other sites that are reaching capacity and to increase habitat value for NOAA trust resources and endangered species.

- Breakout Group B
    - Project Title: Enhance and conserve NOAA trust resources using EWN principles for project design

      Opportunity Statement: The project team will develop a guidance document that identifies opportunities during the planning/design phase to enhance NOAA trust resources by incorporating EWN principles for dredging activities and beneficial use of dredged material, shoreline protection, and coastal resiliency. The document will identify resources and habitats of concern, options for habitat improvement, and considerations for habitat protection. This will streamline design ideas while reducing time and cost for this process.

    - Project Title: Collaborate (USACE-NOAA) for a thin layer placement demonstration project in New England

      Opportunity Statement: USACE and NOAA will collaborate to determine a prime location for a thin layer placement demonstration in New England. This will ensure agency buy-in, establish local reference sites, and promote EWN principles. Site selection will include an iterative process that factors in geographic scope, sediment management need, restoration need, sponsor, long-term data and/or reference site, assessment of risk, constructability/costs, and ecological benefits Threatened and Endangered Species (T&ES). The ultimate goal of this demonstration project is to provide a framework that establishes a process that will save time and money and improve ecological outcomes.

- Breakout Group C
    - Project Title: Communicate and collaborate across agencies, utilizing a central database about projects

Opportunity Statement: The project team will share information across districts at annual meetings, conference calls, and workshops, based on a central database about upcoming projects; the team will also identify opportunities for beneficial use sites; the team will identify monitoring that has or will occurred and know what environmental opportunities there are on a local level; the team will know whether the opportunities have been screened or not, and what has been tested. The Coastal Management Office can help connect with states and regional forums.

- Project Title: Green existing structures

  Opportunity Statement: The project team will identify, assess, and repair existing hardened structures to make them more in line with EWN

At the end of Breakout Session 3, two of the breakout groups (i.e., Breakout Groups A and C) had sufficient time to complete a final series of general questions, and the detailed responses can be found at the end of the workbooks, which are located in Appendix VI and Appendix VIII. When the two groups were tasked with developing ideas for monitoring EWN success, the answers varied greatly. Example responses from Breakout Group A included the need to establish a suite of monitoring options that benefit both agencies; the need to consider cost savings associated with projects; the need to monitor species success (population numbers, etc.); and the need to compare expected outcomes to the actual results. Breakout Group C offered additional insights concerning monitoring success, including the need to define success from an engineering and ecological perspective, and the time savings associated with the consultation process through adoption of environmental operating principles. Other ideas associated with success centered on the need for agencies to meet much earlier in process to discuss project ideas prior to implementation and the need to incorporate monitoring into work plans.

When asked about approaches for USACE and NOAA to share data in the future, Breakout Group A recommended a Memorandum of Agreement (MOA) between the agencies — or some other type of document — that defined who would have data access, where the data would reside, and how it would be used. Sharing of GIS project mapping (and related information) and enhancing communication among the resource agencies were also identified by Breakout Group A as priorities for enhancing data

sharing. Breakout Group C focused on the need to identify points of contact within both agencies responsible for sharing information within (and outside) their respective agencies and also keep relevant agency staff informed of other data-sharing venues, such as webinars, phone calls, data postings, etc.

Finally, the two groups responded to a question concerning how benefits derived from NNBF should be measured with respect to Coastal Storm Risk Reduction. Breakout Group 1 recommended that the following would likely be good metrics to consider with the adoption/use of NNBF: fewer insurance claims, reductions in lost habitat, diminished infrastructure damage (and reduced costs for repair), and improved ability to recover more rapidly from storm events. Breakout Group 3 had a similar focus, with emphasis on the NNBF's structural integrity being preserved during storm events.

4 Closing Session and Workshop Conclusion

The closing session allowed Dr. Todd Bridges and Ms. Cathy Tortorici an opportunity to provide their perspectives and final thoughts to the workshop participants. Dr. Bridges and Ms. Tortorici expressed great satisfaction with the results. Both felt that the two-day workshop had the right mix of attendees, with many beneficial ideas identified. Dr. Bridges also commented that the workshop prioritized several good ideas that could be accomplished in the short term. For example, plenary discussions and group brainstorming identified the need to incorporate NOAA-NMFS staff into relevant, ongoing USACE project teams exploring EWN alternatives. Establishing collaborative teams for the highest priorities, an effort that could then expedite solution development, was also identified as a proposal that could be implemented quickly. Other collaborative project ideas focused on beneficial use of dredged materials for the purpose of creating habitat and supporting NOAA trust resources; these ideas were also described as ones that should be pursued and developed by USACE and NOAA. Finally, Dr. Bridges and Ms. Tortorici were very supportive of developing USACE/NOAA working groups that would further refine the ideas for improving communication and drafting the EWN guideline documents that were recommended during the workshop.

5 Workshop Products, Recommendations and Next Steps

At the conclusion of the workshop, there were a number of products, recommendations, and next steps for USACE and NOAA to pursue, including:

- Preparing and disseminating a joint, executive summary of the workshop;
- Preparing and jointly publishing a workshop proceedings report by December 2016;
- Incorporating NOAA-NMFS staff into relevant, ongoing USACE project teams; and
- Initiating collaborative teams for the highest priority solution development actions.

Highest priority EWN solution development actions included:

- Developing mechanisms to facilitate communication and information sharing across the two agencies;
- Drafting joint guidance for enhancing and conserving NOAA trust resources using EWN;
- Establishing decision-support capabilities for designated critical habitat development and recovery of Atlantic sturgeon through beneficial use of dredged material;
- Establishing expanded dredged material management site options in Chesapeake Bay that support development of blue crab habitat;
- Developing habitat enhancement opportunities, methods, and demonstrations for hard structures; and
- Demonstrating thin-layer placement of dredged material in New England.

References

Bridges, T. S., C. J. Banks, and J. K. King. 2016. *Proceedings of the U.S. Army Corps of Engineers (USACE) and the National Oceanic and Atmospheric Administration (NOAA) Natural and Nature-Based Features Workshop (NNBF)*. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Bridges, T. S., C. J. Banks, and M. A. Chasten. 2016. *Engineering with Nature*. Advancing System Resilience and Sustainable Development. *The Military Engineer* (January/February 2016) 699: 52-54

Bridges, T. S., P. W. Wagner, , K. A. Burks-Copes, , M. E. Bates, , Z. Collier, C. J. Fischenich, J. Z. Gailani, L. D. Leuck, C. D. Piercy, J. D. Rosati, E. J. Russo, D. J. Shafer, B. C. Suedel, , E. A. Vuxton, and T. V. Wamsley. 2015. *Use of Natural and Nature-Based Features (NNBF) for coastal resilience*. ERDC SR-15-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Bridges, T. S., J. Lillycrop, J. R. Wilson, T. J. Fredette, B. Suedel, C. J. Banks, and E. J. Russo. "Engineering With Nature" Promotes Triple Win Outcomes. *Tera et Aqua* (June 2014) 135:17-23.

National Oceanic and Atmospheric Administration (NOAA). 2015. *Guidance for considering the use of living shorelines*. Living Shorelines Workgroup.

National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS). October 2016. NOS Roadmap. *http://oceanservice.noaa.gov/about/NOSRoadmap.pdf*

National Science and Technology Council. 2015. *Ecosystem-service assessment: research needs for coastal green infrastructure*. Committee on Environment, Natural Resources and Sustainability.

Sutton-Grier, A. E., K. Wowk, and H. Bamford. 2015. Future of our coasts: The potential for natural and hybrid infrastructure to enhance the resilience of our coastal communities, economies and ecosystems. *Environmental Science and Policy* 51:113-148.

Appendix I: Participants List

USACE and NOAA National Marine Fisheries Service Workshop: Engineering With Nature					
05-06 October 2016 Gloucester, Massachusetts Total Registered: 40					
Last Name	**First Name**	**Agency/Organization**	**Expertise**	**Contact Number**	**Email**
Banks	Cynthia	USACE-ERDC	Research Biologist	601-634-3820	Cynthia.J.Banks@usace.army.mil
Boelke	Chris	NOAA-NMFS, GARFO HCD	HCD Field Offices Supervisor	978-281-9131	christopher.boelke@noaa.gov
Bridges	Todd	USACE-ERDC	Senior Research Scientist	601-634-3626	todd.s.bridges@usace.army.mil
Burns	Peter	NOAA-NMFS, GARFO SFD	Fisheries	978-281-9144	peter.burns@noaa.gov
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Corbino	Jeff	USACE-MVN	Operations	504-862-1958	Jeffrey.M.Corbino@usace.army.mil
Cresitello	Donald	USACE-NAD	Planning CX-Engineering	347-370-4591	Donald.E.Cresitello@usace.army.mil
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Harmon	Michelle	NOAA-NOS	NCCOS portfolio manager, program planning	240-533-0158	michelle.harmon@noaa.gov
Harris	Janine	NOAA-NMFS-GARFO-HCD	Marine Habitat Resource Specialist		janine.harris@noaa.gov
Hayduk	Mike	USACE-NAP	Biologist	215-656-5822	Michael.H.Hayduk@usace.army.mil
Hutchins	Eric	NOAA-NMFS, GARFO Habitat Restoration	Habitat Restoration Biologist		

Johnson	Mike	NOAA-NMFS-GARFO-HCD	Biologist		mike.r.johnson@noaa.gov
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King	Jeff	USACE-ERDC	Research Civil Engineer	202-761-0752	jeff.k.king@usace.army.mil
Marrone	Dan	NOAA-NMFS, GARFO PRD	ESA Section 7 Biologist	978-282-8465	daniel.marrone@noaa.gov
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Nicholson	Betsy	NOAA-NOS	North Regional Director, Office for Coastal Management	617-869-9148	betsy.nicholson@noaa.gov
Nieves	George	USACE-NAD	Chief, Operations & Regulatory Division	347-370-4556	George.Nieves@usace.army.mil
O'Brien	David	NOAA-NMFS-GARFO-HCD	Biologist		david.l.o'brien@noaa.gov
Pasquale	Jerry	USACE-NAP	Chief, Environmental Resources Branch	215-656-6560	Jerry.J.Pasquale@usace.army.mil
Randall	Todd	USACE-NAE	Eng/Planning - Evaluation - Environmental Resources	978-318-8518	Todd.A.Randall@usace.army.mil
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Swannack	Todd	USACE-ERDC	Research Biologist	601-415-3509	todd.m.swannack@usace.army.mil
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Tucker	Michael	Southeast Regional Office			michael.tucker@noaa.gov
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Verkade	Alison	NOAA-NMFS	Habitat Conservation Division	978-281-9266	alison.verkade@noaa.gov
Weichenberg	Rena	USACE-NAD	Planning-Environmental	347-370-4568	Rena.Weichenberg@usace.army.mil
Weppler	Peter	USACE-NAN	Biologist	917-790-8634	Peter.M.Weppler@usace.army.mil
Wilson	Joe	USACE Headquarters	Senior Environmental Advisor	202-761-7697	Joseph.R.Wilson@usace.army.mil

Appendix II: Workshop Agenda

FINAL AGENDA

USACE-NMFS Engineering With Nature
Collaboration Meeting

Wednesday, October 5, 2016 (9:00 a.m. – 5:00 p.m.)
Dinner – 6:00 p.m. (Latitude 43°; 25 Rogers Street)
Thursday, October 6, 2016 (9:00 a.m. – 5:00 p.m.)

55 Great Republic Drive, Gloucester, MA 01930
Greater Atlantic Regional Fisheries Office

Hearing Rooms A+B

Participants: Participants will include a cross section of people from the USACE and NMFS, including those responsible for project management, operations, engineering, planning, regulatory, environmental, ESA and EFH consultation, etc.

Meeting Purpose: The purpose of the meeting is to identify opportunities to use the principles and practices of EWN to further the missions and projects undertaken by USACE and NOAA-NMFS. Information regarding the scope of responsibilities, challenges and opportunities will be shared between the two organizations. Opportunities to collaborate in developing EWN-based solutions will be identified.

The opportunities identified will span the full spectrum of USACE's missions and projects (i.e. Civil Works -- Navigation, Flood Risk Management and Environment) and NMFS regulatory programs under EFH and ESA section 7.

Objectives:

The objectives for the collaborative meeting are to:

1. Provide an overview of EWN, review progress to date and the path forward;
2. Discuss USACE and NMFS opportunities and challenges with respect to applying EWN;
3. Using tools developed to guide EWN project teams, identify specific EWN-based opportunities;
4. Prepare detailed *Opportunity Statements* for the highest value solutions;

Wednesday, October 5, 2016

9:00 Registration

Welcome and Introductions

9:30 Welcome, Dan Morris and Kim Damon-Randall

9:40 Introductions, Cathy Tortorici and Todd Bridges

9:55 Structure of the Meeting, Cynthia Banks

The EWN Opportunity

10:00 Implementing EWN: Challenges, Opportunities and Solutions, Todd Bridges

10:30 Overview of NMFS Mission Areas, Issues, Challenges, and Opportunities, Cathy Tortorici

10:50 Overview of USACE Mission Areas, Issues, Challenges, and Opportunities, Joe Wilson

11:10 Break

Case Examples of Practice

11:25 USACE Progress on ESA 7(a)(1), Todd Swannack

11:45 Case Examples in Coastal NJ, Monica Chasten

11:55 Case Examples in Coastal Baltimore District, Danielle Szimanski

12:05 Lunch (Brought in from Willow Rest)

12:50 Case Examples on the SE Atlantic, Mark Messersmith

1:00 Case Examples on the Gulf Coast, Jeff Corbino and Andrea Catanzaro

1:10 Case Examples in California, Larry Smith

1:20 NOAA-NMFS Case Examples #1, Dan Marrone, Chris Vaccaro, and Zach Jylkka

1:50 NOAA-NMFS Case Examples #2, Karen Greene

2:00 NOAA-NOS Coastal Zone Management Act, Betsy Nicholson

2:20 Discussion of breakout group structure and process

2:30 Break and transition to breakout groups

Breakout Session

2:45 Identify opportunities, potential EWN demo projects and/or current projects that could/do incorporate EWN principles; prioritize. Develop an *Opportunity Statement* for the top priority opportunity.

Plenary Session

4:15 Each group presents its list of the top 5 – 6 priorities identified and their Opportunity Statement for their top priority.

5:00 Wrap and overview of Day 2

5:10 Adjourn Day 1

6:00 Optional Dinner
Latitude 43° Restaurant and Bar
25 Rogers Street, Gloucester, MA
http://www.latfortythree.com/

Thursday, October 6, 2016

9:00 Address comments/questions from Day 1, review agenda and desired outcomes for Day 2, discuss breakout group assignment

Breakout Session

9:00 Use worksheets provided to develop their top priority EWN opportunity

Plenary Session

11:00 Each breakout group presents their top priorities, 15 minutes each

12:00 Lunch (Brought in from Willow Rest)

Breakout Session

12:45 Use worksheets provided to further develop top priorities

2:45 Break

Plenary Session

3:00 Breakout teams present their priority opportunities

Wrap-up

4:00 Next steps discussion

4:30 Closing thoughts, Cathy Tortorici and Todd Bridges

5:00 Adjourn Day 2

Pre-Meeting Assignment:

1. Review the 'Introduction to EWN' (shown below).
2. Bring at least one idea to the meeting to collect, review, and distill into a general set for group discussion on where/why/when/how we might be able to act on EWN opportunities.

Introduction to EWN:

Pursuing the objective of sustainable development of water resources infrastructure poses both challenges and opportunities. Advancing our practices involves identifying the practical actions that can be taken to better align and integrate engineering and natural systems to produce more socially acceptable, economically viable and environmentally sustainable projects.

The USACE Engineering With Nature (EWN) Program supports more sustainable practices, projects, and outcomes by working to *intentionally align natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes* (www.engineeringwithnature.org). EWN's focus on developing practical methods provides an achievable path toward an ecosystem approach to infrastructure development and operations. Consequently, EWN principles and practices can and are being applied across multiple USACE missions and business lines.

There are four elements critical to the success of EWN projects:

1) Advancing sound science and engineering to improve operational efficiency;
2) Using natural systems and processes to maximize the benefits;
3) Broadening the benefits of the project – economic, environmental and social; and
4) Using collaborative processes to engage stakeholders throughout the project.

There is a long history of implementing some of the elements of EWN in the US and elsewhere. Today, the EWN program is focusing attention on these successes and enabling expansion of this approach to challenges and opportunities across the US. We are working to develop opportunities to draw together leading practices across organizations while expanding and leveraging those practices to seek a broader range of opportunities to apply EWN. With the support our USACE Leadership Team, collaborating USACE research programs, and partnering organizations like NOAA we are advancing the use of EWN to solve problems and create value.

Our strategy for the first five years was to expand the application of EWN principles and practices across USACE business lines and mission areas by first engaging internal leaders and early adopters and then reaching out to our external partners and stakeholders and effectively collaborating with them to establish and achieve common goals. We drew on leading practices in science-based strategic risk communication[1] along with other leading social science practices to do so.

Building on the success of the first five years, our Vision for EWN over the next five years is:

- To systematically integrate EWN principles and practices into USACE culture by continuing to expand its application across our mission areas, while actively demonstrating and communicating its value.
- To broaden and deepen engagement, participation and collaboration with colleagues across USACE mission areas and divisions, and with key agency partners and stakeholders.
- To formally engage with other organizations on EWN-focused R&D, training and education.

[1] Strategic Risk Communication is a purposeful process of skillful interaction with stakeholders supported by

appropriate information. It is an essential component of integrated risk management. Strategic Risk Communications helps decision- makers and stakeholders make well-informed decisions and take appropriate actions.

Appendix III: Day 1 – Morning Plenary Slides

Engineering With Nature

Dr. Todd S. Bridges
Senior Research Scientist, Environmental Science
U.S. Army Engineer Research and Development Center,
U.S. Army Corps of Engineers
todd.s.bridges@usace.army.mil

Gloucester, MA
October 5, 2016

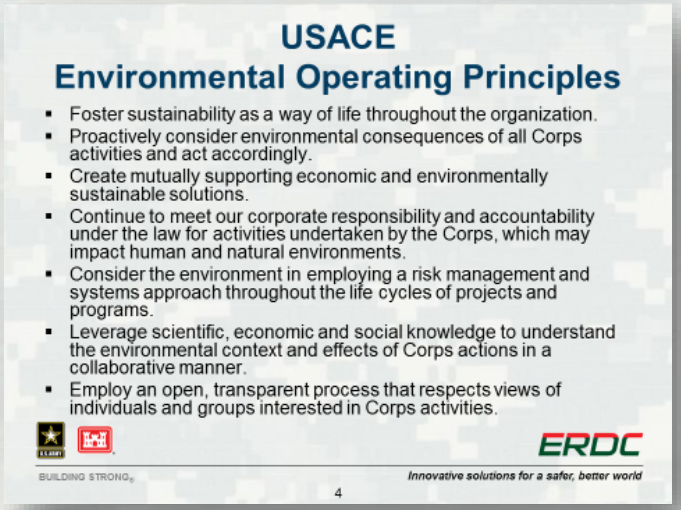


U.S.ARMY

US Army Corps of Engineers®

ERDC
Engineer Research and Development Center

Advancing Technical Practice



Outcomes:

- Cost-effective engineering and operational practices
- Efficient resolution of environmental issues
  - Sustainable delivery of project benefits: Triple-win outcomes integrating social, environmental and economic objectives

Vision: "Contribute to the strength of the Nation through innovative and environmentally sustainable solutions to the Nation's water resources challenges."

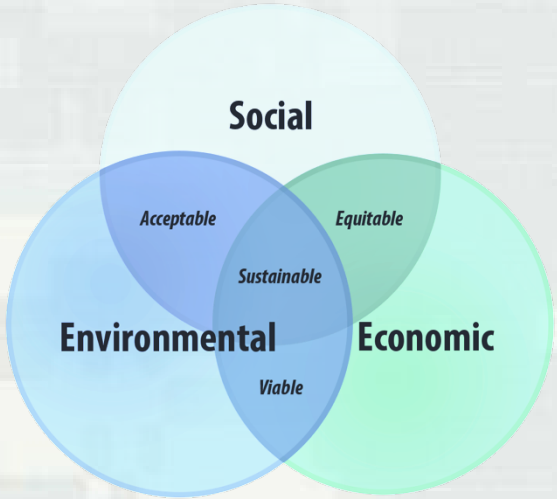


Engineering With Nature…

…the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

Key Elements:

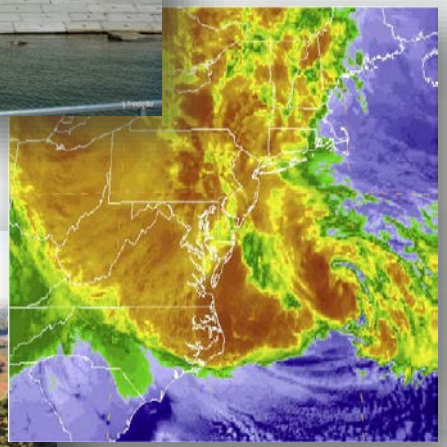
- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



EWN Across USACE Mission Space

- Navigation
  - Strategic placement of dredged material supporting habitat development
  - Habitat integrated into structures
  - Enhanced Natural Recovery
- Flood Risk Management
  - Natural and Nature-Based Features to support coastal resilience
  - Levee setbacks
- Ecosystem Restoration
  - Ecosystem services supporting engineering function
  - “Natural” development of designed features
- Water Operations
  - Shoreline stabilization using native plants
  - Environmental flows and connectivity





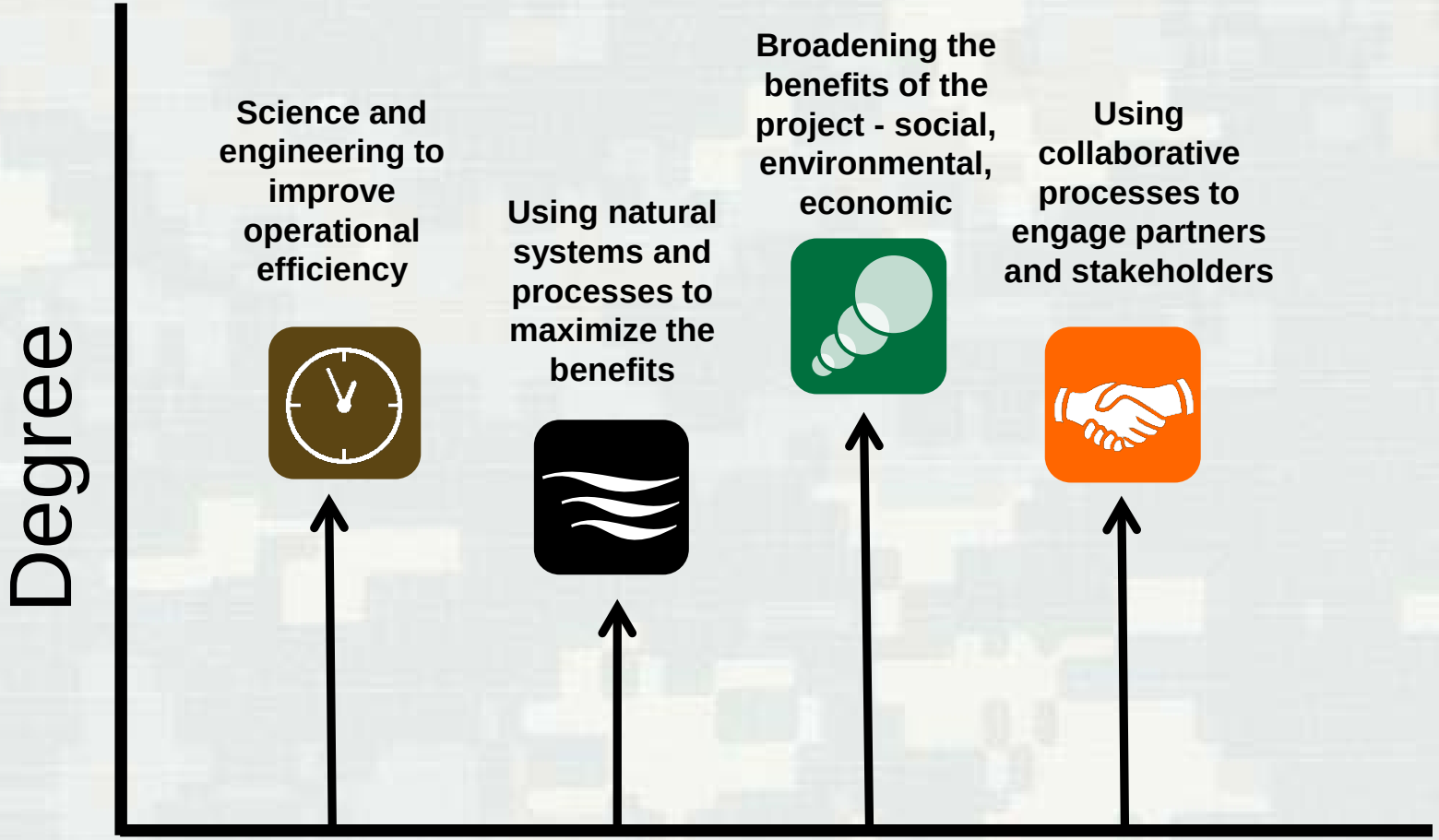




ERDC

Engineering With Nature

Elements



EWN Status

- *Engineering With Nature* initiative started within USACE Civil Works program in 2010. Over that period we have:
  - Engaged across USACE Districts (23), Divisions, HQ; other agencies, NGOs, academia, private sector, international collaborators
    - Workshops (>20), dialogue sessions, project development teams, etc.
  - Implementing strategic plan
  - Focused research projects on EWN
  - Field demonstration projects
  - Communication plan
  - District EWN Proving Grounds established
  - Awards
    - 2013 Chief of Engineers Environmental Award in Natural Resources Conservation
    - 2014 USACE National Award-Green Innovation



www.engineeringwithnature.org

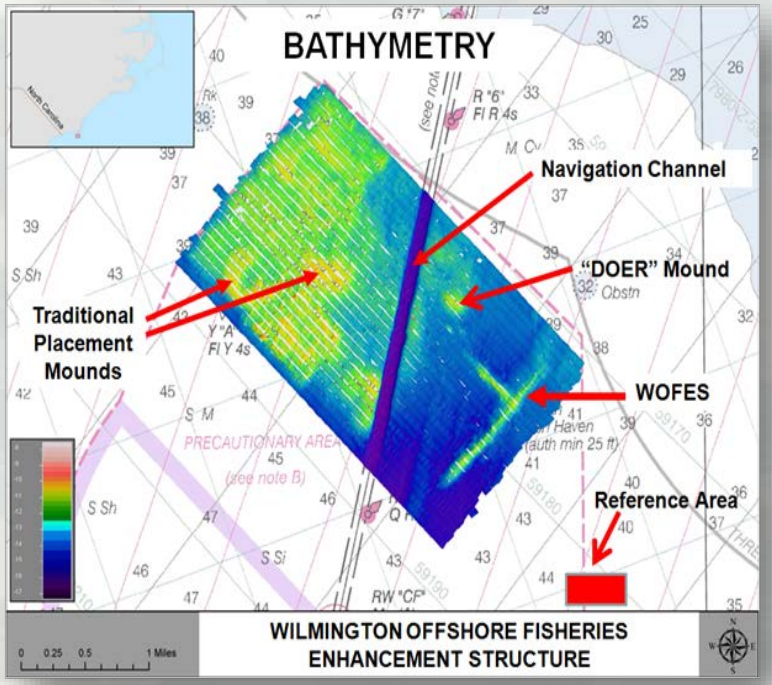
USACE Galveston, Buffalo, Philadelphia Districts: EWN "Proving Grounds"

