

ENGINEERING WITH ECOLOGY AND NATURAL RESOURCE ECONOMICS TO EMPHASIZE COASTAL AND HABITAT RESILIENCE

Ramboll

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RAMBOLL

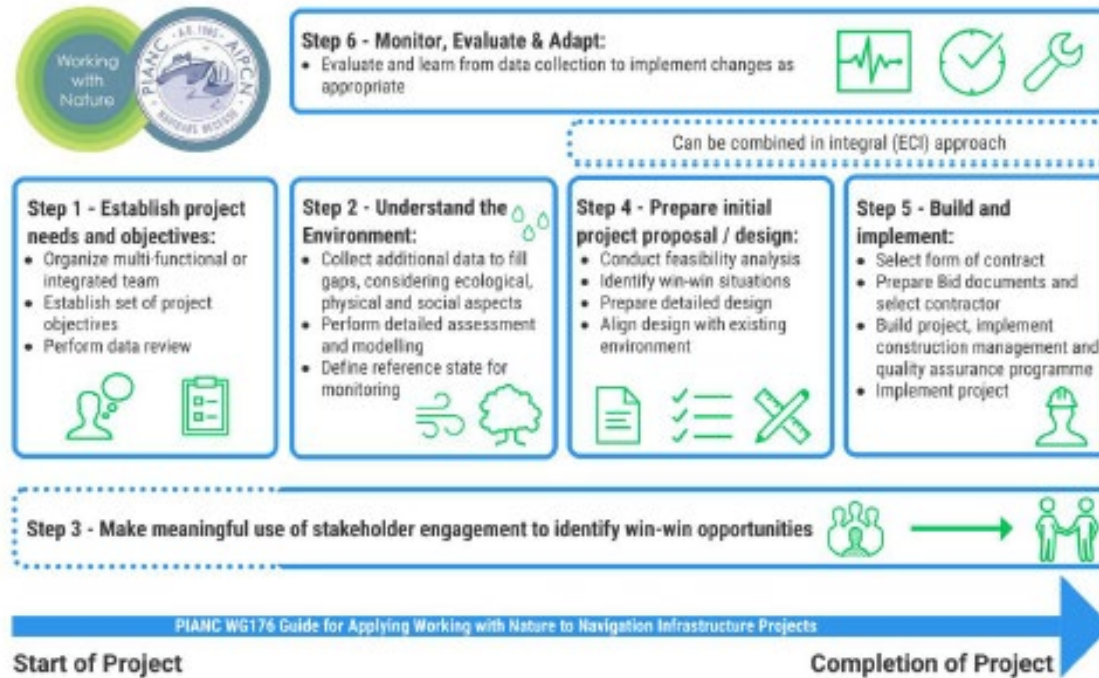
Bright ideas.
Sustainable change.



Outline

1. Engineering with Ecology Approaches
2. Deployment and Funding
3. Project Highlight
4. Lessons Learned/Summary

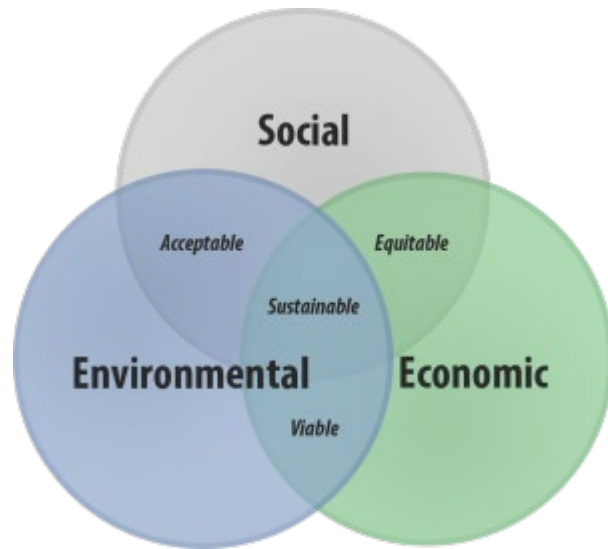
Working with Nature (WwN)



• PIANC 2018, 2022
<https://www.pianc.org/publications>

- Project needs and objectives developed and performed in the context of the environment
- Cost-benefit and ecosystem services frameworks to evaluate beneficial use

Engineering with Nature[®] (EwN)



<https://ewn.ercd.dren.mil>

- **Holistic** – an ecosystems approach
- **Innovative** – science-based, solutions-oriented
- **Collaborative** – from design through implementation and monitoring
- **Adaptive** – supporting system sustainability and resilience
- **Socially responsive** – engaging stakeholders
- **Cost-effective** – efficient and value-adding

Nature-based Solutions

Conserving, restoring, and engineering nature for the benefit of people and nature

- **Project delivery**—“faster, cheaper”
- **Project performance**—complete solutions
- **Adaptability**—scalable, phase-able, flexible
- **Sustainability**—self-repair



- **Value to the Nation**—multi-functional benefits
- **Diversified investment**—diversified value→ diversified partnerships
- **Social license**—community and stakeholder support and participation
- **Regulatory efficiency**—resolving conflict through win-win solutions

NbS



SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