- EWN Proving Ground Kick-Off Workshops
  - October (SWG) and December (LRB) 2014; June 2016 (NAP)
  - District, Division, EWN Leadership Team
- Identify opportunities to implement EWN across current and future programs and projects
- Emphasis on solution co-development



WOFES, Wilmington, NC

- Created in 1994-1997 from 764,600 cubic meters of limestone dredged as part of the Wilmington channel deepening
- Located three nautical miles off of the mouth of the Cape Fear River in North Carolina
- The location and design of the reef involved extensive participation by stakeholders, and the North Carolina Department of Environment and Natural Resources supported the project as a local sponsor.
- Produced significant social benefits as a popular destination for fishing



Integrated Habitats for Breakwaters

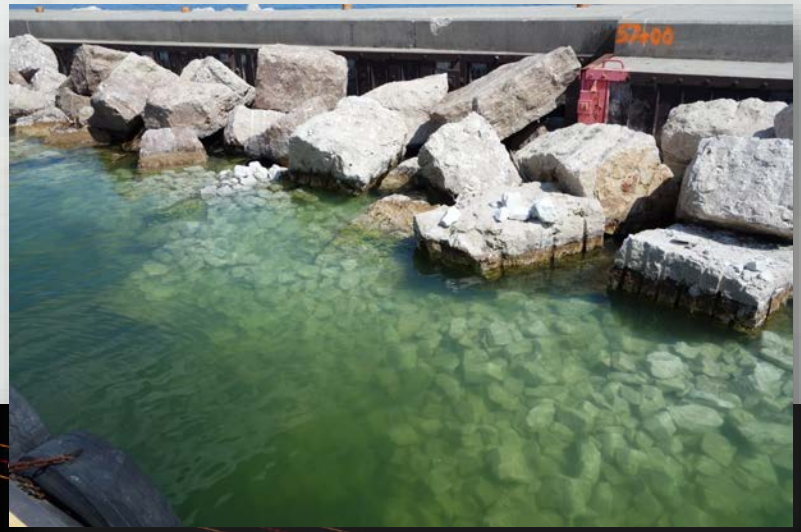
Ashtabula Harbor

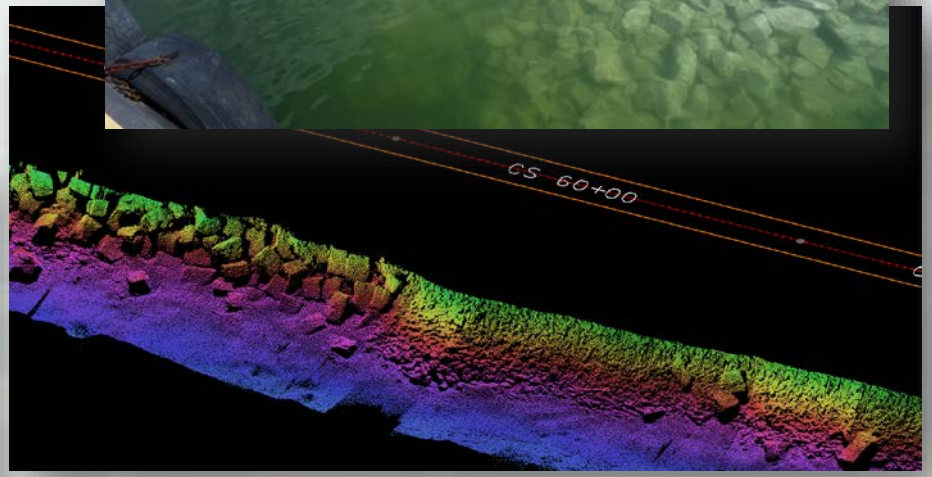






Milwaukee Harbor

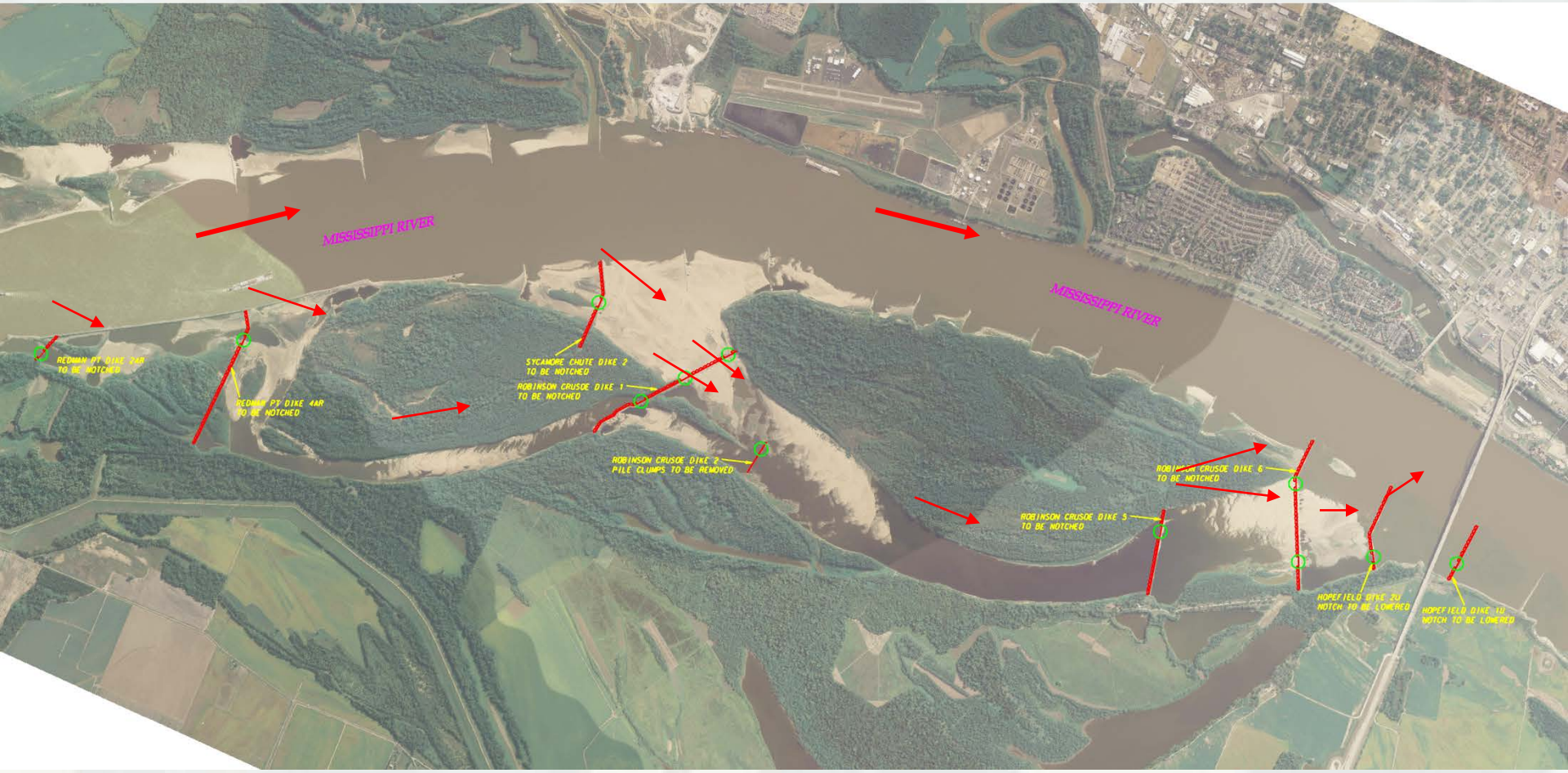




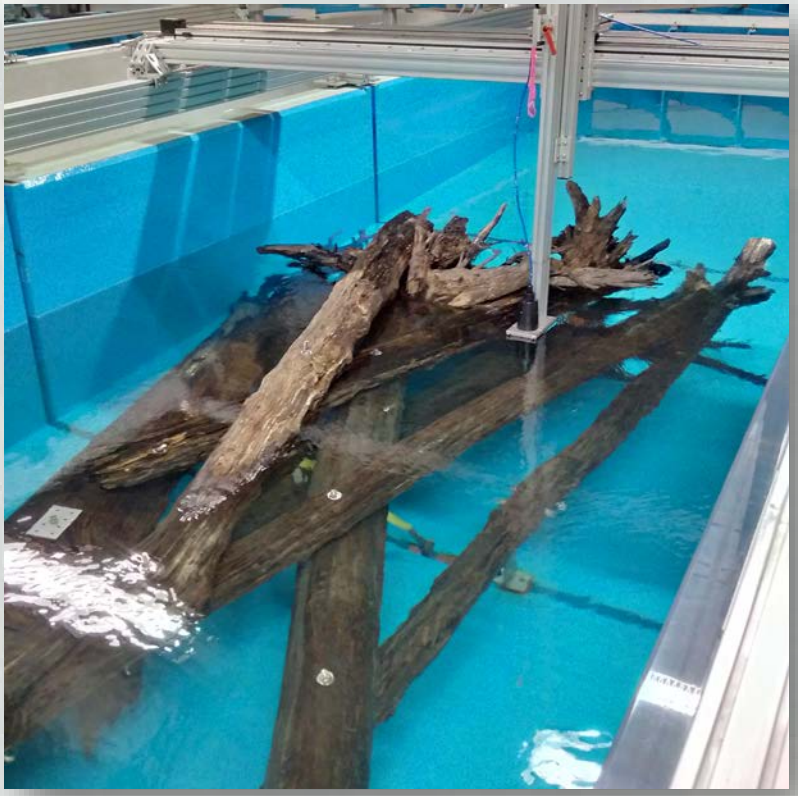
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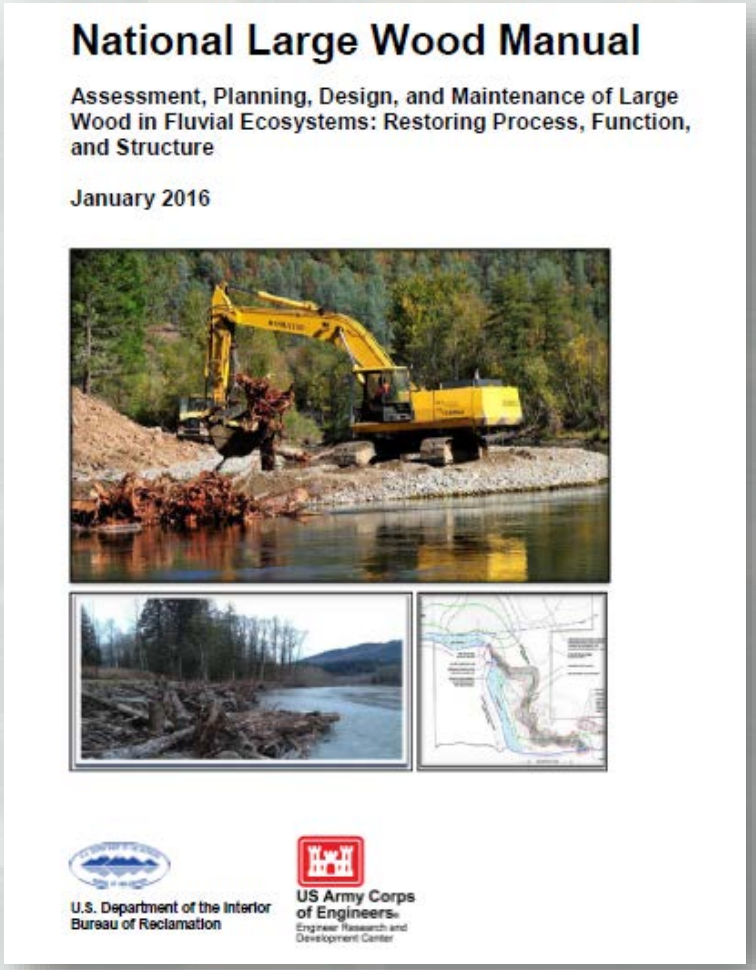
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Loosahatchie Bar



Natural Materials





www.engineeringwithnature.org (Resources, Publications)

Horseshoe Island EWN Project Atchafalaya River

- Options for managing DM via shore-based wetland creation were exhausted
- Strategic placement of sediment (0.5-1.8 mcy/1-3 yrs) was used to create a ~35 ha island
- Producing significant environmental and engineering benefits
- Project won WEDA's 2015 Award for Environmental Excellence









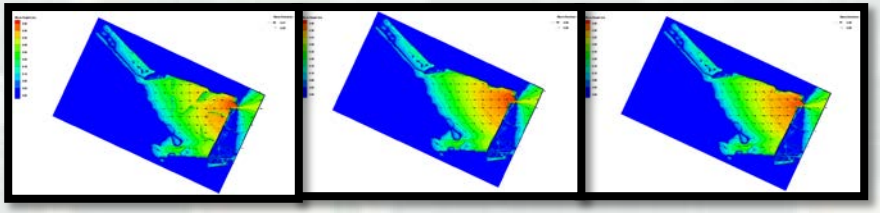
Hamilton and Sears Point Wetland Development, San Pablo Bay

- Accelerate wetland development using berms to support sedimentation during tidal inundation
- Remotely monitoring physical processes: wind, waves, currents suspended sediments, settling velocities, etc.
- Modeling wave generation and dissipation, testing different shapes/configurations of berms









Linear Berms (As-Built) | No Berms (Control) | Mounds (ala Sears Pt.)

Duluth Harbor TLP







Coastal NJ, Philadelphia District



December 2014



Stone Harbor

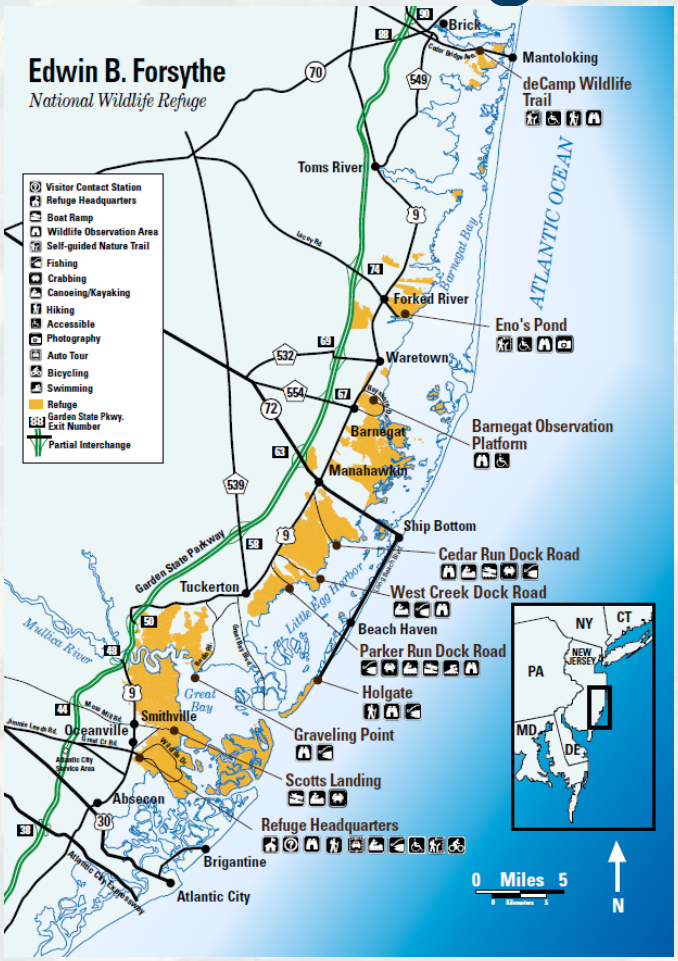




Avalon

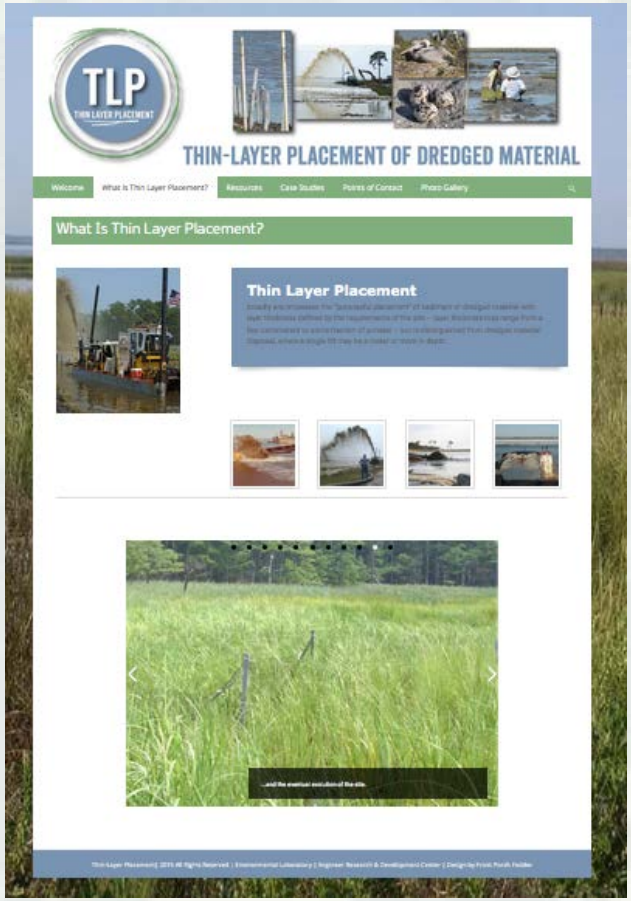
US Fish and Wildlife Service
Forsythe National Wildlife Refuge

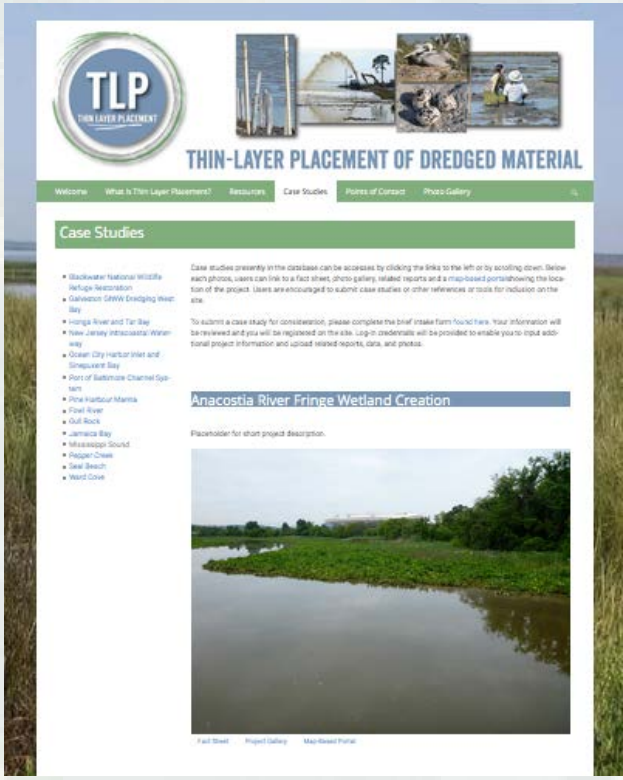
- Forsythe NWR: >40,000 acres of wetlands and other habitat in coastal NJ
- Collaboration objective: Enhance ecosystem resilience through engineering and restoration
- Means: Smart use of sediment resources and EWN principles and practices



Thin-Layer Placement Website







www.engineeringwithnature.org (under Tools)

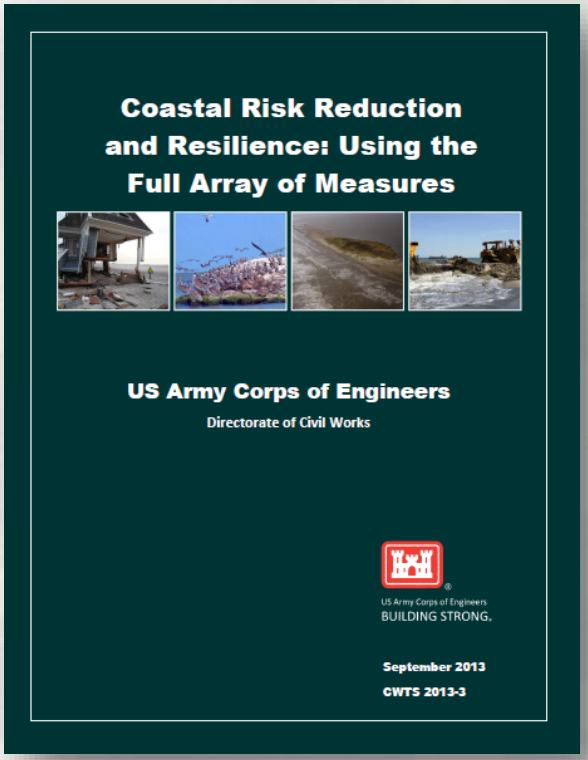
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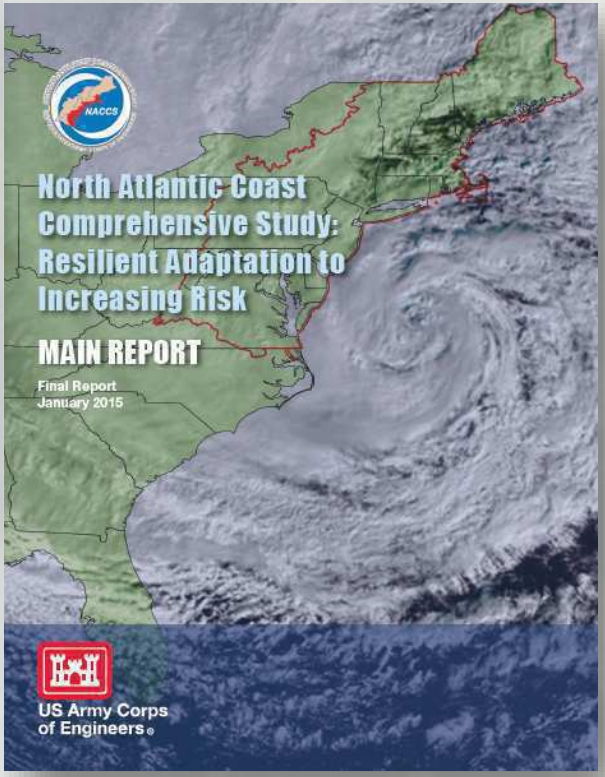
ERDC

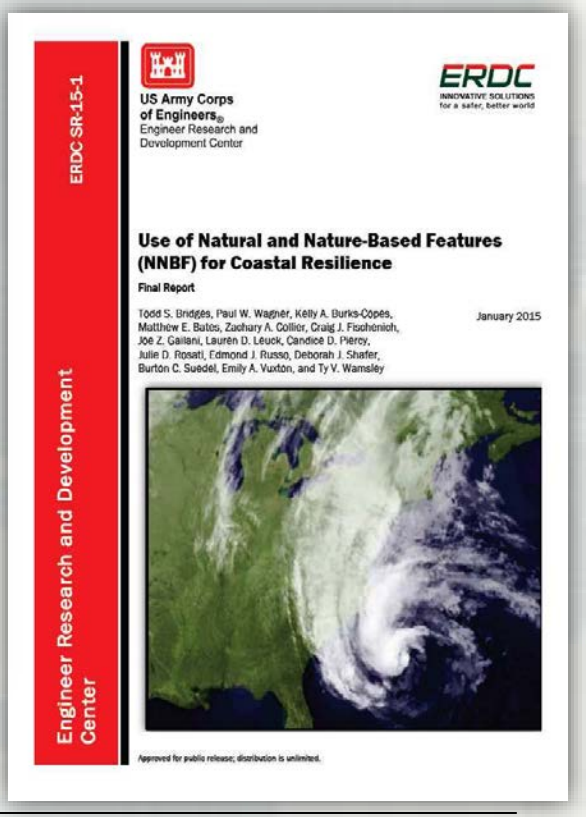
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The North Atlantic Coast Comprehensive Study







U.S.ARMY

http://www.nad.usace.army.mil/CompStudy

Engineering Performance: Nature-Based Features Work in Different Ways

Natural and Nature-Based Infrastructure at a Glance

GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:
STORM INTENSITY, TRACK, AND FORWARD SPEED, AND SURROUNDING LOCAL BATHYMETRY AND TOPOGRAPHY



Dunes and Beaches

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Performance Factors

Berm height and width

Beach Slope

Sediment grain size and supply

Dune height, crest, width

Presence of vegetation



Vegetated Features: Salt Marshes, Wetlands, Submerged Aquatic Vegetation (SAV)

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Increase infiltration

Performance Factors

Marsh, wetland, or SAV elevation and continuity

Vegetation type and density



Oyster and Coral Reefs

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Performance Factors

Reef width, elevation and roughness



Barrier Islands

Benefits/Processes

Wave attenuation and/or dissipation

Sediment stabilization

Performance Factors

Island elevation, length, and width

Land cover

Breach susceptibility

Proximity to mainland shore



Maritime Forests/Shrub Communities

Benefits/Processes

Wave attenuation and/or dissipation

Shoreline erosion stabilization

Soil retention

Performance Factors

Vegetation height and density

Forest dimension

Sediment composition

Platform elevation

Natural and Nature-Based Features Evaluation and Implementation Framework

ORGANIZATIONAL ALIGNMENT

EVALUATION

IMPLEMENTATION

Iterate as Needed

Identify and Organize Stakeholders, Partners and Authorities

Define Physical and Geomorphic Setting

Assess Vulnerability and Resilience

Identify NNBF Opportunities
- Formalize NNBF Objectives
- Identify NNBF Alternatives
- Define NNBF Performance Metrics

Evaluate NNBF Alternatives
- Tier 1
- Tier 2
- Tier 3

Advance through Tiers as Appropriate

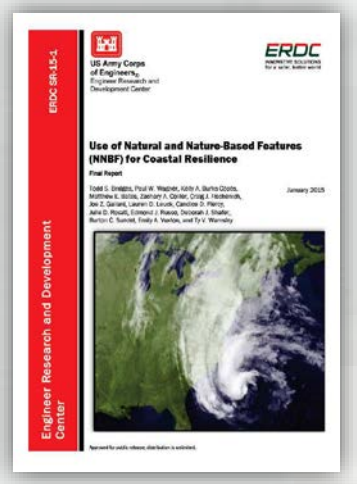
Select NNBF Alternatives

Design Implementation Plan: Elaborate Operational and Engineering Practices

Implement NNBF Alternative

Monitor for Performance and Assess Ecosystem Goods and Services

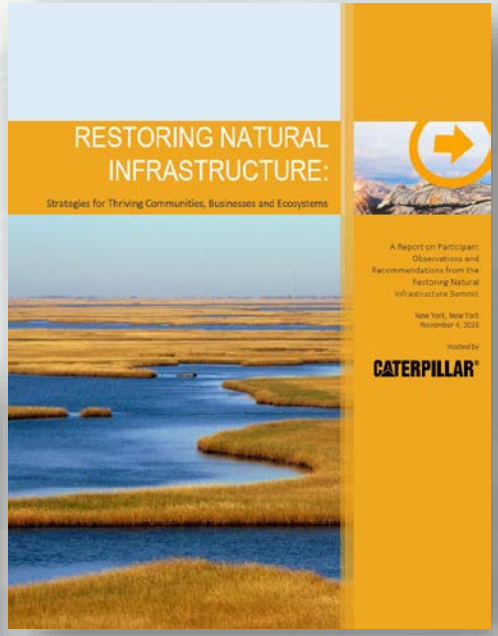
Feedback



Caterpillar Corporation's *Restoring Natural Infrastructure Summit* 4 November 2015, New York City







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BUILDING STRONG®

Innovative solutions for a safer, better world

http://www.caterpillar.com/en/company/sustainability/natural-infrastructure.html

NY DEC and Sea Grant

Exploring Nature-Based Shoreline Erosion Management Practices Along NY's Great Lakes and Connecting Channels

5 November 2015, Rochester, NY

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Sea Grant New York

Sea Grant University of Wisconsin

A Workshop for Practitioners:
Exploring Nature-Based Shoreline Erosion Management Practices Along NY's Great Lakes and Connecting Channels

November 5, 2015 -- 8:30am to 5:00pm
International Arrivals Hall
Rochester International Airport
1200 Brooks Ave, Rochester, NY 14624

Goal

To gain an understanding of the various types of nature-based shoreline (NBS)* protection techniques and approaches that may be applicable to NY's Great Lakes shorelines, to manage erosion and stabilize shorelines while maintaining coastal processes and preserving or enhancing nearshore habitat. A secondary goal is to establish a dialogue and coordinated strategy among regional experts and practitioners to promote the implementation of nature-based shoreline management practices for erosion management along NY's Great Lakes shorelines.

Workshop Objectives

- Learn how nature-based shoreline methods are being used and how they may apply to NY's Great Lakes shorelines;
- Assess opportunities and constraints for implementing nature-based shoreline projects;
- Identify data, research, outreach, and resource needs to advance nature-based shorelines in NYS's Great Lakes;
- Identify demonstration project opportunities by region/reach;
- Identify next steps to work towards a coordinated management approach.

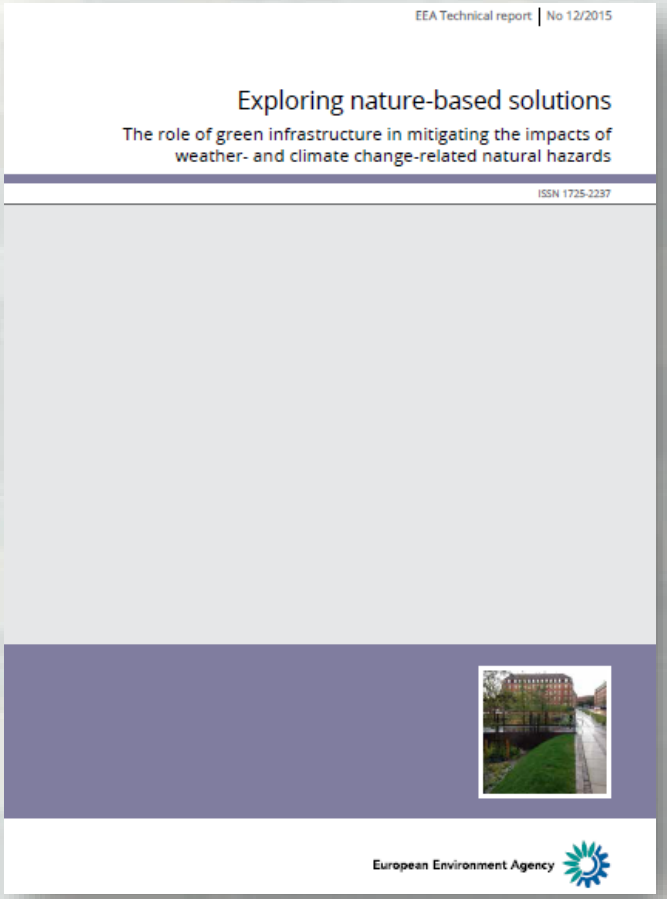


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Exploring nature-based solutions: the role of green infrastructure in mitigating the impacts of weather- and climate change-related natural hazards

- "…instead of automatically defaulting to grey solutions like dikes and pipes for flooding, we first should look at restoring floodplains or wetlands. Rather than building sea walls, we need to think about conserving sand banks...Planners should compare green to grey and identify new opportunities for investing in nature, including a combination of green and grey approaches when nature-based solutions alone are insufficient. As planners explore how to accommodate infrastructure demands in the future, the lesson is clear: think about green before investing in grey."

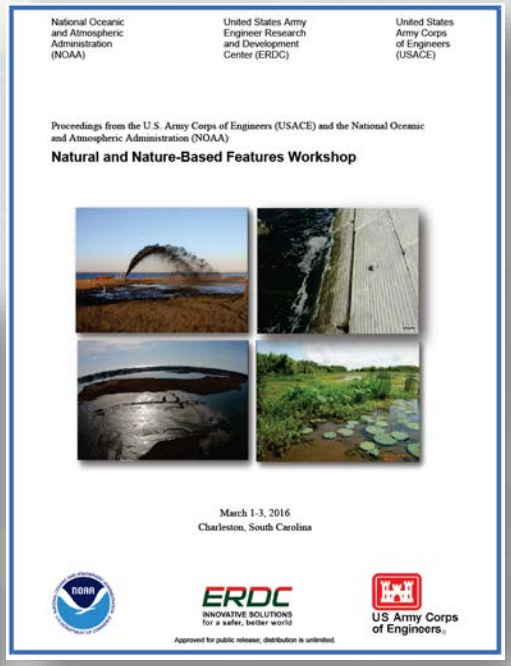


EEA Technical Report No 12/2015

USACE – NOAA Collaboration Workshop on Natural and Nature-Based Features Charleston, SC; 1-3 March 2016







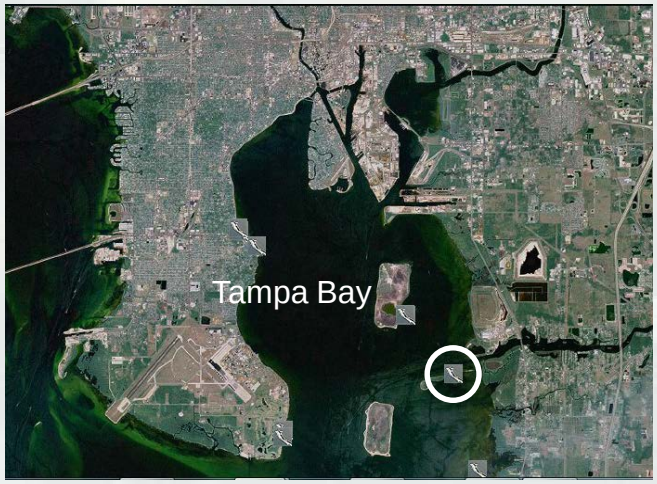
www.engineeringwithnature.org (NNBF)

Fort Pierce City Marina



Alafia Banks Bird Sanctuary, FL

- 8000 lb reef module breakwaters (930 ft)
- Shore protection for Audubon bird sanctuary islands
- Help restore oyster populations
- Provide habitat





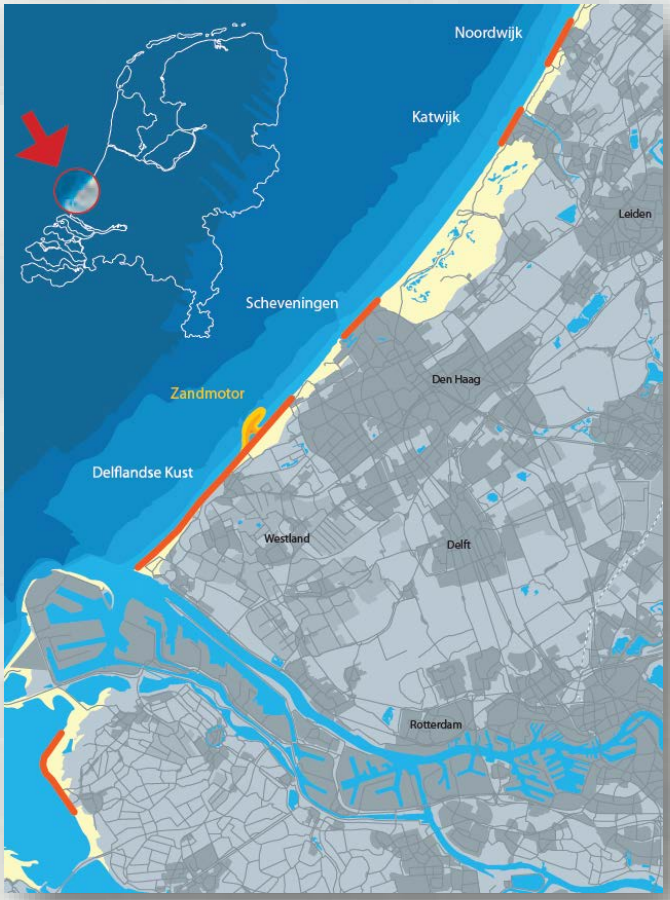


www.reefball.org

Cat Island
Green Bay, Wisconsin



Dutch Sand Motor



- 2011 construction
- 21.5 mcm of sand





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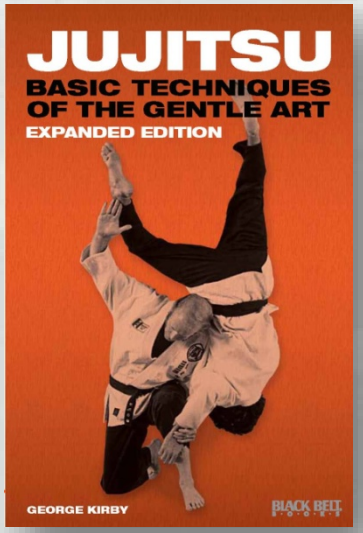
Onehunga Bay Foreshore Restoration
Auckland, New Zealand





Opportunities to *Engineer With Nature*

- **Key Factors, the 4 Ps**
  - ► Processes
    - Physics, geology, biology…
    - Foundation of “coastal engineering Jujitsu”
  - ► Programmatic context
    - Planning, engineering, constructing, operating, or regulating
  - ► Project scale
    - Individual property owner to an entire coastal system
  - ► Performance
    - Configuring the system
    - Quantifying the benefits





ERDC

Questions and Opportunities

- How can/should NMFS and USACE be partnering/cooperating to advance EWN solutions?
- What new/added benefits can we produce?
- What are the challenges? How can these challenges be overcome?
- How can EWN approaches/projects be pursued to create more efficient processes and outcomes?
- What are the opportunities for us to produce some early successes?



Engineering With Nature

Overview of NMFS Mission Areas, Issues, Challenges, and Opportunities



Cathy Tortorici
National Marine Fisheries Service
Cathy.tortorici@noaa.gov
301.427.8495

October 5, 2016
Gloucester, MA

Organizational Perspective

National Marine Fisheries Service Mission



- Provides science-based conservation and management for sustainable aquaculture, marine mammals, endangered species, and their habitats.

- Core Mandate – Recover and conserve protected resources through the use of sound natural and social sciences and compliance with regulations.
  - **Endangered Species Act** - The ESA provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of ecosystems on which they depend.

  - **Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)** - The MSA is the primary law governing marine fisheries management in U.S. federal waters.
    - Essential Fish Habitat describes all waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity. NMFS works with regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. Essential fish habitat has been described for approximately 1,000 managed species to date.

Organizational Perspective

National Marine Fisheries Service Strategic Plan



- Vision and Healthy Ocean Goal
  - Vision – Healthy ecosystems, communities, and economies that are resilient in the face of change
  - Goal – Marine fisheries, habitats, and biodiversity sustained within healthy and productive ecosystems

Organizational Perspective

National Marine Fisheries Service Strategic Plan



- NMFS Core Mandate – Recover and conserve protected resources through the use of sound natural and social sciences and compliance with regulations.

- Office of Protected Resources plan goals related to EWN:
  1. Stabilize the most critically endangered species and improve populations of those species nearing recovery – **Species in the Spotlight Initiative**
  2. Develop guidelines and tools to make protected species management decisions "Climate Smart"
  3. Maximize our effectiveness in implementing the ESA and MMPA
  4. Cultivate collaborators to recover and conserve protected species

Organizational Perspective

Habitat Enterprise Strategic Plan



- Vision - Ensure healthy ecosystems, sustainable living marine resources, and resilient coastal communities thrive through innovative solutions, management flexibility, adaptability, and science excellence. Its mission is to protect and restore habitat to sustain fisheries, recover protected species, and maintain resilient coastal ecosystems and communities.

- Habitat Enterprise Strategic Plan goals related to EWN:
  1. Conserve habitat for managed fisheries and protected resources.
  3. Increase resilience of coastal ecosystems, communities, and economies through habitat conservation.

- Habitat Blueprint - NOAA developed the Habitat Blueprint principles to increase the effectiveness of habitat conservation across the country.

Organizational Perspective

National Ocean Service Mission



- Leader in observing, measuring, assessing, protecting, and managing coastal, ocean, and Great Lakes areas. NOS provides science-based services to inform decision making, thereby positioning America's communities, economies, and ecosystems for the future.

- Three National Programs – the National Estuarine Research Reserve System, the Coastal and Estuarine Land Conservation Program, and the National Coastal Zone Management Program

  - Coastal Zone Management Act - Provides for the management of the nation's coastal resources, including the Great Lakes. Goal of the CZMA - Preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone.

Organizational Perspective

National Ocean Service Priorities



- **Coastal Resilience** – Identifying threats and vulnerabilities, planning, response actions, and recovery activities. Provide a range of authorities and capabilities in coastal and ocean science, navigation, observation, positioning, resource management, habitat conservation, decision support, technical assistance, and training to able communities to advance their resilience goals.

- **Coastal Intelligence** – Improve the public and private decision makers ability to make informed choices by providing observations (physical, chemical, biological), measurements, models, monitoring, assessment, analysis, and the forecasts, tools, products, and services that derive from that foundational geospatial data.

- **Place-based Conservation-** Conserve marine areas — and preserve the economic benefits of these special places to local communities — through coastal management and place-based conservation programs. These include Coastal Zone Management, the Coastal and Estuarine Land Conservation Program, the National Estuarine Research Reserve System, National Marine Sanctuaries, and the Coral Reef Conservation Program.

Issues/Challenges

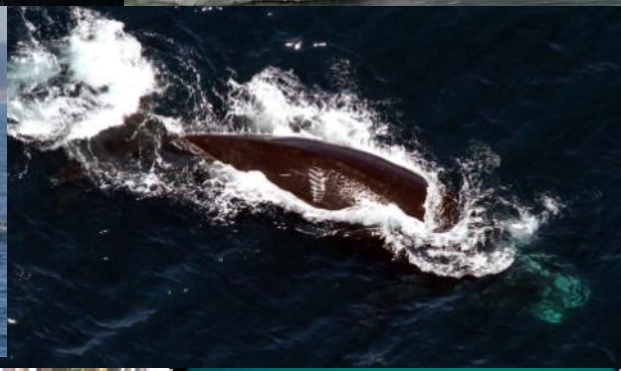
Threats that ESA-listed Species Face

- Habitat loss
  - Land or water use
  - Environmental/Climate change
  - Pollution
- Human use conflicts
  - Ship strikes
  - Overharvest
  - Construction activities
  - Recreation









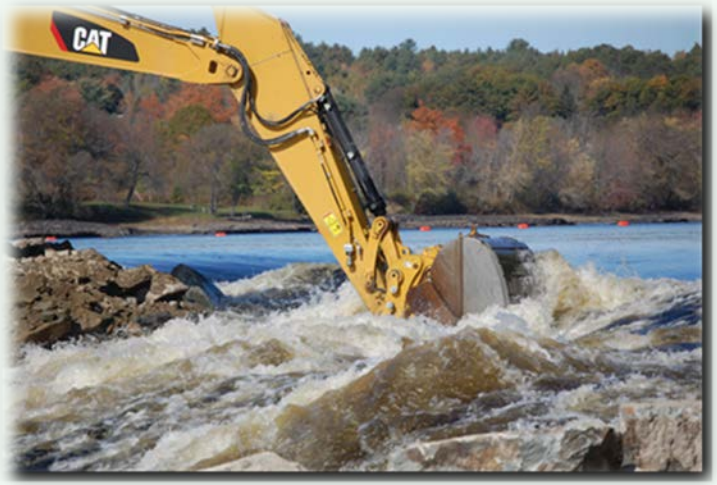




Issues/Challenges

Project Design and Implementation

- Engineering and Technical
  - Sediment contamination
  - Hydrology and hydraulics
  - Erosion and sedimentation
  - Habitat conversion/impacts
  - Regulatory compliance



- Financial and human resources
  - Agency technical expertise
  - Project management capacity

- Social
  - Recreational uses and commercial use conflicts
  - Landowner concerns
  - Aesthetic and sentimental changes values

Issues/Challenges

Points to Consider

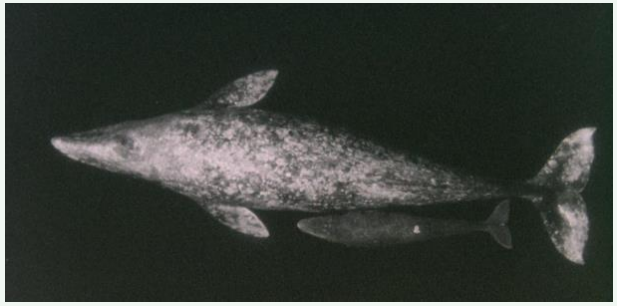
- How do we best approach competing Regulatory Mandates (ESA/EFH/CWA)?
- How do we allow for “flexibility” where appropriate in our regulatory processes to support the EWN approach (how much risk/uncertainty are NMFS and the Corps of Engineers willing to accept?)
- How can best apply pre- and post monitoring to EWN projects to learn and move forward with this approach?
- How do we gain consistency within the Corps of Engineers and NMFS on utilizing the EWN approach?
- How can we “pilot” the EWN approach in a manner to eventually make it a standard practice for the Corps of Engineers (Regulatory and Civil works) and NOAA?

Future Opportunities

Recovery - Goal of the ESA

- NOAA Fisheries charge: recover species so that they are no longer at risk of extinction
- To do this, we:
  - develop and implement Recovery Plans (ESA section 4)
  - conduct interagency consultations (ESA section 7)
  - coordinate with and provide grants to states (ESA section 6)
- It is a long-term challenge, and we can't do it alone

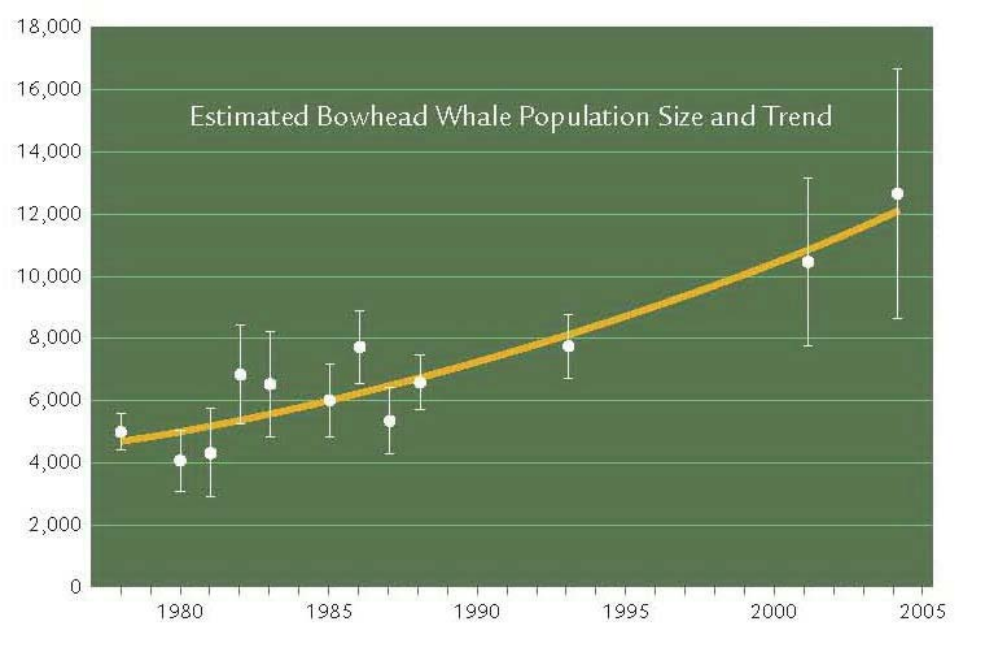




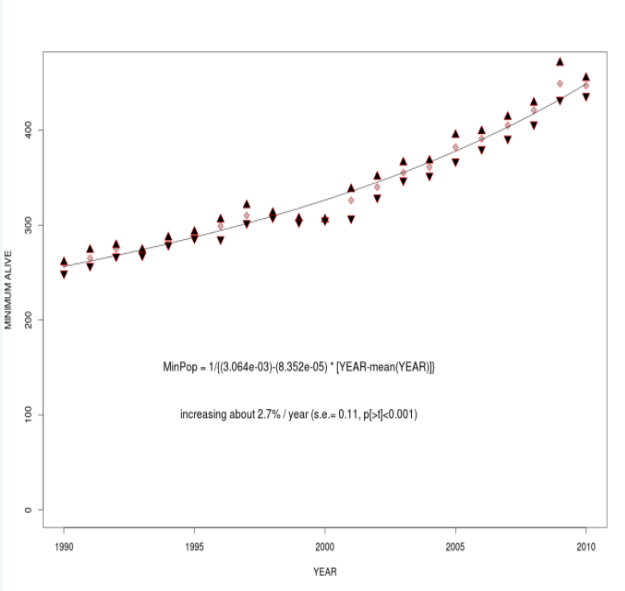
Future Opportunities

The Endangered Species Act At Work

- Delisting of Eastern Population of Steller sea lion due to recovery
- 820,000 fall Chinook pass Bonneville Dam – double the 10 year average
- Humpback population annual growth
- 3 – 7% - Just delisted 9 DPSs
- Monk seal recovery program



NA right whale – 2.6% growth



Bowhead whale population growth
Est > 3% annually since 2001

Future Opportunities

NMFS's Community-based Restoration Program

- Nationally competitive grants and technical assistance program
- Goals:
  - support recovery of endangered and threatened species
  - contribute to sustaining and rebuilding managed species
  - promote ecosystem and community resiliency
- Funds and technical assistance provided to states, national and state-based non-government organizations, local community-based groups
- Community engagement/stewardship







Future Opportunities

Habitat Restoration Opportunities



Tidal flow restoration to coastal wetlands



Shellfish restoration – focused on oyster restoration



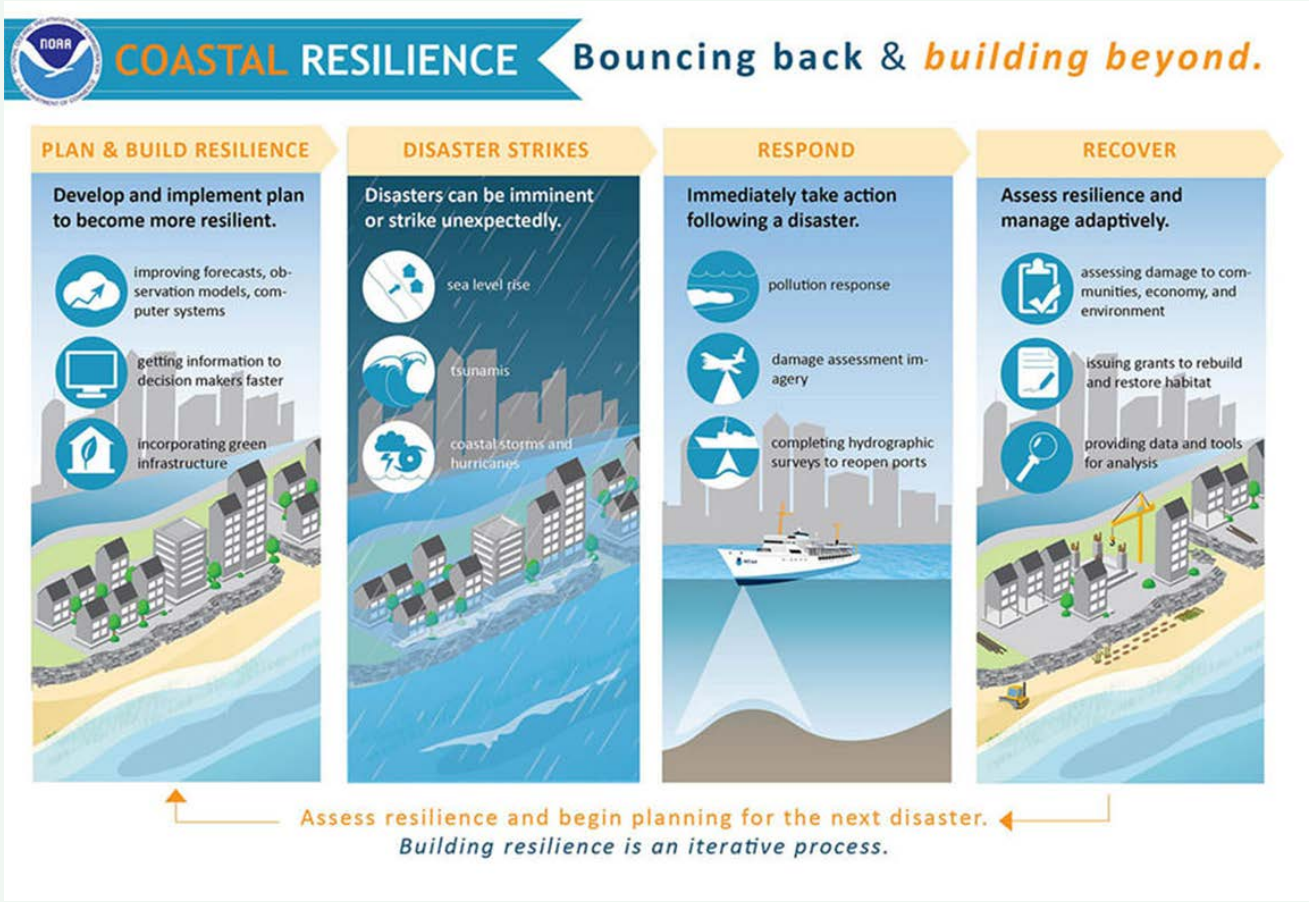
Fish passage – restoration of diadromous fish through dam removal



Coastal ecosystem resiliency

Future Opportunities

The Construct of Coastal Resilience



Future Opportunities

Place-based Conservation





Engineering With Nature
USACE Navigation Overview

Joe Wilson
Operations Division
Headquarters

05-06 October 2016
Gloucester, MA

Corps Navigation Mission

Provide safe, reliable, economically efficient, and environmentally sustainable waterborne transportation systems for movement of commerce, national security needs, and recreation.

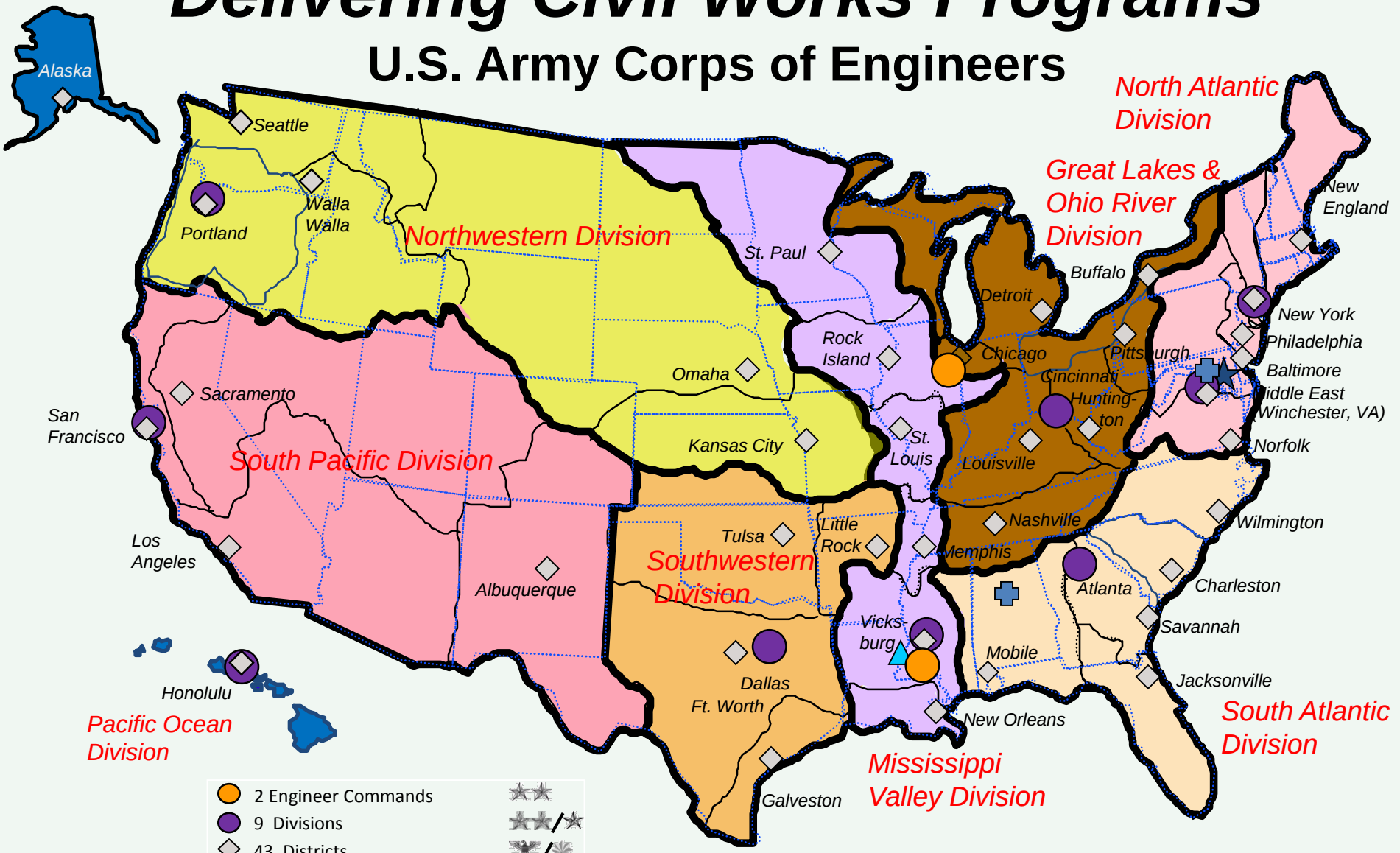






Delivering Civil Works Programs

U.S. Army Corps of Engineers

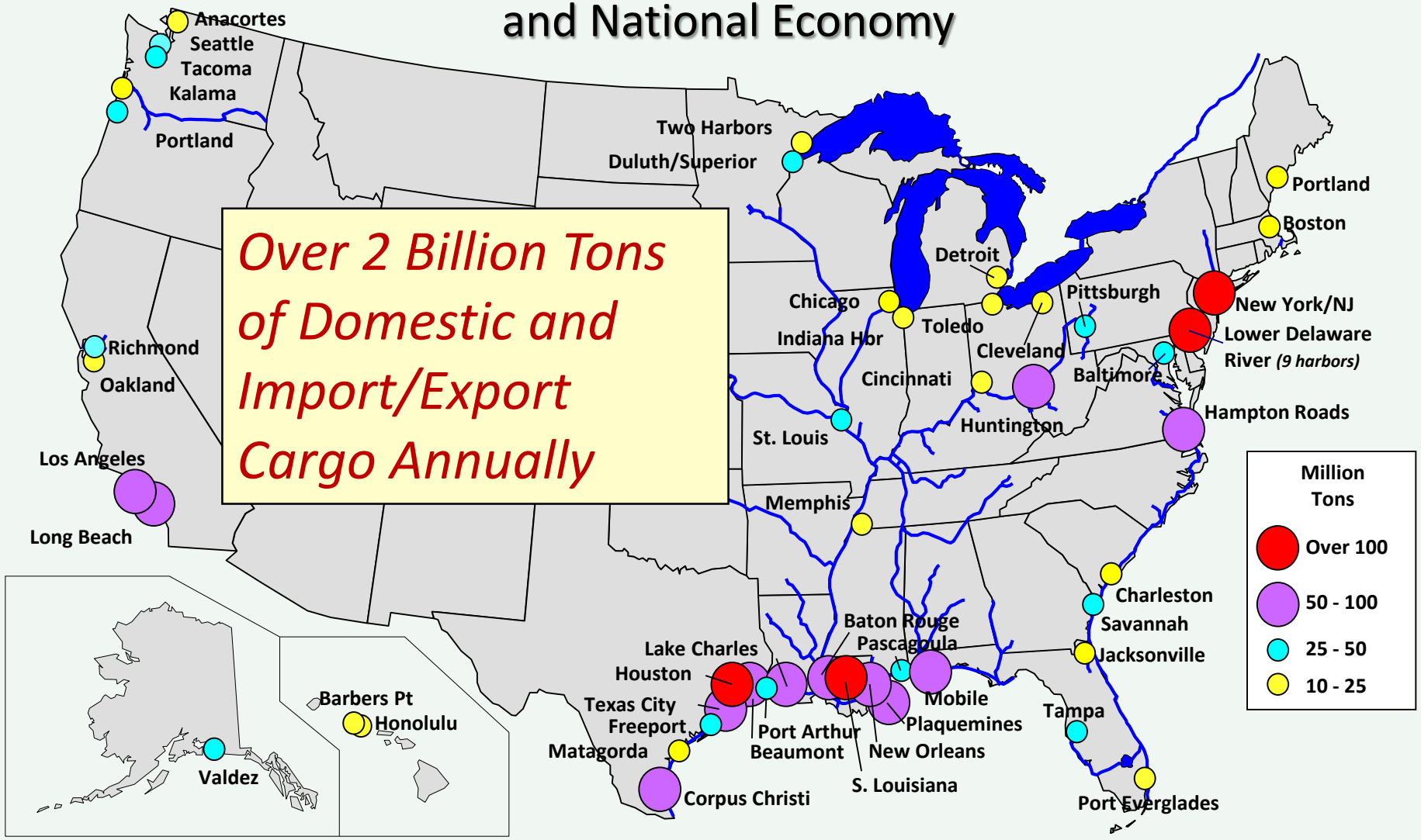


Workforce Size Varies with Workload

Workforce = 821 Military + 33,000 Civilians

The United States Is A Maritime Nation

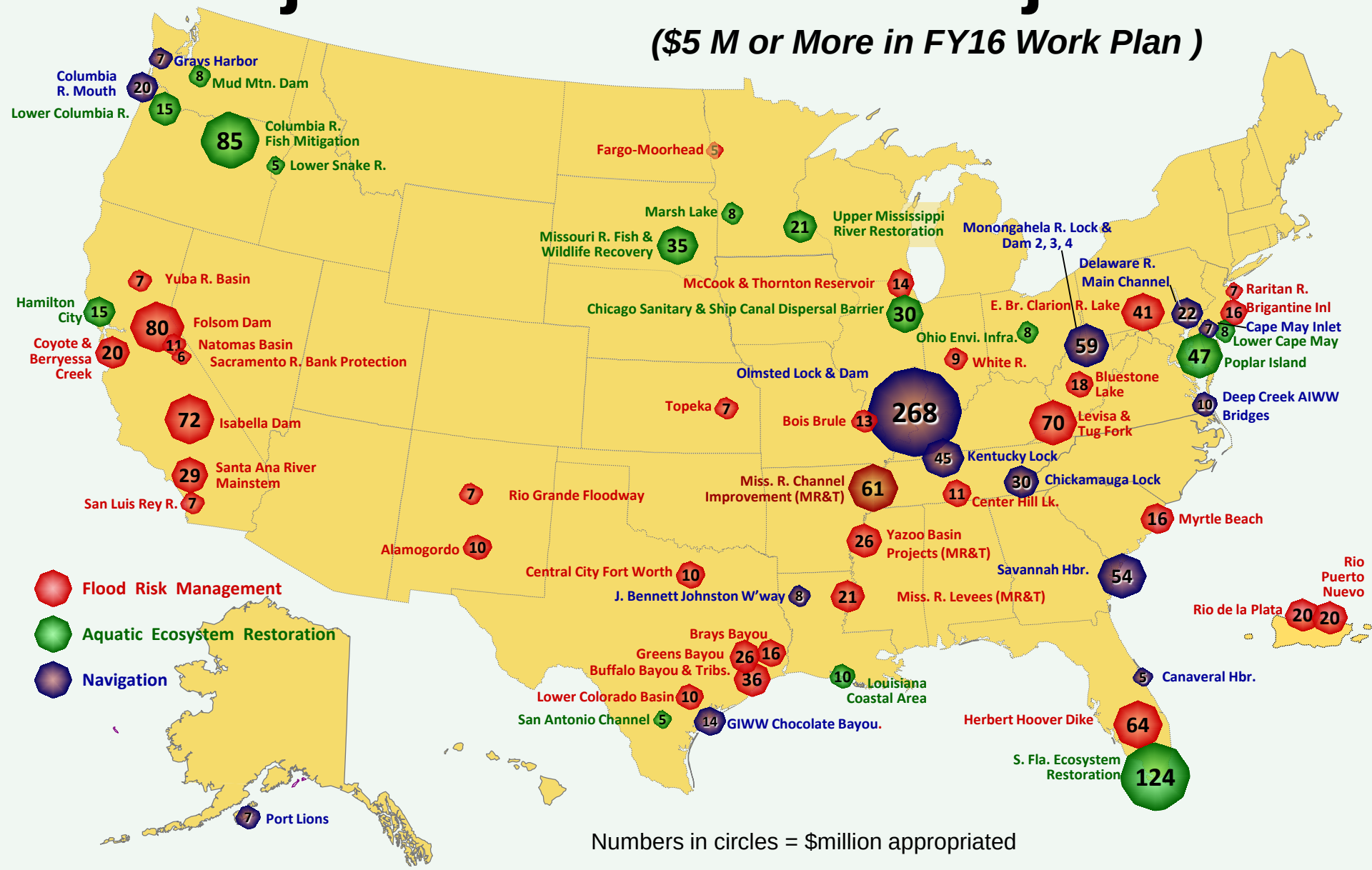
Inland Marine Transportation System + Ports: Vital to U.S. Trade and National Economy



Over 2 Billion Tons of Domestic and Import/Export Cargo Annually

Major Construction Projects

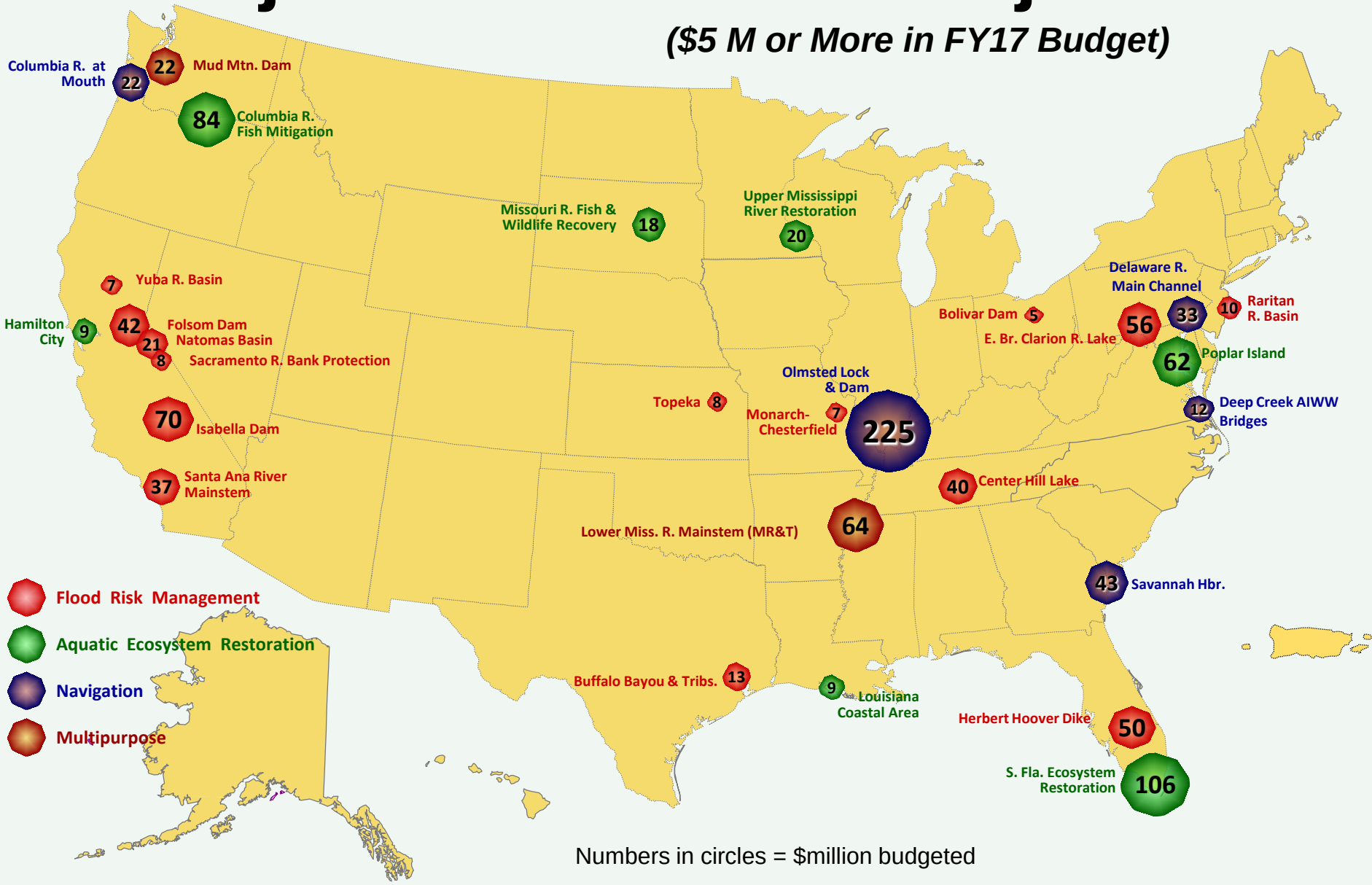
($5 M or More in FY16 Work Plan)



Numbers in circles = $million appropriated

Major Construction Projects

($5 M or More in FY17 Budget)



Numbers in circles = $million budgeted

USACE Navigation System Assets

INLAND NAVIGATION

- 27 Inland River Systems
- 228 Lock Chambers @ 186 Lock Sites
- 12,000 Miles of Inland River Channels





COASTAL NAVIGATION

- 1,067 Navigation Projects
- 13 Lock Chambers
- 929 Navigation Structures
- 13,000 Miles of Channels
- 844 Bridges

Navigation Facts

- 99.6% of U.S. overseas trade volume moves through coastal channels maintained by USACE
- The U.S. marine transportation industry supports ~ $2 trillion in commerce.
- Panama Canal new locks opening in 2016 - Worldwide numbers of post-Panamax vessels to increase
- More than 60% of farm exports move on inland waterways to downstream ports.
- One barge can carry as much freight as 15 rail cars or 58 trucks. This reduces traffic congestion and air pollution.

Vehicle	Capacity	Truck Equivalency
 Barge	1500 Tons 52,500 Bushels 453,600 Gallons	57.7 (865.4 for 15 barges in tow)
 Hopper car	100 Tons 3,500 Bushels 30,240 Gallons	3.8

Navigation Challenges

- Attracting and retaining knowledgeable personnel
- Constrained Funding - can't maintain authorized/constructed channel dimensions
- Low Commercial Use Projects
- Increased cost of doing business
- Aging infrastructure
- Behind in channel depths
- Environmental Issues
- Facing Crisis by Skewed Management

Challenges and Opportunities

- **Infrastructure Investment = Global Challenge**



- **Corps Civil Works Portfolio: 3,000+ Operational Projects, with Replacement Value of Approx $268B**
- **Corps Civil Works Asset Classes are Diverse**
  - Flood & Coastal Storm Damage
  - Coastal and Inland Harbors
  - Inland Waterways
  - Hydropower
  - Dam & Levee Safety Programs
  - Water Storage
  - Aquatic Ecosystems
  - Water-Based Recreation

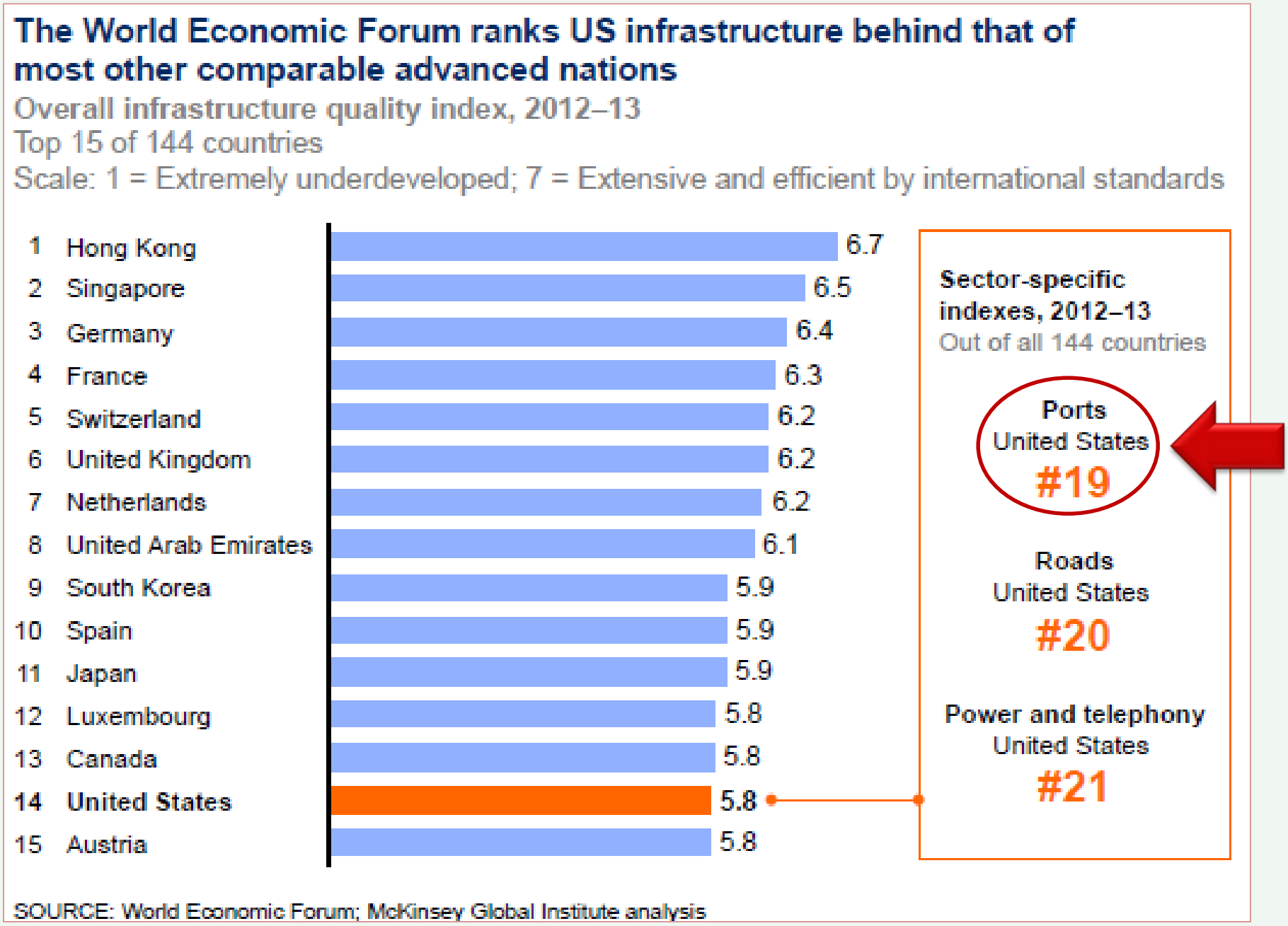


- **Demands for CW Infrastructure Maintenance, Operations, and Capital Investment are Expanding**
  - Civil Works New Construction Backlog → $ 60B
  - ASCE: Dams, Levees, IWW's = "D" → $140B
- **CW Infrastructure Systems Aging, Experiencing Negative Performance Trends Across Portfolio (Serviced by ~$4.6B Annual Budget Nationally….)**



10

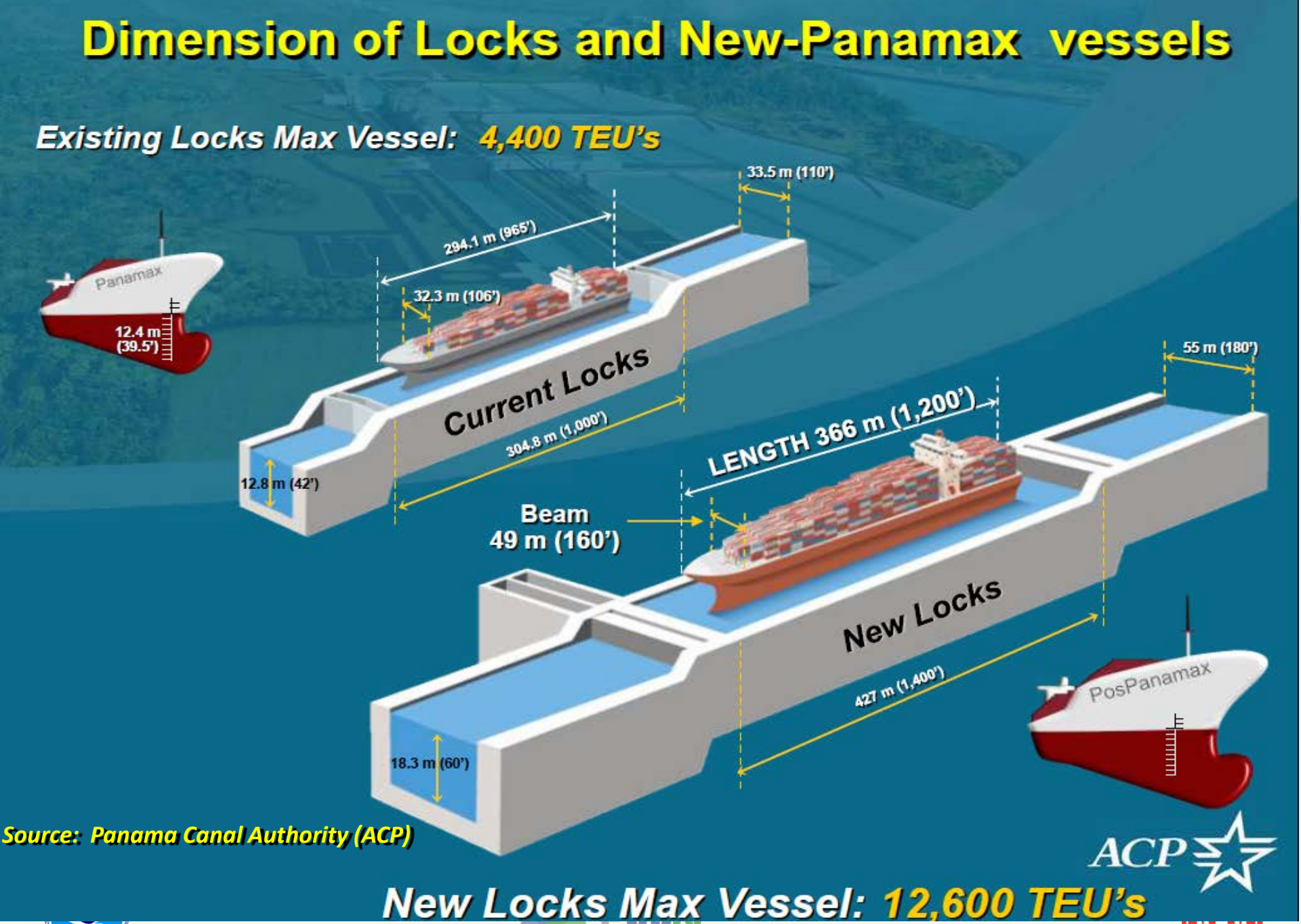
Relative Quality of US Infrastructure



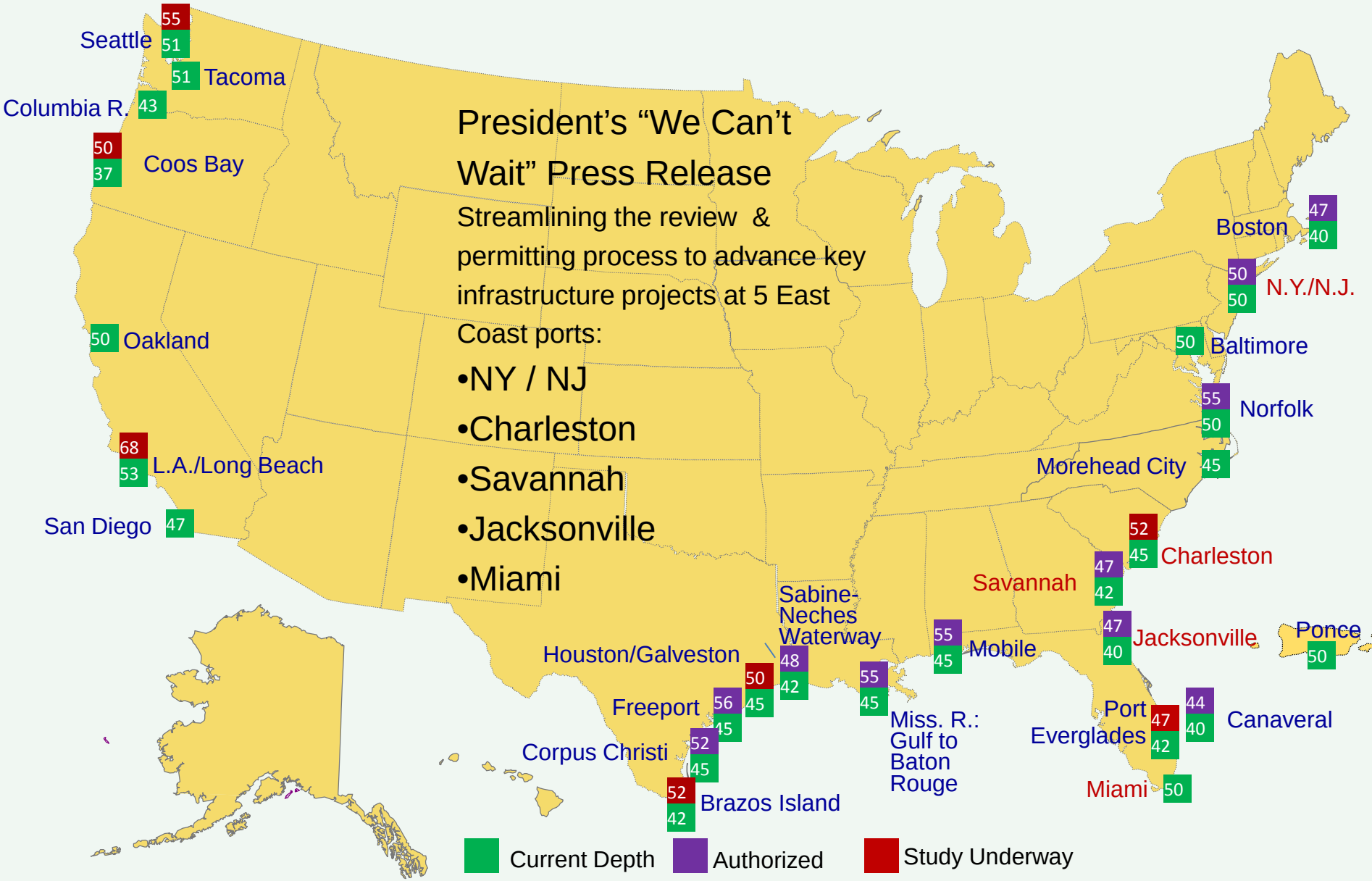
Future Opportunities & Demands

- **Corps Water Infrastructure Important to US Economy**
  - 98% of US Overseas Trade by Weight Moves Thru Corps Navigation Systems
  - 60% of US Grain, 22% of Coal, 22% Petroleum
  - Provides Strategic Overseas Deployment Platform
  - Has Capacity to Help Relieve Congestion Pressures on Other Modes
- **Nation's Water Infrastructure is Aging, Performance is Degrading, and Economic Impacts are Increasing**
- **U.S. Population Projected to Increase by 110 Million in 30 Years**
- **U.S. Imports and Exports Projected to Increase Significantly**
- **Panama Canal New Locks Opening in 2016 – Global Post-Panamax Fleet to Increase**
- **Increased Grain Exports Expected as Result of Transportation Cost Savings Associated with larger Vessels**

Dimension of Locks and New-Panamax vessels



Potential Post-Panamax Port Studies



Future Budgets

- FY18 Budget Outlook
  - Probable Release Early 2017
  - Allows New Administration to Influence Budget Priorities

- FY17 Workplan Outlook
  - Districts and MSC Submittals Under Development
  - Expect HQ National Ranking to be Wrapped Up Before Christmas

Funding Sources for Corps Navigation Expenditures

Inland Waterways

O&M	General Treasury	100%	
Construction	General Treasury	50%	
	Inland Waterways TF		50%

Harbors

O&M	General Treasury	0%	
	Harbor Maintenance TF		100%
Construction	General Treasury	40-80%	
	Project Sponsors	20-60%	

President's Budgets

($millions)

Pres Bud	Coastal	Inland	Nav	CW total	Nav Percent
FY 17	$1,017	$917	$1,934	$4,620	42%
FY 16	$973	$974	$1,947	$4,732	41%
FY 15	$991	$834	$1,825	$4,561	40%
FY 14	$980	$904	$1,884	$4,826	39%
FY 13	$967	$780	$1,747	$4,731	37%
FY 12	$832	$744	$1,575	$4,631	34%
FY 11	$873	$779	$1,652	$4,939	33%
FY 10	$971	$796	$1,767	$5,125	35%
FY 09	$969	$931	$1,900	$4741	40%

Coastal Navigation Budget

($million)

Pres Bud	Investigations	Construction	O&M	MR&T	Total Coastal
FY 17	**$14**	**$105**	**$896**	**$2**	**$1,017**
FY 16	**$18**	**$81**	**$872**	**$2**	**$973**
FY 15	**$17**	**$97**	**$875**	**$2**	**$991**
FY 14	**$16**	**$108**	**$853**	**$2**	**$980**
FY13	**$17**	**$151**	**$797**	**$2**	**$967**
FY12	**$7**	**$117**	**$706**	**$2**	**$832**
FY11	**$9**	**$115**	**$747**	**$2**	**$873**
FY10	**$16**	**$119**	**$834**	**$2**	**$971**

Closing Thoughts

- Addressing the Nation's Infrastructure Investment Gap is a Shared Federal, State and Local Responsibility

- The Corps Doesn't Deliver Anything by Itself… Critical that We Not Lose Focus on Our Partners and Our Commitments

- Navigation Investment is Essential for the Nation's Global Trade and International Competiveness

- Economically Justified Investment Reduces Risk to Economic Activity, Lives, Livelihoods and Quality of Life

- How do we manage activities to achieve environmental benefits with funds appropriated?

- What are YOUR ideas?

Thank You!



U.S.ARMY

BUILDING STRONG®

As of: <date>
POC: <name>

USACE Progress on ESA 7(a)(1)

Todd Swannack and Richard Fischer
U.S. Army Engineer R&D Center

05-06 October 2016
Gloucester, MA

Organizational Perspective

- USACE TES conservation and compliance spending averages ~$230 million per year
- TES conservation concerns currently exist at over 430 USACE projects, for over 300 different species
- An additional 250 species listings or critical habitat designations are expected to occur by 2018
- USACE has no formal, organized strategy for assessing, prioritizing, and addressing TES issues



USACE Threatened & Endangered Species Team (TEST)

- **Objective:** ***Accelerate the development of solutions to priority threatened and endangered species issues that will:***
  - *Improve species conservation outcomes*
  - *Reduce future costs*
  - *Improve budget planning capabilities*
  - *Reduce adverse impacts to mission execution*

Approach: ***Accelerate the development of solutions to priority threatened and endangered species issues:***

  - *Prioritize resolvable TES issues*
  - *Identify system-scale approaches with*
  - *Partner with Division, Districts, resource agencies to develop and implement solutions*
  - *Track ROI to scale future priorities*









Current Projects

- Web-based TES Mapping Tool
- Interior Least Tern Recovery Planning
- TES Listing Impacts on USACE Navigation Program
- Southwestern Riparian TES
- Multi-scale tools to predict spatial distributions of TES
- Impacts of navigation and ecosystem restoration projects on endangered freshwater mussels
- Los Angeles District – Whittier Narrows 7(a)(1)

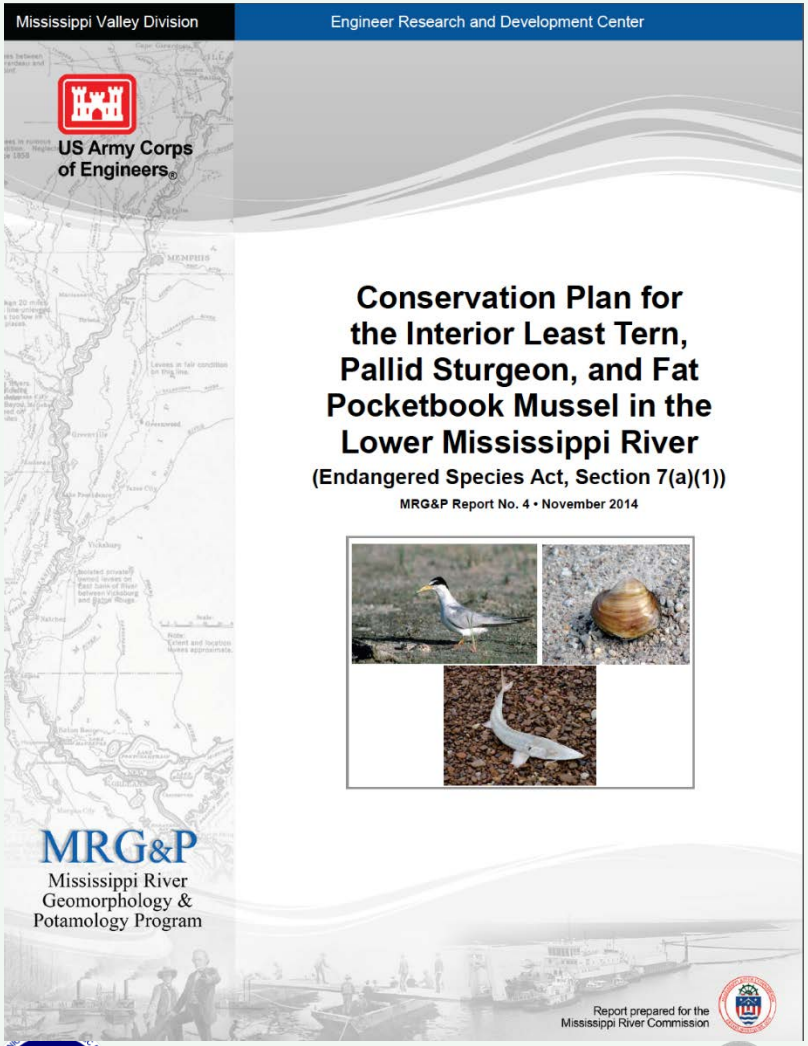
ESA 7(a)(1) Approach

Section 7(a)(1)

- Allows USACE to be proactive in consultation and conservation processes rather than reactionary
- Reduces surprises and conflicts
- We commit to actions we would be predisposed to undertake anyway under 7(a)(2)
- Reduce future 7(a)(2) consultations or improve their outcomes
- Actions contingent upon availability of funds providing budget predictability
- Improves likelihood of species recovery

Conservation Programs under 7(a)(1) are designed to improve listed species baselines within the scope of Federal action agency authorities.

Significant Outcomes/Value Produced



- Proactive and innovative
- Creates “buy-in” from multiple agencies and organizations
- Addresses multiple species
- Conserves habitat in perpetuity for listed species
- Provides template for others to follow
- Long-term cost-savings to USACE
- Supports USFWS 5-Year Status Reviews for listed species

Significant Outcomes/Value Produced

- Delisting the Interior Least Tern
  - ✓ Complete testing of TernPOP model and provide to USFWS
  - ✓ Complete **7(a)(1)** Plans for Mississippi Valley, Southwestern, and Great Lakes/Ohio River Divisions
  - ✓ Publish monitoring plan in peer-reviewed literature
  - USFWS proposes delisting rule in Federal Register
  - USFWS receives comments from federal agencies, species experts, etc.
  - Final Rule



U.S. Fish & Wildlife Service

Delisting a Species

Section 4 of the Endangered Species Act

Delisting is the removal of species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from Endangered to Threatened. Delisting and downlisting actions result from successful recovery efforts. To delist a species, the Service must determine that the species is not threatened based on a number of factors, such as population size, recruitment, stability of habitat quality and quantity, and control or elimination of the threats. If some of the threats have been reduced and the population has met its recovery objectives for downlisting, we may consider changing the species status from Endangered to Threatened. Delisting species is the ultimate goal of implementing the Endangered Species Act (ESA).

Why, when, and how are species removed from the list of endangered and threatened species?

Recovery plans, developed by the Service and stakeholders for listed species, identify delisting and downlisting goals. When a species reaches its delisting goals, the Service considers removing it from the Federal Lists of Endangered and Threatened Wildlife and Plants. Likewise, when a species reaches its downlisting goals, the Service considers changing its status from Endangered to Threatened.

To delist or downlist a species, the Service follows a process similar to when we consider a species for listing under the ESA: we assess the population and its recovery achievements; we assess the existing threats; and, we seek advice from species experts in and outside of the Service. To assess the existing threats, the Service must determine that the species is no longer threatened or endangered based on five factors:

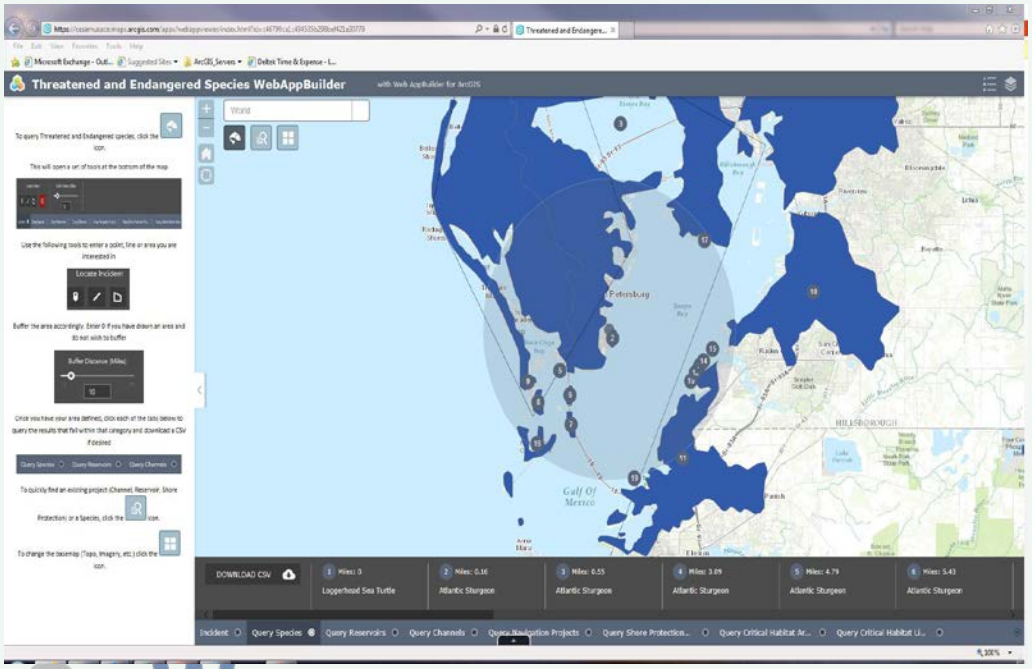
- Is there a present or threatened destruction, modification, or curtailment of species' habitat or range?
- Is species subject to overutilization for commercial, recreational, scientific, or educational purposes?
- Is disease or predation a factor?
- Are there inadequate existing regulatory mechanisms in place outside the ESA (taking into account the efforts by the States and other organizations to protect the species or habitat)?
- Are other natural or manmade factors affecting its continued existence?

If the Service determines that the threats have been sufficiently reduced, then we may consider delisting or downlisting the species. When delisting or downlisting a species, the Service first proposes the action in the *Federal Register*. At this time, we also seek the opinion from independent species experts, other Federal agencies, State biologists, and the public. After analyzing the comments received on the proposed rulemaking, we decide whether to complete the proposed action or maintain the species status as it is. Our final decision is announced in the

American peregrine falcon, delisted in 1999, because of recovery. Craig Koppie, USFWS

Challenges

- Finding willing partners to cost-share conservation planning for recovery
- Adequate funding to address high-priority TES recovery needs



Future Opportunities?

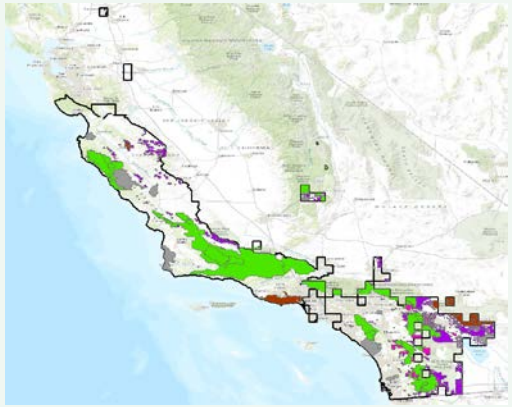


Rio Grande Silvery Minnow

Salmon, chinook (9 Populations)	$73,851,410
Steelhead (11 populations)	$51,907,342
Sturgeon, pallid	$48,718,484
Salmon, sockeye (2 Populations)	$14,293,621
Flycatcher, southwestern willow	$7,668,176
Salmon, chum (2 Populations)	$6,102,995
Minnow, Rio Grande silvery	$5,787,904
Plover, piping (2 Populations)	$5,339,877
Tern, least	$4,467,906
Salmon, coho (4 Populations)	$3,404,322
Sturgeon, Atlantic	$2,248,191
Vireo, least Bell's	$2,229,661
Sturgeon, shortnose	$1,628,115
Sturgeon, North American green	$1,385,026
Woodpecker, red-cockaded	$1,058,791
Trout, bull	$979,656
Smelt, delta	$586,391
Bat, Indiana	$560,676
Sea turtle, loggerhead	$496,875
Manatee, West Indian	$469,134



Least Bell's Vireo





Southwestern Willow Flycatcher



Western DPS Yellow-billed Cuckoo

Summary

- Utilizing 7(a) (1) allows for collaborative, proactive, interagency approach for species conservation and potentially recovery
- ILT serves as model for multiagency integration
- USACE TEST is actively developing targeted strategies for T&E species

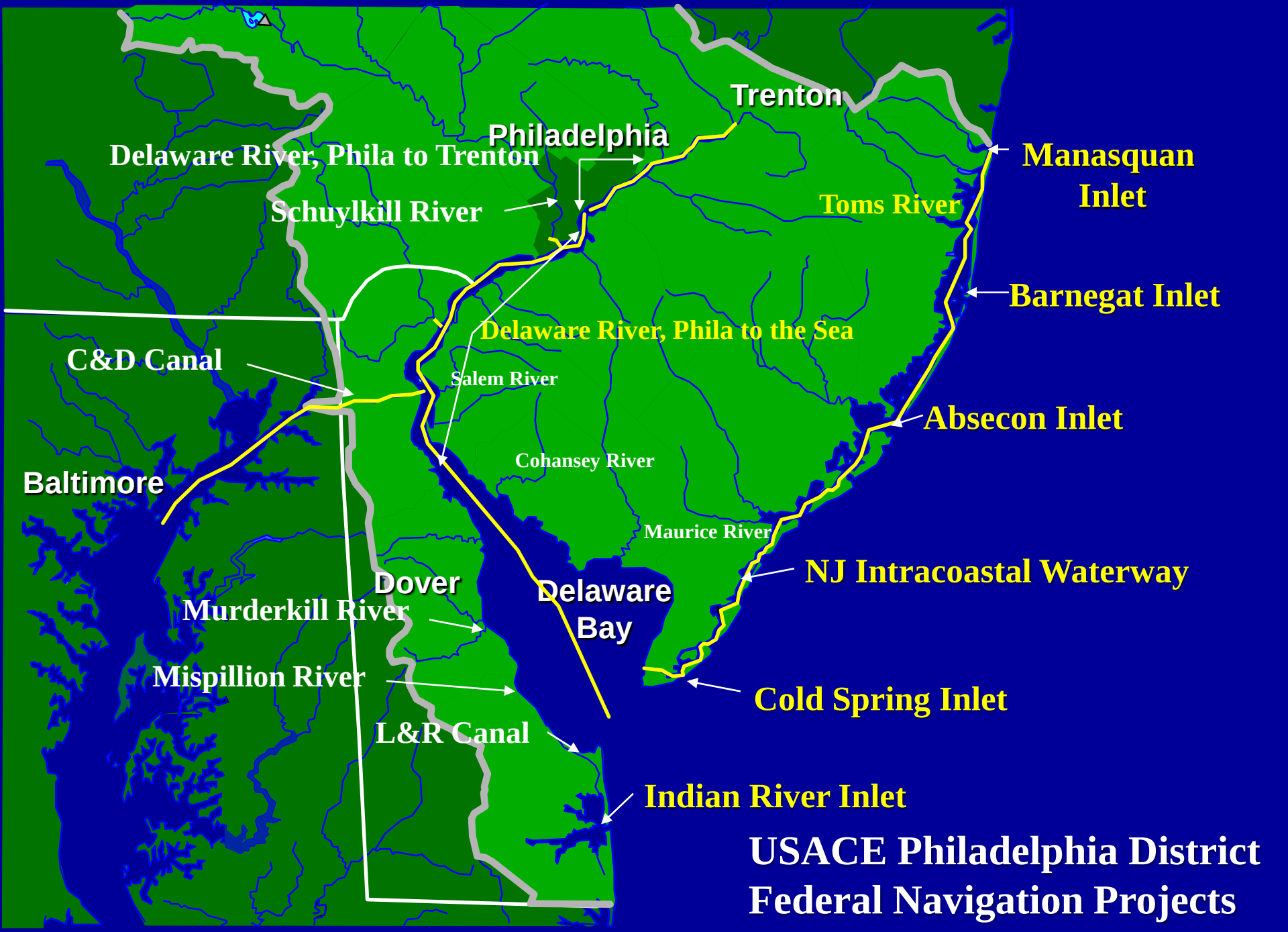
Engineering With Nature
Case Examples of Practice

Monica Chasten
USACE, Philadelphia District
Operations Division

05-06 October 2016
Gloucester, MA

Organizational Perspective

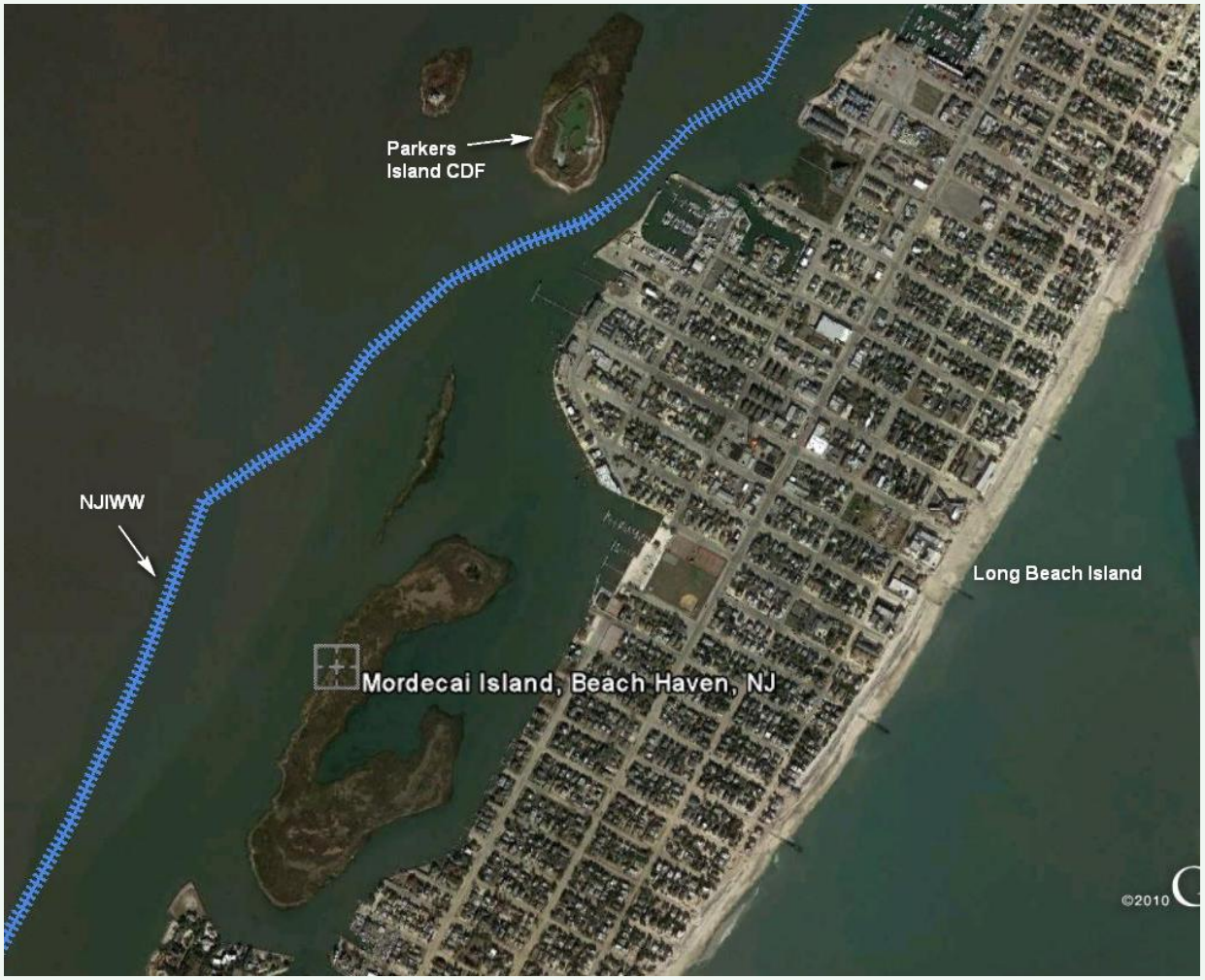
- Navigation mission: maintain federal channels in the Philadelphia District
- Regional Sediment Management approach is to keep the sediment in the natural system
- Strong beach nourishment program (borrow areas)
- Regulatory mission


Trenton
Philadelphia
Delaware River, Phila to Trenton
Schuylkill River
Manasquan Inlet
Toms River
Barnegat Inlet
Delaware River, Phila to the Sea
C&D Canal
Salem River
Absecon Inlet
Cohansey River
Baltimore
Maurice River
NJ Intracoastal Waterway
Dover
Murderkill River
Delaware Bay
Mispillion River
Cold Spring Inlet
L&R Canal
Indian River Inlet
USACE Philadelphia District
Federal Navigation Projects

Current Projects

- Dredging of coastal inlets with USACE plant
- Post-Sandy actions to dredge federal channels and place beneficially to restore the system and build coastal resilience
  - Ring Island (August 2014)
  - Mordecai Island (November 2015)
  - Avalon (February 2016)
  - Barnegat Bay placement sites

Mordecai Island, Beach Haven, NJ



Mordecai Island CONSTRUCTED! November 2015







Mordecai Island Plantings
May 2016







Mordecai Island
9 months after construction



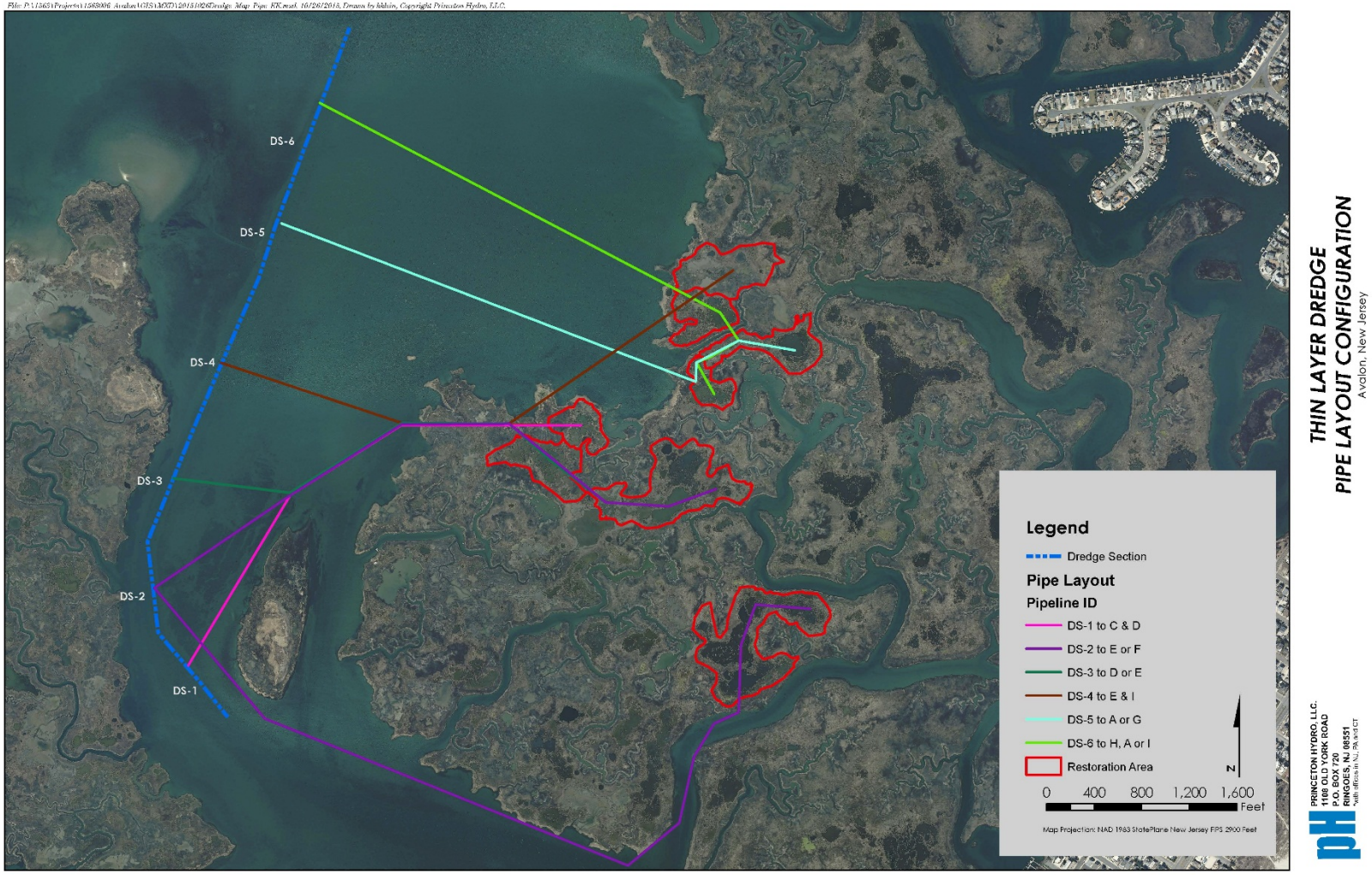
Mordecai Island
9 months after construction



Ring Island, Middle Township, NJ
Constructed August 2014



NJIWW Dredging & Avalon Placement
Thin Layer Placement Project
Constructed Nov 2015 to Feb 2016



NJIWW Avalon Pilot Project: Dredging "The Football Field" and Thin-layer Placement



- Pilot Project constructed Dec 2014
- Small thin layer placement demo with fine-grained material and filled pools and pannes to restore marsh

- Larger project continued from Nov 2015 to Feb 2016 (approx. 45,000 cy)
- Monitoring to continue for several years





Significant Outcomes/Value Produced

- Ongoing Monitoring
- Lessons learned on criteria, design and constructability for future restoration projects
- Work contributes to healthy ecosystems and EWN approach; supports adjacent NMFS resources
- Supports coastal resiliency and sustainability efforts

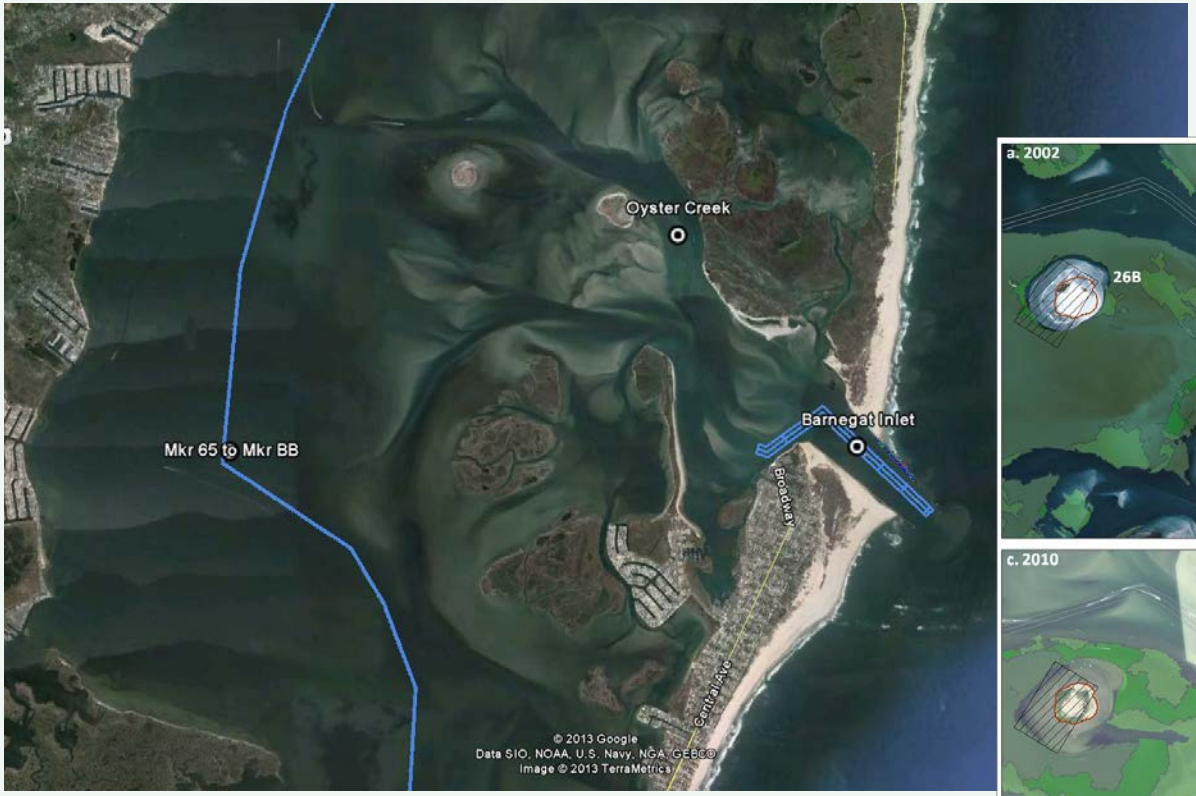
Challenges

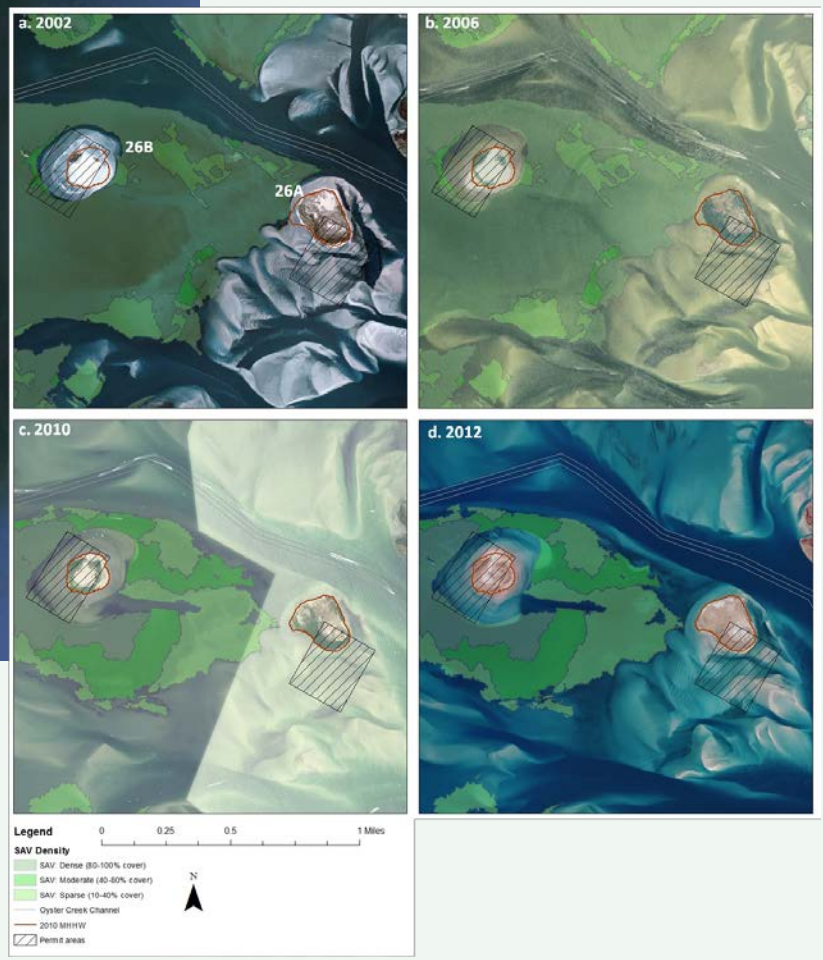
- Need better consensus *between and within agencies* on how to evaluate projects and what defines success
- Balance impacts and benefits, criteria are subjective
- Variability in state permit requirements
- Environmental windows to accomplish work

Future Opportunities

- Island Creation in coastal NJ and DE
- Dredge Hole infilling
- Marsh Restoration
  - Thin layer
  - Edge restoration
- Working together to inform science-based decisions and projects

Barnegat Inlet, NJ





Barnegat Inlet
Post-Sandy CHARTS Survey



Engineering With Nature
Case Examples of Practice

Danielle Szimanski
US Army Corps of Engineers: Baltimore District

05-06 October 2016
Gloucester, MA

Current Projects

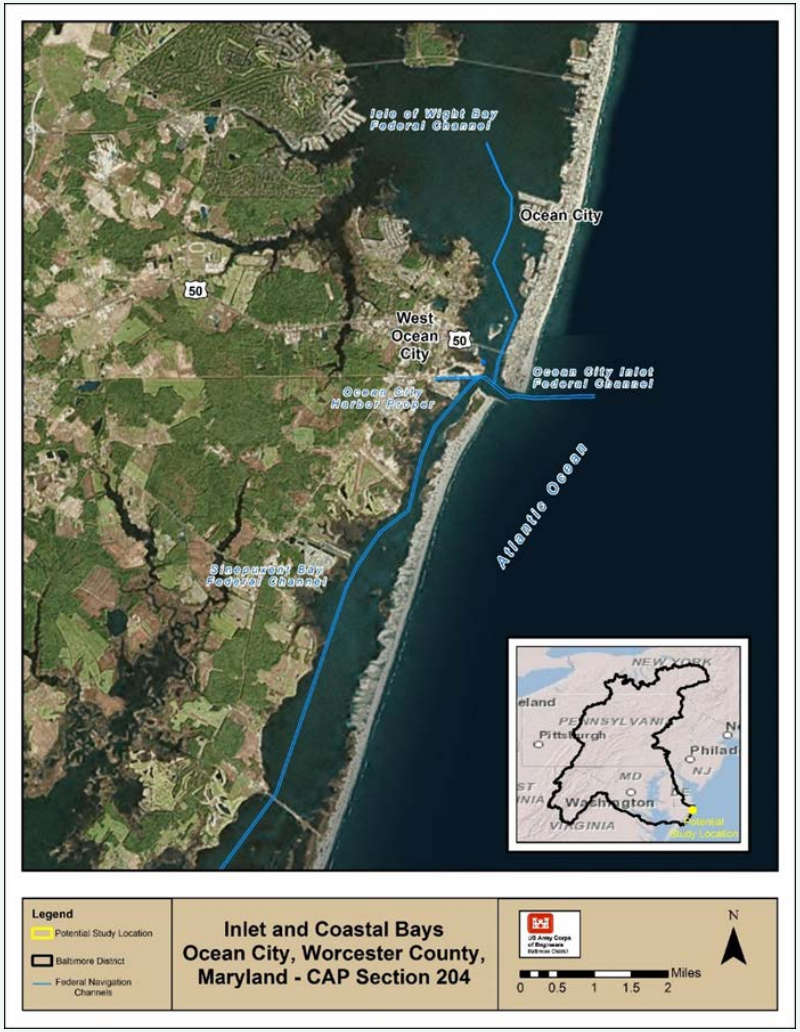
Ocean City Sinepuxent and Isle of Wight Bay Maintenance Dredging

- FY2014-Present
- Dredged approx. 400,000 cubic yards
  - Unconfined placement
- Restored 4 historic islands
  - Two vegetated, two bare
- Migratory Bird Habitat
- Shallow water habitat creation

Fishing Battery/ Susquehanna River Maintenance Dredging

- FY2013
- Dredged approx. 200,000 cubic yards
  - Unconfined placement
- Restored 11 acre island
- Wetland, transitional marsh, and high marsh created
- Planted with 11 different species
- Shallow water habitat creation

Ocean City Sinepuxent and Isle of Wight Bay Maintenance Dredging







Fishing Battery/ Susquehanna River Maintenance Dredging







Fishing Battery/ Susquehanna River Maintenance Dredging



Spring 2013

Summer 2014



Most Significant Contributions

- Cooperation between federal, state, local agencies from beginning of design
- Unconfined placement of dredged material in open water for island restoration
- Completed Navigation and environment mission
- Creation of new shallow water habitat near islands
- Migratory bird nesting habitat created

Challenges

- Unconfined placement-MD State law
- Public Use
- Environmental window for anadromous fish (Battery Island)
- Post creation monitoring
- Turbidity at cutterhead (SAV, benthics)

Future Opportunities

Wicomico River: Ellis Bay Wetland Restoration and Thin Layer Placement



Smith Island: Swan Island Wetland Restoration



Appendix IV: Day 2 – Afternoon Plenary Slides

Engineering With Nature
Case Examples of Practice

Andrea Catanzaro & Jeff Corbino
USACE - Galveston & New Orleans Districts

05-06 October 2016
Gloucester, MA

Organizational Perspective

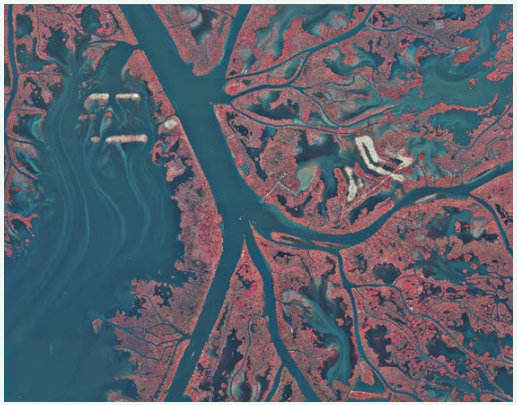
EWN Provides the District's with:

Opportunities to both validate & refine existing practices;

Methods to describe & quantify non-traditional benefits; &

Mechanisms to justify added cost & attract cost-share partners.





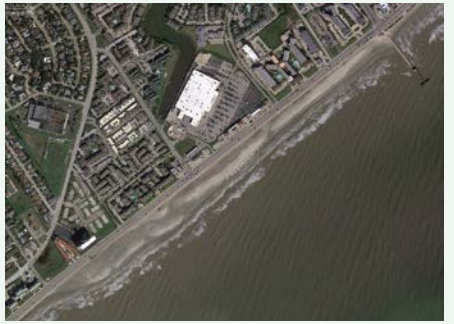


Current Projects

GALVESTON ISLAND BEACH RESTORATION

* Habitat & Recreational Benefits
* Beach nourishment in lieu of ODMDS
* Partnership with Galveston Island Park Board of Trustees & Texas General Land Office

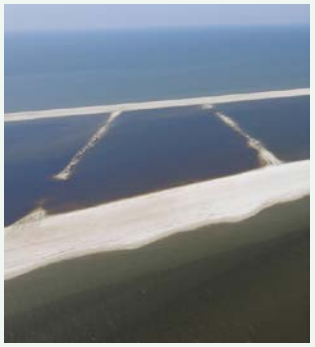




ROUND ISLAND – PASCAGOULA UPPER SOUND

Multi-Agency Sponsored Beneficial Use Facility

* Overbuilt Semi-Containment Dikes
* Cells Sized for Known Future Needs
* Collaboration made Construction Possible





CHAIN ISLANDS - ATCHAFALAYA BAY

Linear Series of Dredged Material Islands

* Bird Nesting Grounds
* Protected Water for SAV & Emergent Veg
* Channel Constriction / Increased Flow



Significant Outcomes/Value Produced

BOLIVAR MARSH, GALVESTON BAY, TX

"Hard and Soft" Engineering Features

* Fish and Wildlife & Recreational Benefits
* Beneficial Use of Dredged Material
* Interagency Collaboration on Design



DEER ISLAND – MISSISSIPPI COAST

"Soft Engineering" Shoreline Features

* Habitat & Recreational Benefits
* Storm Protection & Erosion Control
* Capacity for Future Dredging Projects





HORSESHOE ISLAND - ATCHAFALAYA RIVER

Island Formation Fueled by Dredged Material

* Complex & Diverse Habitats
* Shortened Navigation Route
* Reduced Maintenance Requirements





Challenges

Construction costs relative to base placement plan (navigation projects).

Construction limitations related to project authority & policy.

Alignment of partnership agreements, cost-shares, & the Federal budget cycle.

Urgent need to fulfill primary USACE missions rarely compatible with planning & legal review times for partnering projects.







Future Opportunities

Leveraging funds from other authorities & programs.

Staging or stockpiling dredged material for future use by others when schedules do not overlap.

Assistance from others with monitoring performance of constructed projects to inform future design.







Engineering With Nature
Case Examples of Practice

Larry Smith
Los Angeles District
U.S. Army Corps of Engineers

05-06 October 2016
Gloucester, MA

Current Projects

- Port of Los Angeles Maintenance Dredging
- Malibu Creek Ecosystem Restoration Study
- Port of Long Beach Deep Draft Navigation Study

Port of Los Angeles Maintenance Dredging

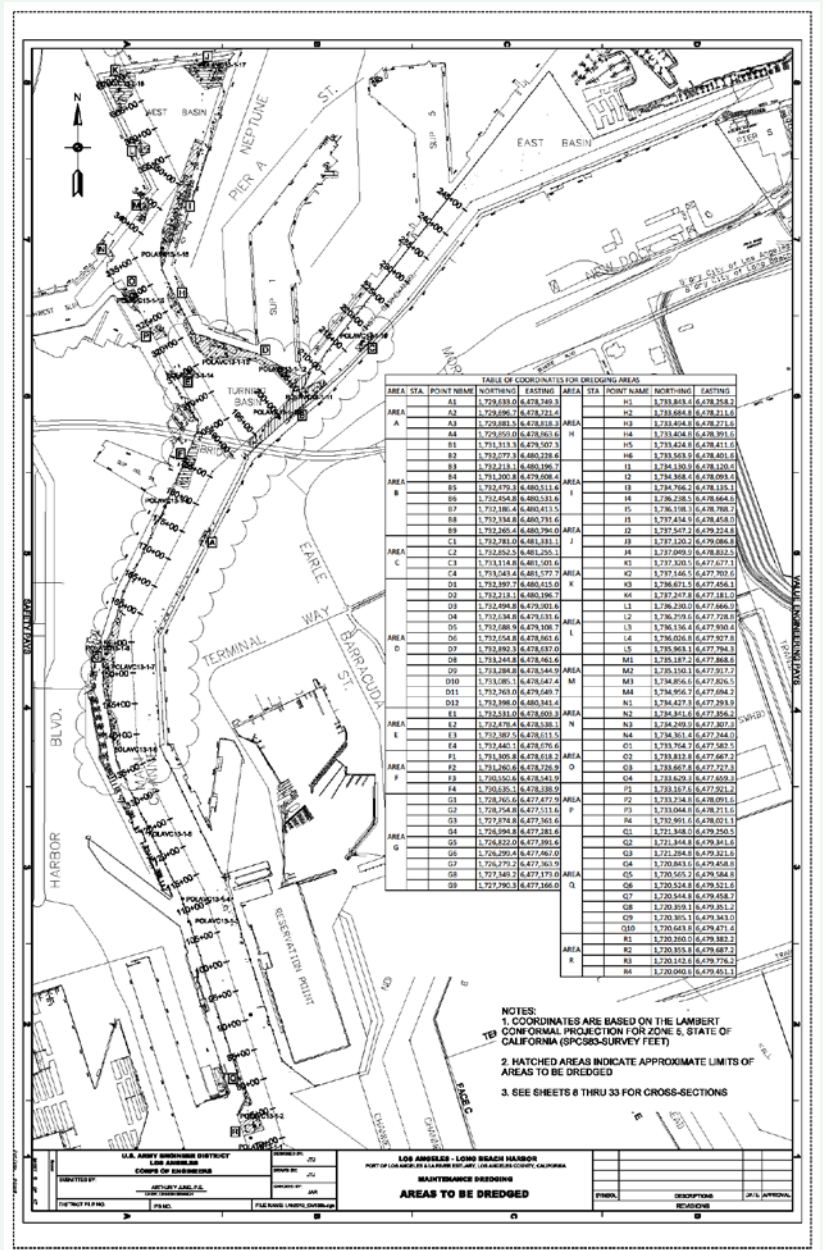
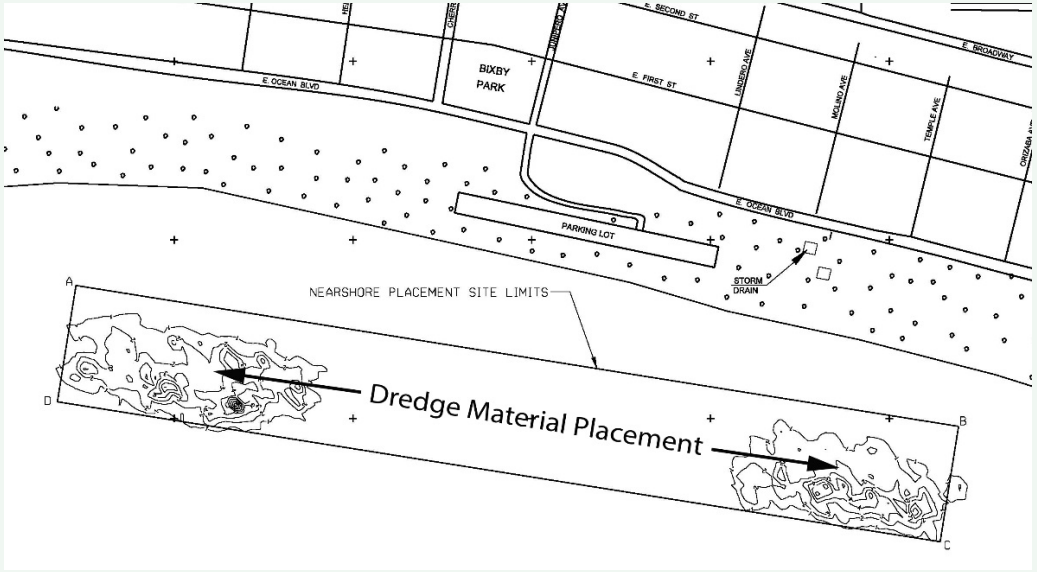


TABLE OF COORDINATES FOR DREDGING AREAS

AREA	STA.	POINT NAME	NORTHING	EASTING
AREA A		A1	1,729,633.0	6,478,749.3
		A2	1,729,696.7	6,478,721.4
		A3	1,729,881.5	6,478,818.3
		A4	1,729,950.0	6,478,963.6
AREA B		B1	1,731,313.3	6,479,507.3
		B2	1,732,077.3	6,480,228.6
		B3	1,732,218.1	6,480,196.7
		B4	1,731,200.8	6,479,608.4
		B5	1,732,479.3	6,480,511.6
		B6	1,732,454.8	6,480,531.6
		B7	1,732,186.4	6,480,411.5
		B8	1,732,334.8	6,480,731.6
		B9	1,732,265.4	6,480,794.0
AREA C		C1	1,732,781.0	6,481,331.1
		C2	1,732,852.5	6,481,255.1
		C3	1,733,114.8	6,481,501.6
		C4	1,733,043.4	6,481,577.7
AREA D		D1	1,732,397.7	6,480,415.0
		D2	1,732,218.1	6,480,196.7
		D3	1,732,494.8	6,479,901.6
		D4	1,732,634.8	6,479,631.6
		D5	1,732,688.9	6,479,308.7
		D6	1,732,654.8	6,478,661.6
		D7	1,732,892.3	6,478,637.0
		D8	1,733,244.8	6,478,681.6
		D9	1,733,284.8	6,478,544.9
		D10	1,733,085.1	6,478,047.4
		D11	1,732,763.0	6,479,049.7
		D12	1,732,398.0	6,480,341.4
AREA E		E1	1,732,531.0	6,478,603.3
		E2	1,732,479.4	6,478,538.1
		E3	1,732,387.5	6,478,611.5
		E4	1,732,440.1	6,478,676.6
AREA F		F1	1,731,305.8	6,478,618.2
		F2	1,731,260.6	6,478,726.9
		F3	1,730,550.6	6,478,541.9
		F4	1,730,635.1	6,478,336.9
AREA G		G1	1,728,765.6	6,477,477.9
		G2	1,728,754.8	6,477,511.6
		G3	1,727,874.8	6,477,363.6
		G4	1,726,994.8	6,477,281.6
		G5	1,726,822.0	6,477,391.6
		G6	1,726,290.4	6,477,467.0
		G7	1,726,271.2	6,477,363.9
		G8	1,727,349.2	6,477,171.0
		G9	1,727,790.3	6,477,166.0

AREA	STA.	POINT NAME	NORTHING	EASTING
AREA H		H1	1,733,843.4	6,478,358.2
		H2	1,733,684.8	6,478,211.6
		H3	1,733,404.8	6,478,271.6
		H4	1,733,404.8	6,478,391.6
		H5	1,733,424.8	6,478,411.6
		H6	1,733,563.9	6,478,401.6
AREA I		I1	1,734,130.9	6,478,120.4
		I2	1,734,368.4	6,478,093.4
		I3	1,734,766.2	6,478,135.1
		I4	1,736,238.5	6,478,664.6
		I5	1,736,198.1	6,478,788.2
AREA J		J1	1,737,434.5	6,478,458.0
		J2	1,737,547.2	6,479,224.8
		J3	1,737,120.2	6,479,086.8
AREA K		J4	1,737,049.9	6,478,832.5
		K1	1,737,320.5	6,477,677.1
		K2	1,737,146.5	6,477,702.6
		K3	1,736,671.5	6,477,456.1
		K4	1,737,247.8	6,477,181.0
AREA L		L1	1,736,230.0	6,477,666.0
		L2	1,736,259.6	6,477,728.8
		L3	1,736,136.4	6,477,930.4
		L4	1,736,026.8	6,477,927.8
		L5	1,735,963.1	6,477,794.3
AREA M		M1	1,735,187.2	6,477,868.6
		M2	1,735,150.1	6,477,917.7
		M3	1,734,856.6	6,477,826.5
		M4	1,734,956.7	6,477,694.2
		N1	1,734,427.3	6,477,393.9
AREA N		N2	1,734,341.6	6,477,356.2
		N3	1,734,249.9	6,477,307.3
		N4	1,734,361.4	6,477,244.0
AREA O		O1	1,733,764.7	6,477,583.5
		O2	1,733,812.8	6,477,667.2
		O3	1,733,667.8	6,477,727.3
		O4	1,733,629.3	6,477,659.3
		P1	1,733,317.6	6,477,921.2
AREA P		P2	1,733,234.8	6,478,091.6
		P3	1,733,044.8	6,478,211.6
		P4	1,732,901.6	6,478,021.1
AREA Q		Q1	1,721,348.0	6,479,350.5
		Q2	1,721,344.8	6,479,341.6
		Q3	1,721,284.8	6,479,321.6
		Q4	1,720,843.5	6,479,458.8
		Q5	1,720,565.2	6,479,584.8
		Q6	1,720,524.8	6,479,521.6
		Q7	1,720,544.8	6,479,458.7
		Q8	1,720,359.1	6,479,351.2
		Q9	1,720,305.1	6,479,343.0
		Q10	1,720,643.9	6,479,471.4
AREA R		R1	1,720,260.0	6,479,382.3
		R2	1,720,355.8	6,479,687.2
		R3	1,720,142.6	6,479,776.2
		R4	1,720,040.6	6,479,451.1



Most Significant Contributions

- Beneficial reuse of dredged materials
- Nearshore placement for the purposes of beach nourishment and eelgrass protection/enhancement

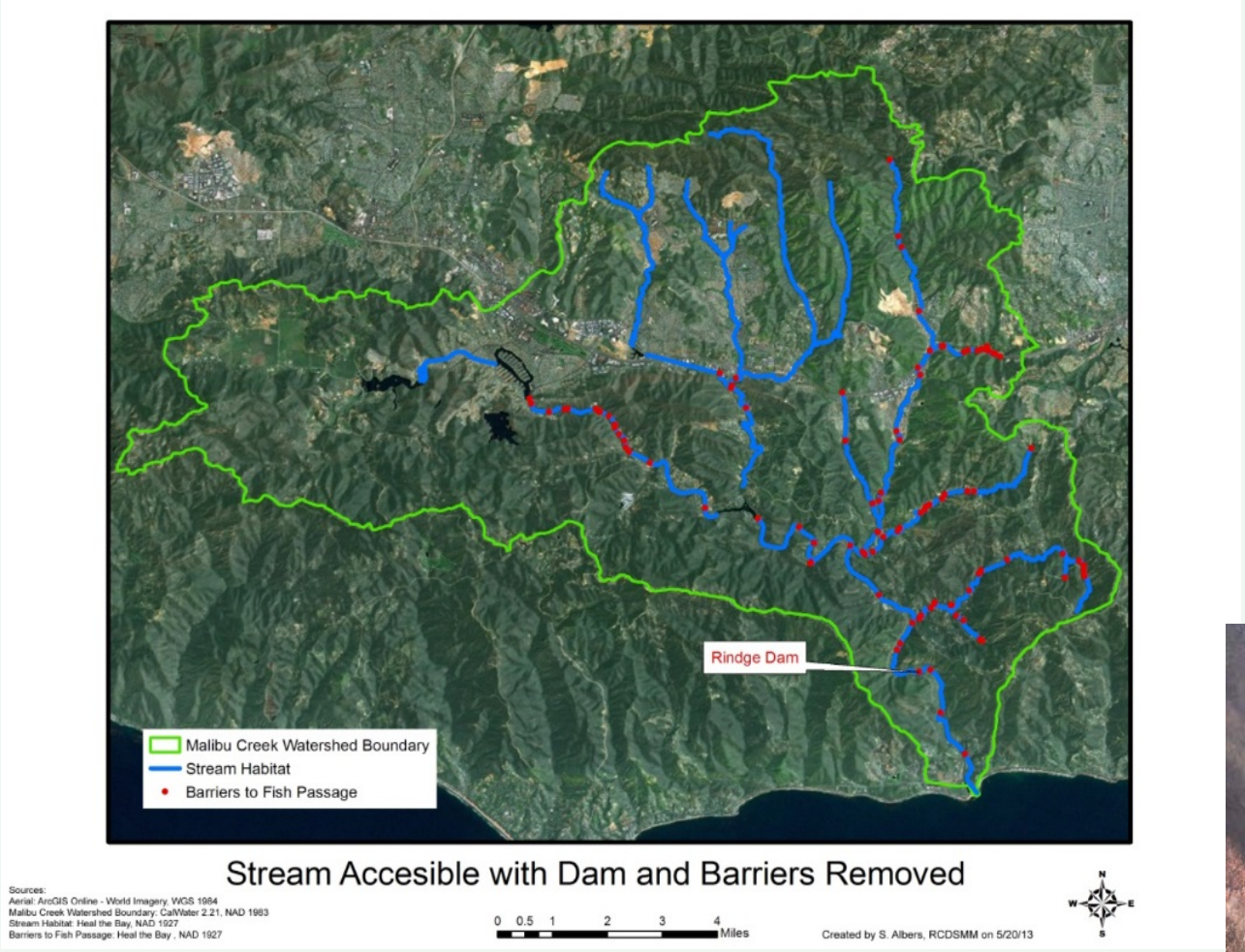
Challenges

- Identify nearshore-compatible sediments within the POLA
- Define areas of nearshore-compatible sediments in a dredgeable design
- Avoid impacts to existing eelgrass

Future Opportunities

- Identify protection of eelgrass as a beneficial reuse of dredged materials as purpose under Section 404 of the Clean Water Act

Malibu Creek Ecosystem Restoration Study





Most Significant Contributions

- Beneficial reuse of sands trapped behind a river dam that would otherwise flow to the sea

Challenges

- Segregating sand
- Transport and storage of sand
- Beach placement during off-season only
- Nearshore placement requires trucking and barging
- Traffic restrictions
- Surf grass concerns

Future Opportunities

- Allows use of inland source of sand for either beach placement or nearshore placement for purposes of nourishing beaches, removing built up sands from behind a large dam, and returning sands that, but for the dam, would have flowed to the placement area naturally.

Port of Long Beach Deep Draft Navigation Study



Most Significant Contributions

- Use of dredged material for benefits other than beach nourishment; in this case environmental restoration
- Use of dredged materials to refill historic (North and South Energy Island Borrow Pits) and recent (Surfside Borrow Pit) borrow pits

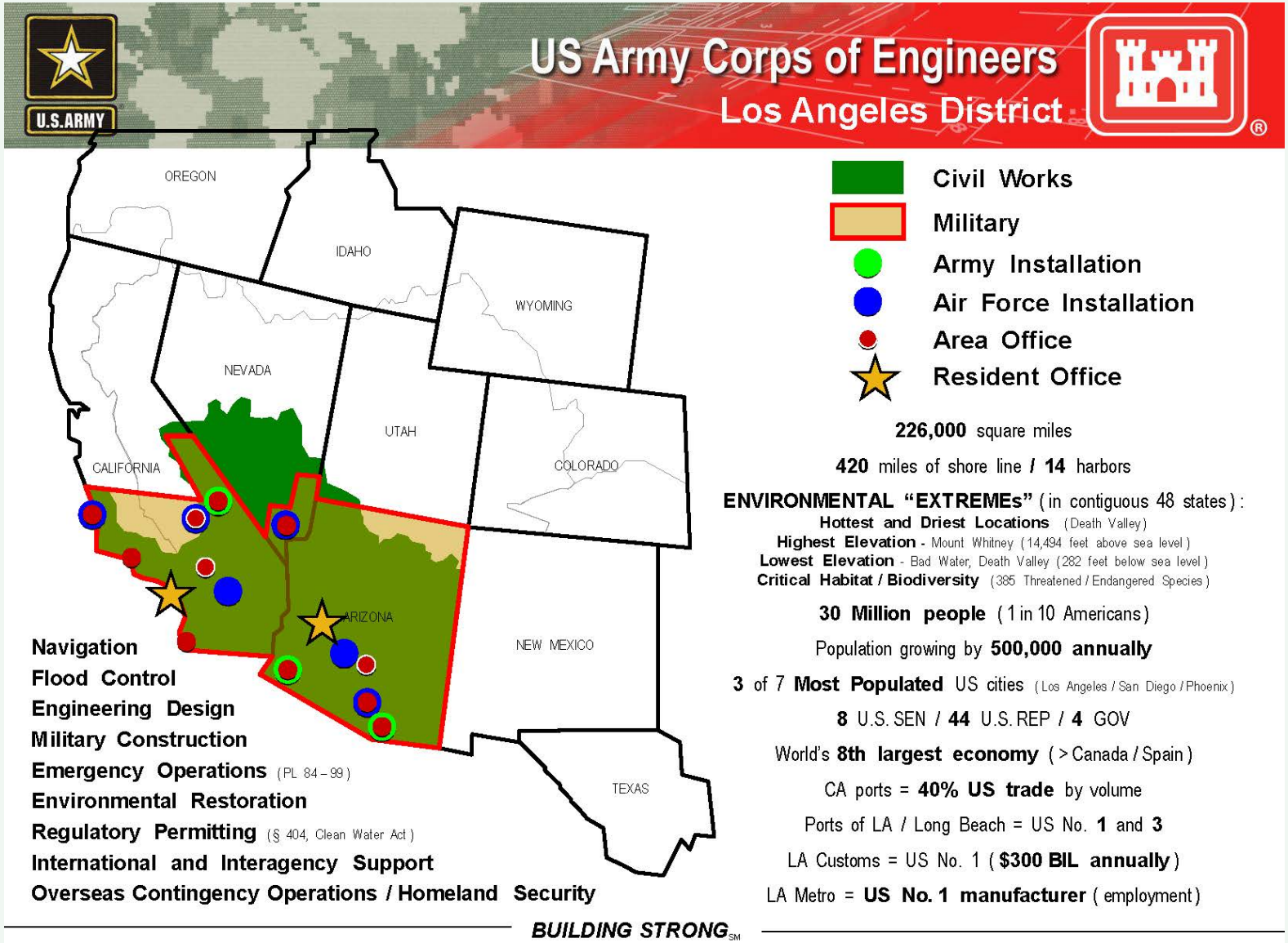
Challenges

- Obtain state and local approvals to use borrow pits, e.g. Coastal Commission
- USEPA review and concurrence for use and suitability of sediments

Future Opportunities

- Use of dredged materials for beneficial uses other than beach nourishment
- Add new dimensions to the term “beneficial reuse”
- Reduce “disposal” but still allow where appropriate

Questions?


U.S.ARMY
US Army Corps of Engineers
Los Angeles District
OREGON
IDAHO
WYOMING
NEVADA
UTAH
COLORADO
CALIFORNIA
ARIZONA
NEW MEXICO
TEXAS
Civil Works
Military
Army Installation
Air Force Installation
Area Office
Resident Office
226,000 square miles
420 miles of shore line / 14 harbors
ENVIRONMENTAL "EXTREMEs" (in contiguous 48 states):
Hottest and Driest Locations (Death Valley)
Highest Elevation - Mount Whitney (14,494 feet above sea level)
Lowest Elevation - Bad Water, Death Valley (282 feet below sea level)
Critical Habitat / Biodiversity (385 Threatened / Endangered Species)
30 Million people (1 in 10 Americans)
Population growing by 500,000 annually
3 of 7 Most Populated US cities (Los Angeles / San Diego / Phoenix)
8 U.S. SEN / 44 U.S. REP / 4 GOV
World's 8th largest economy (> Canada / Spain)
CA ports = 40% US trade by volume
Ports of LA / Long Beach = US No. 1 and 3
LA Customs = US No. 1 ($300 BIL annually)
LA Metro = US No. 1 manufacturer (employment)
Navigation
Flood Control
Engineering Design
Military Construction
Emergency Operations (PL 84-99)
Environmental Restoration
Regulatory Permitting (§ 404, Clean Water Act)
International and Interagency Support
Overseas Contingency Operations / Homeland Security
BUILDING STRONG℠

Engineering With Nature
Case Examples of Practice

Dan Marrone, Chris Vaccaro, Zach Jylkka
NMFS Protected Resources

05-06 October 2016
Gloucester, MA







Organizational Perspective

- NOAA-NMFS-GARFO-PRD-Section 7
- PRD is dedicated to managing, conserving, and rebuilding populations of marine mammals and endangered and threatened marine and anadromous species in rivers, bays, estuaries and marine waters
- ESA Section 7 consultations assist Federal agencies in fulfilling their duty to ensure Federal actions do not jeopardize the continued existence of a species or destroy or adversely modify critical habitat
- Biological opinions document NMFS' opinion as to whether the Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of critical habitat

Current Projects

- Sea Bright Offshore Borrow Area: Beach Nourishment
- James River Federal Navigation Project (FNP)
- Delaware River: Philadelphia to the Sea FNP Deepening and Maintenance

Sea Bright Offshore Borrow Area: Project Elements

- Three beach nourishment projects located in New Jersey
- Removal of over 16 million cubic yards via hopper dredge equipped with UXO screens
- Construct structures along the shoreline that aim to reduce damages from future storm events

Challenges

- Estimating and monitoring incidental take of ESA-listed species from hopper dredges utilizing UXO screens
- Determining if other entry points exist for take on hopper dredges
- Developing BMPs to minimize incidental take





Future Opportunities

- Continue beach nourishment while minimizing take of ESA-listed species
- Research and develop monitoring systems for hopper dredges
- Implement pilot projects to test new developments for ESA take mitigation (e.g., tickler chain, cameras)



James River: Project Elements

- Removal of shoal sediments via cutterhead dredge
- Material disposed of at Craney Island
- Biological Opinion in place for project since 2012
- Dredging occurs in spawning, rearing, and staging habitat for Atlantic sturgeon

Challenges

- Atlantic sturgeon spawning river—fall spawning is confirmed to occur and time of year restrictions need amendment.
- Atlantic sturgeon critical habitat has been proposed for the James River and may shift analysis of the project in the future.
- Management of incidental take as well as habitat disturbance for fish that are not directly affected by dredging activities

Future Opportunities

- Continue dredging shoals for safe navigation while working around important time of year segments for various life stages of Atlantic sturgeon
- Reduce impacts to Critical Habitat to inform analyses in other less studied river systems.

Delaware River: Project Elements

- Deepening from 40 to 45 feet, almost complete, but second season of blasting remains.
- Mechanical, cutterhead, and hopper dredging
- In-water disposal & beach nourishment

Delaware River: Challenges

- DE River, from the top of the Bay to the Trenton-Morrisville Bridge, has been proposed as Atlantic sturgeon critical habitat
- Blasting occurs in an expected spawning area
- Deterrents ineffective
- Relocation trawling
- Warm/dry season & unknown winter conditions upcoming



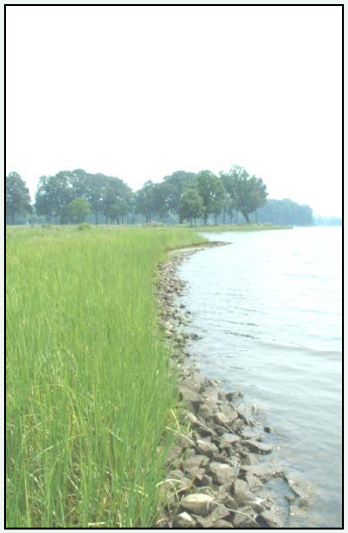
Downlines that are connected to explosives are pulled from the water by workers aboard the drillboat Apache after a morning blast off Chester, Pa., as part of the Army Corps' Delaware River deepening project, Wednesday, Jan. 20, 2016. (Tim Hawk | For NJ.com)

Future Opportunities

- Study impacts to Critical Habitat (e.g., sturgeon usage before, during, and after blasting/dredging)
- Continue to study deterrence mechanisms
- Improve climate change analyses

Engineering With Nature
Case Examples of Practice

Karen Greene
NOAA Fisheries
Greater Atlantic Regional Fisheries Office Habitat Conservation Division



05-06 October 2016
Gloucester, MA



Organizational Perspective

- NOAA Fisheries Mandates
  - Stewardship, conservation, protection and management
- Tools – MSA, FWCA, interagency coordination
- Support use of natural and nature based solutions





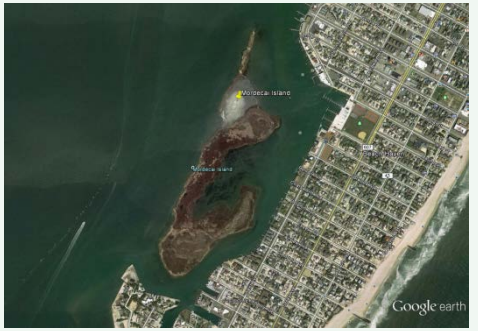


Current Projects

- Successes are currently few
  - Craney Island living shoreline
- Looking good
  - Mordecai Island, NJ
- Jury is still out on many
  - Fortescue, NJ
  - Avalon/Stone Harbor, NJ
- Lost opportunities
  - Revetment – Hull, MA
  - Delaware Bayshore wetlands









Significant Outcomes/Value Produced

- Improve fisheries habitat
  - Ecosystem services
  - Economic benefits







- Increased resiliency

Challenges

- Funding
  - Extra costs to construct environmentally beneficial projects
  - Funding for site screening, appropriate pre-construction/pre-design surveys, and post-construction monitoring.
- Selecting appropriate sites/methods
- Balancing ecological trade offs





Future Opportunities

- Increased collaboration with Corps
  - Site selection and monitoring protocols
- Wetland restoration
- Increasing ecological value of hardened shoreline stabilization structures
- Living shorelines







Engineering With Nature
Case Examples of Practice

Betsy Nicholson
NOAA Office for Coastal Management
05-06 October 2016
Gloucester, MA

Organizational Perspective

- The Office for Coastal Management is the nation's federal lead for coastal management activities.
- The emphasis is on a partnership approach with all sectors, striving to find the best approach for addressing coastal issues.
- Major initiatives include the National Coastal Zone Management Program, the Coral Reef Conservation Program, the Digital Coast, and the National Estuarine Research Reserve System.
- All pieces have a role to play in promoting green or natural infrastructure for resilience to coastal hazards.

Current Projects

CZMA Partnerships



Digital Coast

Coastal Green Infrastructure

Data | Tools | Training | Case Studies

Other Recent Initiatives

- Regional Coastal Resilience Grants
- Coastal Resilience Networks Grants

Current Projects

CZMA Partnerships:

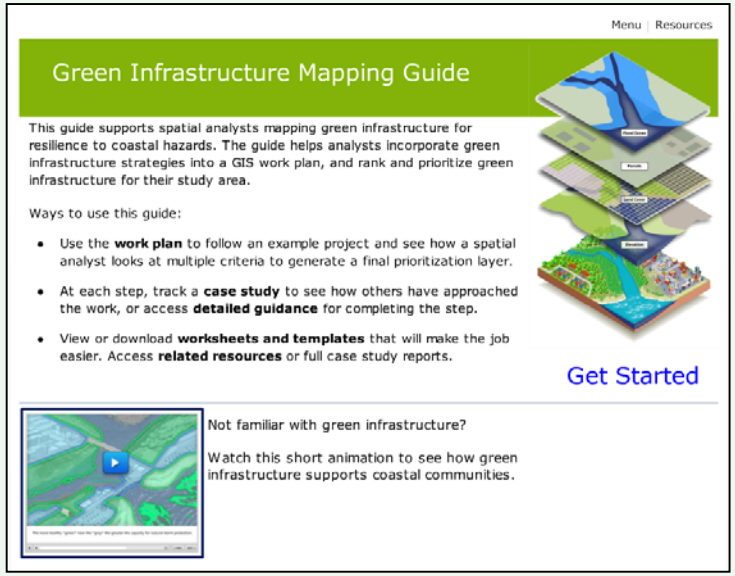
- National Coastal Zone Management Program
- National Estuarine Research Reserves
  - NERRS Science Collaborative

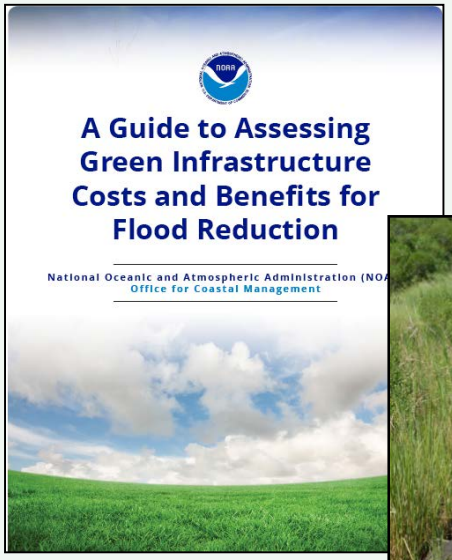


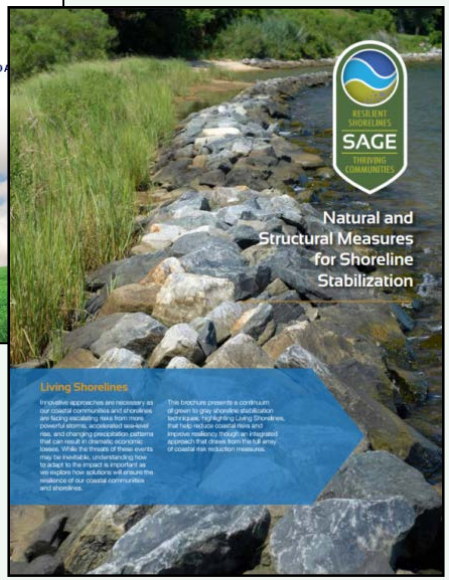


Current Projects

Digital Coast:



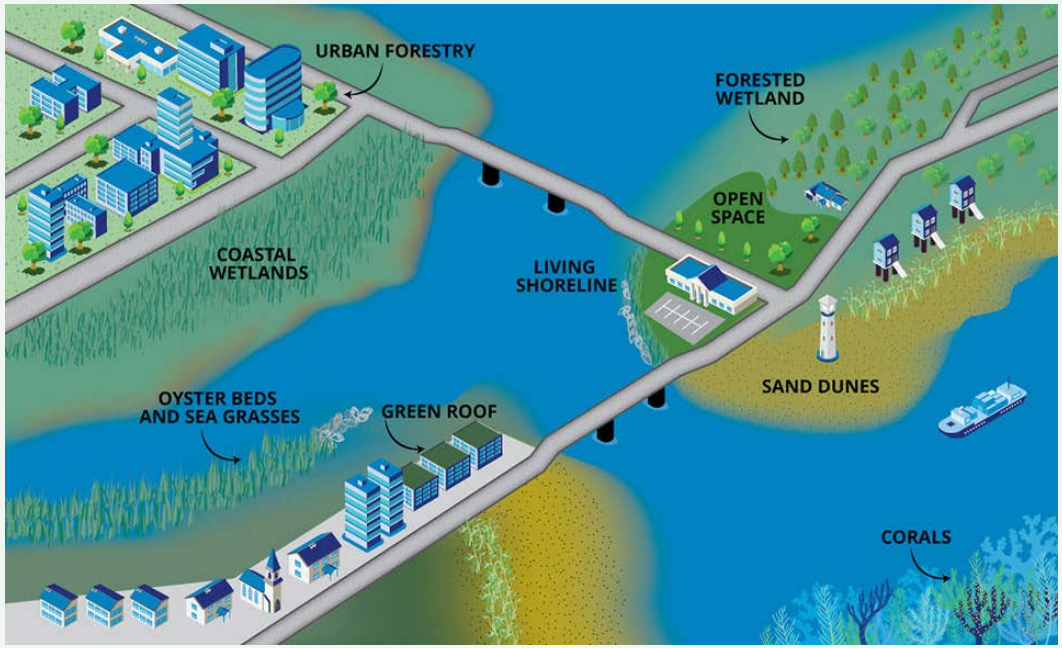




coast.noaa.gov/digitalcoast/topics/green-infrastructure

Significant Outcomes/Value Produced

- Better coordination within NOAA and other agencies



Challenges

- State/local policies and regulatory structure
- Education and outreach on value living shorelines/GI and acceptable approaches
- Clear design guidelines





Future Opportunities

- Stronger partnerships
- Better coordination
- Revisions to state/local policies and regulatory structures
- Continued education
- Additional guidance



Appendix V: Breakout Group Listing of Participants

Group 1: Hearing Room A Facilitator: Mark Murray-Brown, NMFS Notetaker: Edith Carson, NMFS			Group 2: Hearing Room B Facilitator: Jeff King, USACE Notetaker: Cynthia Banks, USACE			Group 3: Hearing Room C Facilitator: Monica Chasten, USACE Notetaker: Ainsley Smith, NMFS		
1	Mike Hayduk	USACE	1	Danielle Szimanski	USACE	1	Todd Swannack	USACE
2	Andrea Catanzaro	USACE	2	Dan Marrone	NMFS	2	Peter Weppler	USACE
3	Zack Jylkka	NMFS	3	Eric Hutchins	NMFS	3	Mike Johnson	NMFS
4	David O'Brien	NMFS	4	Todd Randall	USACE	4	Chris Vaccaro	NMFS
5	Donald Cresitello	USACE	5	Rachel Sweeny	NMFS	5	Rena Weichenberg	USACE
6	Michelle Harmon	NMFS	6	Jeff Corbino	USACE	6	Betsy Nicholson	NMFS
7	Joe Wilson	USACE	7	Allison Verkade	NMFS	7	Monica Chasten	USACE
8	John Catena	NMFS	8	Jerry Pasquale	USACE	8	Mathias Collins	NMFS
9	Jim Haggerty	USACE	9	Janine Harris	NMFS	9	Larry Smith	USACE
10	Peter Burns	NMFS	10	Karen Greene	NMFS	10	Michael Tucker	NMFS
11	Chris Boelke	NMFS	11			11	Kim Damon-Randall	NMFS
12			12			12	Lou Chiarella	NMFS
13			13			13		

Appendix VI: Facilitator Workbook for Breakout Group A

EWN Opportunity Discovery

Facilitator

- Using the worksheet below, ask participants to identify up to 3 opportunities, potential EWN demo projects and/or current projects that could/do incorporate EWN key elements (shown below). Share with the group.
- Group consolidate the opportunities as appropriate, then rank them.



Improving operational efficiency



Using natural systems and processes to maximize the benefits



Broadening the benefits of the project – social, environmental, economic



Using collaborative processes to engage stakeholders throughout the project

Group A

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Participants Identify Opportunities for Implementing EWN in Demo Projects or Current Projects

Identify the up to 3 opportunities, potential EWN demo projects and /or current or potential projects to incorporate the EWN key elements. From your perspective, rate each opportunity as high, medium or low potential; and the reason you give it that priority. Define the timeframe: Immediate: Now - 3 years; Short-term: 3-5 years; Long-term: 5-10 years.

Identify Opportunities	
Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Facilitated Discussion on Opportunities for Implementing EWN in Demo Projects or Current Projects

Facilitator:

- Go around the table and ask for a high priority opportunity from each of the participants asking them to also discuss why it is a top priority and the timeframe for implementing it. Keep going around the table until you have elicited all of the high priority opportunities. Explain to participants that all of the opportunities will be collected and included in the Workshop report.
- Once all of the opportunities have been collected, ask each member of the group to rate each opportunity as high, medium or low potential. Use these ratings to rank the top 2 opportunities (Rating: High 5 points; Medium 3 points; Low 1 point).
- Define the timeframe for the top 2 opportunities: Immediate: now -3 years; Short Term: 3-5 years; Long-Term: 5-10 years.

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
In-water BMP manual for pier and dock construction	23	Many reinvent the wheel with this. It would be nice to have one go-to operational manual for new and old staff to refer to.	
Hard stabilization projects: jettys, etc.	21	Look for more opportunities to use the material other than disposal. i.e. Jetties, reef balls	
ID Regional barriers to EWN Implementation States/ Industry i.e. property owner resistance	25	Identify and address regional barriers such as private property owner resistance.	
Monitoring for Atlantic sturgeon in the James River	27	Tagging and monitoring studies to learn more about where they are at different time periods. We need more information about where they are in the tributaries.	
Wolf Trap overboard placement site vs. blue crab sanctuary: Site placement Creates more blue crab habitat	35 [#2]	There are other opportunities to create blue crab habitat. We need to choose the right sites to place this material.	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
Building marsh islands behind a storm surge barrier to help attenuate wave impacts	29	Small marshes might not be enough to attenuate wave impacts. These projects are over sold to the public. Building large scale might be more beneficial. We also need to address public misconception about the effectiveness of these small marshes.	
Need Reference Sites	32 [#4]	Monitoring occurs a lot in these areas. It will be helpful to compare other habitats. We propose creating a pilot for these type of activities.	
Beneficial use of Dredge Material	33 [#3]	We need better uses for the material such as creating reef balls. Deep holes are an opportunity to place the material.	
Use new work material	27	For projects, we could try to use different materials such as cap shell base materials.	
Fishing Community Resiliency	25	Besides collaborating between USACE and NMFS, we should also be collaborating with the fishing community (commercial and recreational). We could include fishing projects that have the dual goal of coastal resiliency for habitat and benefits to fishing communities.	
Reuse of hard material to improve ANS CH	41 [#1]	Create artificial reefs for sturgeon spawning habitat. It's been done before in the James River but they couldn't get permits in the more desirable areas. We need to find a way to get closer to the more desirable areas.	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
Habitat Mapping	31 [#5]	We need a better understanding of where the critical habitat is located.	
Deepen dredge areas more the first time	20	Consider deepening the areas more than needed so species such as sturgeon won't be crushed between the bottom and vessels. Maintenance dredging could be more infrequent.	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Facilitator:

- Facilitate a dialogue on each of the top 2 opportunities using the worksheet below.

Describe the Current Situation: Thinking about the top priority opportunity, briefly describe the current situation noting problems that the project is intended to resolve. In a facilitated discussion, the group should answer the following, using the worksheet below.

Opportunity #1 (Top Priority) Title: Reuse of hard material to improve Atlantic sturgeon Critical Habitat	
Opportunity Description	**Current Situation**

Opportunity #2 Title: Wolf Trap overboard placement site vs. blue crab sanctuary: Site placement	
Opportunity Description	**Current Situation**

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Describe the EWN Project Opportunity: For each of the top two opportunities, draft an initial Opportunity Statement that broadly spells out the scope of the opportunity, what the desired outcome is and how success will be measured. It is based on the current situation, along with the goals of EWN – enhancing the benefits of a project and producing a win-win-win.

Sample Opportunity Statement

Working Project Title: Extending Habitat Conservation Program for the Interior Least Tern

Project Team will design, implement, monitor and evaluate an EWN-based project to assure the persistence and expansion of Interior Least Tern colonies within the Red and Arkansas River drainages. By conserving the habitat in perpetuity for this species, we will make a significant contribution to its preservation, benefit multiple species, and provide long-term cost savings to USACE and USFWS. We will document and communicate each step of our project so it can serve as a model for other EWN conservation projects focused on threatened and endangered species.

The team must review the Initial Opportunity Statement to ensure that it is:

- **Appropriately focused**
- **Avoids using negative language**
- **Is clear**
- **Is measurable**
- **Is achievable**
- **Has a clear timeline**

Opportunity #1 (Top Priority) Worksheet

Working Project Title: Develop decision support tool for advance identification of suitable placement of rocky material for Atlantic sturgeon critical habitat

The Project Team (NOAA NMFS, academic researchers, US Navy, states) will work to identify areas within Atlantic sturgeon critical habitat that are suitable for Atlantic sturgeon spawning/rearing habitat restoration or enhancement. These areas will form a database for all elements of the USACE to draw from to identify locations for beneficial hard substrate dredge placement. Success will be measured by progress toward Atlantic sturgeon critical habitat restoration goals as outlined in the recovery plan.

Develop the Action Plan and Identify the Timeline:

What are the key actions that need to be taken in the next 6 months to get this project underway?

Key Action Steps	Timeframe	Who's Responsible	Possible Issues/Concerns
Review existing tools to identify suitable habitat	2 months	USACE	Data gaps, workload
ID Partners/ States/ Academia	2 months	NMFS, USACE	Too many involved; try to find the right number of stakeholders
Identify sources of rocky material: review existing USACE databases	ongoing	USACE	Data gaps; competition for the material from the states
Advance ID of placement areas for rocky material that is suitable for ANS spawning/rearing; ID	6 months	Project team	Data gaps, workload

environmental constraints; ID Political/ State Constraints			
Modify existing GIS spatial database to measure distance, cost, and transport areas	6 months	USACE , NMFS	Workload, time

Benefits:

NMFS: Increase Atlantic sturgeon critical habitat. Help return them to historical spawning habitat. Increase the quality of spawning habitat. Increase in population which would lead to recovery. Create habitat for other species including shortnose sturgeon. Reduce vessel traffic for disposal.

ACOE: More predictability. More options for dredge material placement. Save capacity and extend the life of other placement sites. Less time figuring out where to put it. It will be quicker and more reliable. Transport might be shorter and therefore, there will be less expensive costs on fuel, etc. If compensatory mitigation were required, beneficial placement of material for sturgeon recovery could reduce/offset some of the mitigation costs.

Both: Developing/strengthening partnerships. Improving public perspective

Opportunity #2 Worksheet

Working Project Title: Identify alternative disposal sites adjacent to the Wolf Trap disposal site to increase blue crab habitat

The Project Team (NOAA, USACE (NAB, NAO), VIMS, VMRC) will negotiate the identification and authorization of the disposal sites adjacent to the Wolf Trap disposal site for the benefit of blue crab overwintering and foraging habitat. By providing more habitat, we're increasing this iconic species. The designation of the site will bring long term disposal, monitoring and it is cost effective. We will evaluate this site and transfer the success for other sites. It will serve as a model for other sites that are reaching capacity and to increase habitat value for NOAA trust resources and endangered species.

Develop the Action Plan and Identify the Timeline:

What are the key actions that need to be taken in the next 6 months to get this project underway?

Key Action Steps	Timeframe	Who's Responsible	Possible Issues/Concerns
Monitor existing site/system/process to see how it has currently improved habitat; ID hurdles to monitoring plan	2 months	USACE, VIMS, NMFS	Money, workload
Increase the collaborative process by IDing regulatory regimes (NOAA, USACE (NAB, NAO), VIMS, VMRC)	2 months	NOAA, USACE (NAB, NAO), VIMS, VMRC	Jurisdictions; getting everyone together might be difficult
Build a case that the existing site will reach capacity and that this process is beneficial to blue crabs	2 months	NMFS, USACE, VMRC	Workload

Benefits:

NMFS: Increase blue crab habitat and productivity. Increases productivity of other species. Benefits ecosystem as a whole. Increase fishing stocks and fishing resiliency.

ACOE: There will be an increase in future disposal areas. Reduce capacity needs. Decrease in transportation to other areas more offshore.

Both: Increase public perspective.

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Work together to brainstorm the following general questions:

a. How will we monitoring success?

Come up with a suite of options that would benefit both agencies. Cost savings. Actual implementation of the ideas. See if the expected outcomes and results did occur. Monitor species successes (population numbers, etc.).

b. How will we share data?

Create a formal document stating who has access to the data, where the data will be shared, and how the data will be used. GIS map out projects coordinates of where projects have occurred, share on website. Share other mapping tools and make sure it's accessible for those who need it. Keep communication flowing: meetings, phone calls,etc.

c. How will we measure benefits derived from natural and nature-based features with respect to Coastal Storm Risk Reduction?

Number of insurance claims. Reduction in lost habitat. Reduction in loss of infrastructure damage costs. Rapid recovery.

Appendix VII: Facilitator Workbook for Breakout Group B

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

EWN Opportunity Discovery GROUP B

Facilitator

- Using the worksheet below, ask participants to identify up to 3 opportunities, potential EWN demo projects and/or current projects that could/do incorporate EWN key elements (shown below). Share with the group.
- Group consolidate the opportunities as appropriate, then rank them.



Improving operational efficiency



Using natural systems and processes to maximize the benefits



Broadening the benefits of the project – social, environmental, economic



Using collaborative processes to engage stakeholders throughout the project

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Participants Identify Opportunities for Implementing EWN in Demo Projects or Current Projects

Identify the up to 3 opportunities, potential EWN demo projects and /or current or potential projects to incorporate the EWN key elements. From your perspective, rate each opportunity as high, medium or low potential; and the reason you give it that priority. Define the timeframe: Immediate: Now - 3 years; Short-term: 3-5 years; Long-term: 5-10 years.

Identify Opportunities	
Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Facilitated Discussion on Opportunities for Implementing EWN in Demo Projects or Current Projects

Facilitator:

- Go around the table and ask for a high priority opportunity from each of the participants asking them to also discuss why it is a top priority and the timeframe for implementing it. Keep going around the table until you have elicited all of the high priority opportunities. Explain to participants that all of the opportunities will be collected and included in the Workshop report.
- Once all of the opportunities have been collected, ask each member of the group to rate each opportunity as high, medium or low potential. Use these ratings to rank the top 2 opportunities (Rating: High 5 points; Medium 3 points; Low 1 point).
- Define the timeframe for the top 2 opportunities: Immediate: now -3 years; Short Term: 3-5 years; Long-Term: 5-10 years.

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
1. Corbino – Lateral Dikes/Jetties reference. Concrete mats that are easily maintained. Alternative to rock/concrete mats.	M	Rock and ACM are expensive, not much value for ecological	Short Term
2. Pasquale – Delaware Bay Beneficial use of DM for Oysters Beds enhancement. Shows environmental benefits, economic, social, opps to support Eel Grass. Sediment transport opp	M	They already have a site but would be nice.	Short Term
3. Hutching – Salt Marsh Restoration/Tide Gates (Oak Island), rapid growth with SLR, opp to get proactively involved, City-owned, provides flood benefits, upland to salt marsh (5-20 acres),	H (#5)	Pilot complete, willing owners	Short Term
4. Szimanski – Dredging to restore barrier island in Chesapeake,	M	help erosion, cooperation with other agencies (FWS)	Now

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
5. Streamline joint evaluation with resource agencies to identify project and facilitate coordinate, rough framework before formal coordination	H (#4)	Makes matters easier for design process	Short Term
6. Obtaining funds for monitoring	M		Short Term
7. Marrone – R&D alternative methods for reducing take instances	H	Can help both economically and environmentally beneficial to USACE and NMFS	Now
8. Harris – Beneficial island creation, (reference to bird island projects)	M	Creating habitat	Short Term
9. Regional guidance document (EWN options), grain size, site selection	H (#3)	Need guidance to assistance with planning, good opp to partner	Now
10. Randall – Soft, natural structural solutions for marsh edge with coral	M		Short Term
11. Habitat creation for species that may eventually get here (lobster)	M		Long Term

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
	H	Large port, about to construct	Now
12. Section 111 (Cape Cod Canal Jetty)	H	Interrupted sediment flow, fisheries concern, opp for collaboration	Now
13. Guidance on development on stabilizing naturally hard shorelines for fish habitat	H		Short Term
14. Greene – Working collaborative with USACE, data collection, post monitoring	H	Knowing this in advance will make the process go faster	Now
15. Guidance document on varying views on what is a degraded marsh/habitat	H	Need a consistent view on what 'degraded' means	Now
16. ID EWN options, 'cookbook', acknowledging all sites are different.	H (#1)	We can all be on the same page, prevent folks form looking at projects that will not be going forward.	Now
17. Develop better ways to integrate economic benefits of environmental benefits of EWN projects	H		Now
18. Dredging in Essex (thin layer placements)	H (#2)	Come with many EWN elements, proximity, with lots of reference sites	Now
19. Breakwater in Rockport enhancement for lobster			

Top 5: 18, 16, 9, 5, 3
Opportunity #1 (Top Priority) EWN Guidance (16)
Opportunity #2 Dredging in Essex (18)
Todd Randall will present for Group B

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Facilitator:

- Facilitate a dialogue on each of the top 2 opportunities using the worksheet below.

Describe the Current Situation: Thinking about the top priority opportunity, briefly describe the current situation noting problems that the project is intended to resolve. In a facilitated discussion, the group should answer the following, using the worksheet below.

• **Opportunity #1 (Top Priority) Title: Enhancing and Conserving NOAA Trust Resources Using EWN Principles for Project Design**	
Opportunity Description	**Current Situation**

Opportunity #2 Title:	
Opportunity Description	**Current Situation**

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Describe the EWN Project Opportunity: For each of the top two opportunities, draft an initial Opportunity Statement that broadly spells out the scope of the opportunity, what the desired outcome is and how success will be measured. It is based on the current situation, along with the goals of EWN – enhancing the benefits of a project and producing a win-win-win.

Sample Opportunity Statement

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Project Team will design, implement, monitor and evaluate an EWN-based project to assure the persistence and expansion of Interior Least Tern colonies within the Red and Arkansas River drainages. By conserving the habitat in perpetuity for this species, we will make a significant contribution to its preservation, benefit multiple species, and provide long-term cost savings to USACE and USFWS. We will document and communicate each step of our project so it can serve as a model for other EWN conservation projects focused on threatened and endangered species.

The team must review the Initial Opportunity Statement to ensure that it is:

- **Appropriately focused**
- **Avoids using negative language**
- **Is clear**
- **Is measurable**
- **Is achievable**
- **Has a clear timeline**

Opportunity #1 (Top Priority) Worksheet

Working Project Title: Enhancing and Conserving NOAA Trust Resources Using EWN Principles for Project Design

The Project Team will develop a guidance document that identifies opportunities during the planning/design phase to enhance NOAA Trust Resources by incorporating EWN principles for dredging activities and beneficial use of dredged material, shoreline protection and coastal resiliency. The document will identify resources and habitats of concern, options for habitat improvement and considerations for habitat protection. This will streamline design ideas while reducing time and cost for this process.

Develop the Action Plan and Identify the Timeline:

What are the key actions that need to be taken in the next 6 months to get this project underway?

Key Action Steps	Timeframe	Who's Responsible	Possible Issues/Concerns
Proceedings document circulated to determine level of buy-in from individual organizations	3 months	Bridges/King (USACE) Tortorici/Selburg (NMFS)	Workload concerns
Assuming approval to proceed, form a working group will begin developing an outline	6 months	King (USACE)/? (NMFS)	None.
Assuming approval of outline, working group will begin developing chapters	6 months	King (USACE)/? (NMFS)	None.
In-person working group meeting	Long-term	King	Restrictive travel budget

Opportunity #2 Worksheet

Working Project Title: USACE-NOAA Collaboration for a Thin Layer Placement Demonstration Project in New England

The Project Team will USACE and NOAA will collaborate to determine a prime location for a thin layer placement demonstration in New England. This will ensure agency buy-in, establish local reference sites and promote EWN principles. Site selection will include an iterative process that considers: geographic scope, sediment management need, restoration need, sponsor, long-term data and/or reference site, assessment of risk, constructability/costs, and ecological benefits (T&ES). This ultimate goal of this demonstrate project will be to provide a framework that established a process that will save time and money in addition improves ecological outcomes.

Develop the Action Plan and Identify the Timeline:

What are the key actions that need to be taken in the next 6 months to get this project underway?

Key Action Steps	Timeframe	Who's Responsible	Possible Issues/Concerns
Buy-in from individual organizations	3 months	Bridges/King (USACE) Tortorici/Selburg (NMFS)	Some uncertainty, workload
Establishing a project team	6 months	Randall/King (USACE)/? (NMFS)	Some uncertainty, workload
Research past related work	6 months	Randall/King (USACE)/? (NMFS)	Some uncertainty, workload
Project team will prioritize 15-20 potential areas for demonstration project	Long-term	Randall/King/? (NMFS)	Some uncertainty, workload

Work together to brainstorm the following general questions:

a. How will we monitoring success?

_____
_____
_____
_____
_____
_____.

b. How will we share data?

_____
_____
_____
_____
_____
_____.

c. How will we measure benefits derived from natural and nature-based features with respect to Coastal Storm Risk Reduction?

_____
_____
_____
_____
_____
_____.

Appendix VIII: Facilitator Workbook for Breakout Group C

10/5/16 Breakout group

Group C: Monica Chasten, Ainsley Smith

Top priorities identified

1. Improve communication across agencies
    a. Sharing data for restoration,
    b. Buddy up between organizations,
    c. Digital Coast webinar,
    d. Lessons learned,
    e. Share technical knowledge

2. Proactive conservation planning (7a1) with team approach
    a. Collaborate and communicate to create habitat restoration projects with hard substrata (ie, rock) and sediments (soft)
    b. Standard Assessment Models for living shorelines

3. Develop ways to quantify risk reduction, costs and benefits of EWN projects
4. Interagency collaboration for MONITORING of EWN projects
    a. Leveraging technical expertise
    b. Sharing in data collection efforts

5. Identify opportunities to create "green" structures by collaborating on initial construction and repair efforts.

Can further discuss on region specific implementation next (Delaware River and Bay, Chesapeake Bay, Barnegat Bay, NY/NJ). Quick start requires a USACE person willing to participate and a NOAA person willing to participate plus funding or at least funding prospect.

Bullet 1 Current Situation: There are many parallel efforts ongoing by different agencies (both federal and state). Need to increase leveraging and technical collaboration by developing better methods to share data, lessons learned, etc Agencies are stronger together and in times of limited budgets can do more by leveraging expertise and funding. Also need to keep nomenclature etc simple and practical…many similar efforts, but different names.

EWN Opportunity Discovery

Facilitator Monica Chasten and Ainsley Smith - Group 3

- Using the worksheet below, ask participants to identify up to 3 opportunities, potential EWN demo projects and/or current projects that could/do incorporate EWN key elements (shown below). Share with the group.
- Group consolidates the opportunities as appropriate, then rank them.



Improving operational efficiency



Using natural systems and processes to maximize the benefits



Broadening the benefits of the project – social, environmental, economic



Using collaborative processes to engage stakeholders throughout the project

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Participants Identify Opportunities for Implementing EWN in Demo Projects or Current Projects

Identify the up to 3 opportunities, potential EWN demo projects and /or current or potential projects to incorporate the EWN key elements. From your perspective, rate each opportunity as high, medium or low potential; and the reason you give it that priority. Define the timeframe: Immediate: Now - 3 years; Short-term: 3-5 years; Long-term: 5-10 years.

Identify Opportunities	
Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

Specific Project Opportunity Title/Name:	
Priority (H/M/L) & Rationale:	**Timeframe for Implementation:**
Description of Opportunity:	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Facilitated Discussion on Opportunities for Implementing EWN in Demo Projects or Current Projects

Facilitator:

- Go around the table and ask for a high priority opportunity from each of the participants asking them to also discuss why it is a top priority and the timeframe for implementing it. Keep going around the table until you have elicited all of the high priority opportunities. Explain to participants that all of the opportunities will be collected and included in the Workshop report.
- Once all of the opportunities have been collected, ask each member of the group to rate each opportunity as high, medium or low potential. Use these ratings to rank the top 2 opportunities (Rating: High 5 points; Medium 3 points; Low 1 point).
- Define the timeframe for the top 2 opportunities: Immediate: now -3 years; Short Term: 3-5 years; Long-Term: 5-10 years.

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
Better communication between Coastal Management and NMFS and ACOE – "buddy up" (regional level offices) to improve communication and share cooperative agreements		**No missed opportunities**	**Now**
Restoration site database – identify sites that need restoration, where has been done, specific details on site, links to reports		**Helpful for new projects, benchmark cost estimates, compare sites in similar geographic areas, put all information in one spot -NROC/EPA has already started this (northeastoceandata.org)**	**Now**

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
Develop standard assessment model for living shorelines – how to look at engineering and biological benefits, model to explain different techniques and how they benefit which species, as well as economic information to to convey info to public; done on a regional level – can start with best practices between ACOE and NMFS, then share with states			**Now between ACOE and NMFS, a few years to share with states**
Communication collaboration on 7(a)(1) to be aware of what projects and opportunities are going on			**Now**
Quantify or measuring risk reduction/cost savings/protection reduced by EWN/NBF projects – will a smaller structure be sufficient to achieve goals etc, give ranges of anticipated results to help with understanding.		**Will be big selling point to program, need to give tangible examples of successes**	**Now, start with guidelines**
NMFS using 7(a)(1) to create habitat restoration projects - can blasted material be used to create other spawning grounds – identify sites that are good for restoration		**Help with proactive conservation of species instead of being reactive**	**Short-term collaboration – will need a few meetings to start identifying sites**

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
Repair of existing structures (breakwaters) - not taking advantage of adding in new features when opportunities come up (add different types of stone/size etc)		**Take advantage of opportunities to improve habitat**	**Now**
Information sharing and lessons learned between agencies – common place or website to contribute to share info or sharing info on outreach/collaborations; start with ACOE and NOAA; build off SAGE site?		**Many groups doing similar work – stronger together than doing parallel actions**	**Now**
Be proactive in sharing 7(a)(1) methods during early stages of project planning			
Digital Coast Webinar to share tools, give feedback to make everyone aware of what tools partners are using			**Now**
Barrier island and inlet maintenance – sand bypass system, use sand in back bay environment – look for EWN opportunities in inlets		**Cheaper? Work with natural environment**	

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
Rivers with salmon have been levy-ed, floodplains are cut off from rivers – engineers floodplains for multiuse – take water in winter and provide flood relief and salmon, provide farm land in summer (Central CA)		**Need for habitat**	
Large structures (intakes, groins) create predator habitat, bad for juvenile salmon – create predator habitats in separate areas and corner off area for juvenile fish (WCR) – innovative approaches to ecophysicial interactions		**Need to protect juvenile fish**	
Incorporate ecosystem services and then reevaluate federal standard of maintenance dredging			**Long term**
7(a)(1) ways for beneficial reuse hard sediment to help with degraded rearing or foraging habitat – increase shellfish beds, seagsrass etc			
Allow for conservation planning under ESA for habitats associated with maintenance dredging projects – nest site enhancements			

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Specific Project Opportunity	Team's Priority Ratings (H/M/L)	Reason for Priority	Timeframe for Implementation
Harbor deepening projects - allow for environmental considerations for depths for species, not just economic (vessel depth + room for fish to move) – benefits for fish are not included in evaluation of project – can you apply a value to each organism?			
Projects were not ranked, but merged into overarching categories – see separate attachment for list of top priorities			

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Facilitator: Monica Chasten and Ainsley Smith

- Facilitate a dialogue on each of the top 2 opportunities using the worksheet below.

Describe the Current Situation: Thinking about the top priority opportunity, briefly describe the current situation noting problems that the project is intended to resolve. In a facilitated discussion, the group should answer the following, using the worksheet below.

Opportunity #1 (Top Priority) Title: Communication	
Opportunity Description	**Current Situation**

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Opportunity #2 Title: Database	
Opportunity Description	**Current Situation**

USACE-NMFS EWN Workbook
EWN Opportunity Discovery

Describe the EWN Project Opportunity: For each of the top two opportunities, draft an initial Opportunity Statement that broadly spells out the scope of the opportunity, what the desired outcome is and how success will be measured. It is based on the current situation, along with the goals of EWN – enhancing the benefits of a project and producing a win-win-win.

Sample Opportunity Statement

Working Project Title: Extending Habitat Conservation Program for the Interior Least Tern

Project Team will design, implement, monitor and evaluate an EWN-based project to assure the persistence and expansion of Interior Least Tern colonies within the Red and Arkansas River drainages. By conserving the habitat in perpetuity for this species, we will make a significant contribution to its preservation, benefit multiple species, and provide long-term cost savings to USACE and USFWS. We will document and communicate each step of our project so it can serve as a model for other EWN conservation projects focused on threatened and endangered species.

The team must review the Initial Opportunity Statement to ensure that it is:

- **Appropriately focused**
- **Avoids using negative language**
- **Is clear**
- **Is measurable**
- **Is achievable**
- **Has a clear timeline**

Opportunity #1 Top Priority Worksheet

Working Project Title: Communication and collaboration across agencies, informed by central database about projects

The Project Team will Share information across districts at annual meetings, conference calls and workshops, based on central database about upcoming projects, identify opportunities for beneficial use sites, monitoring that has or will occurred, knowing what environmental opportunities are (on local level), have opportunities been screened or not, what has been tested. Coastal Mgmt office can help connect with states and regional forums

Develop the Action Plan and Identify the Timeline:

What are the key actions that need to be taken in the next 6 months to get this project underway?

Key Action Steps	Timeframe	Who's Responsible	Possible Issues/Concerns
Prepare "read ahead material" briefings before meeting so discussion is productive and efficient		ACOE	
Discuss at existing annual meetings and conference calls WEDA, Regional Dredge Team meetings, ACOE/HCD meetings		ACOE and NOAA	
Identify and invite stakeholders to discussions		ACOE and NOAA	How to identify state users or stake holders (Universities, sea grant, logal government, cooperative units, State Fish and wildlife) and their sediment or funding needs
Develop data sharing site		ACOE ITL to set up, NOAA and ACOE team to contribute information	Firewalls Version control

			Multiple users entering data How to identify opportunities yet stay focused?
Input details on upcoming projects, potential beneficial use projects, monitoring data and needs for assistance; Identifying existing databases like DIS			
Identify monitoring needs		ACOE and NOAA	Need match making to identify partners who can assist with project monitoring?
Identify who has funding or assets for projects or monitoring			
Share historic data from previous projects, monitoring protocols and contract specifications, MOUs		All	Include public affairs departments when sharing information Need so communicate benefits, successes
Share construction specifications for sites for NMFS permitting, previous BiOps and approved projects		All	FOIA Confidentiality

Opportunity #2 Worksheet

Working Project Title: Greening of Existing Structures

The Project Team will identify, assess and repair existing hardened structures to make them more in line with EWN.

Develop the Action Plan and Identify the Timeline:

What are the key actions that need to be taken in the next 6 months to get this project underway?

Key Action Steps	Timeframe	Who's Responsible	Possible Issues/Concerns
Action 1: Identify structures that are scheduled for pending repair within 12 months by canvassing ACOE navigation structure database – include greening from start of planning repair	Can happen immediately – 3 months	Monica and Coastal systems asset mgmt. team (meets in November)	Is there a flood mgmt. database as well? Consider dunes or soft structures as well. Living shorelines. Beach nourishment… endless possibilities. Budget runs 2 years ahead – need to identify future projects
Action 2: Identify rapid bioassessment methodology tools that already exist (CRAM/SAM) and determine their applicability or develop model/tool if needed, to determine best options and "score" of outcomes based on materials/potential plans	Develop tool within a year, apply tool to process within a few months to allow for time to incorporate changes		When to develop tool vs locate projects – let timeline of repair drive tool
Action 3: Determine what type of "greening" will occur – contact Tony (Buffalo) for advice on how to proceed based on his experience, look into R+D and		ACOE	

create action plan for site			
Action 4: Collaborate with funders of project		ACOE	
Action 5: Implement project	Ideally keep to typical project schedule	ACOE	
Action 6: Monitor project, apply feedback to model		NOAA and ACOE	Funding for monitoring; workload
Action 7: Create case study from first example to apply for future projects		ACOE	

Work together to brainstorm the following general questions:

a. How will we monitoring success?

We need to define success from engineering and ecological perspectives

Success is time savings in consultation process by implementing environmental operating principals

Current assessments are judged by: Was it built to the correct specifications? Have plantings continued to grow? Has habitat improved? Is there less erosion or coastal hazard reductions? Are there any standard protocols at this time? (Does not appear to be from CZMA perspecitve) Does HCD have monitoring plans?

If we write out 7a1 conservation plan ahead of time, could write one programmatic consultation for greening of structures instead of doing project specific consultations which would save time. Agencies need to meet well in advance of implementation to account for permitting and planning (we don't do this yet). ACOE does outreach to resource agencies but resource constrained. Prioritize projects among districts at annual meeting to assess for year and make commitment to become more invested. This also allows for batching and S7 programmatic/BiOp development for the greening of structures, can help to get broad view of plans by combining activities. Could use opportunity to assess risk of monitoring/species presence etc to avoid future consultations on project site. Must incorporate monitoring into work plan – must agree on which variables are monitored for ahead of time – need NMFS Permit to do monitoring, but can identify need for monitoring and include in S7 consultation to avoid S10 permit

Emphasize importance of sharing quantities data and anecdotes/lessons learned

What are the key parameters and are they shared? Metrics – quantifying risk, the big "so what?"

Remote monitoring - Incorporate monitoring plan such as aerial to visualize project area

B. How will we share data?

Todd's group is currently developing guidance for monitoring plans/how to judge ecological success – first workshop in 2 weeks – will have webinar option to dial in

Determine points of contact to share information within agencies to keep others informed of webinars and calls

C. How will we measure benefits derived from natural and nature-based features with respect to Coastal Storm Risk Reduction?

Is structural integrity maintained (this is how projects are currently monitored)

How to monitor community resilience? → Need to develop paradigm shift on how to assess structures – is it performing correct ecological purpose as planned?

States have different monitoring guidelines – ex CA monitoring guidelines for eelgrass

Needs classification system to determine what's present in terms of habitat

Don't have quantitative data at this time – need to identify what parameters would be cost effective to monitor first

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14. ABSTRACT

This proceedings report summarizes the activities of a collaborative workshop conducted on the topic of Engineering With Nature (EWN) by the U.S. Army Corps of Engineers (USACE) and the National Oceanic Atmospheric Administration (NOAA)-National Marine Fisheries Service (NMFS). The workshop was held from October 5-6, 2016, in Gloucester, Massachusetts. EWN is defined as sustainable development of water resources infrastructure through the beneficial integration of engineering and natural systems (*www.engineeringwithnature.org*). It is this intentional alignment of natural and engineering processes that efficiently and sustainably delivers economic, environmental, and social benefits through collaborative processes. Thirty-eight workshop participants represented USACE and NOAA. The objectives of the workshop included were to: 1. provide an overview of EWN, review progress to date, and establish a path forward for application in the coastal zone; 2. discuss USACE and NMFS opportunities/challenges with respect to applying EWN; 3. use tools developed in conjunction with workshop format to guide EWN project teams (i.e., breakout groups) towards the identification of specific EWN-based opportunities; and 4. prepare detailed Opportunity Statements for the highest-value EWN collaborative projects/solutions. The workshop included a plenary session where USACE and NMFS leaders presented their respective organizational overviews and legislative mandates concerning EWN implementation in the coastal zone. Interactive breakout sessions were also convened to gather input on priority opportunities for collaborative EWN projects in conjunction with potential initial steps, concerns, and challenges. Over the course of the two-day workshop, a total of six short- and long-term opportunities emerged. It will be essential to capture and share lessons learned as the two organizations plan and implement selected EWN projects/initiatives.

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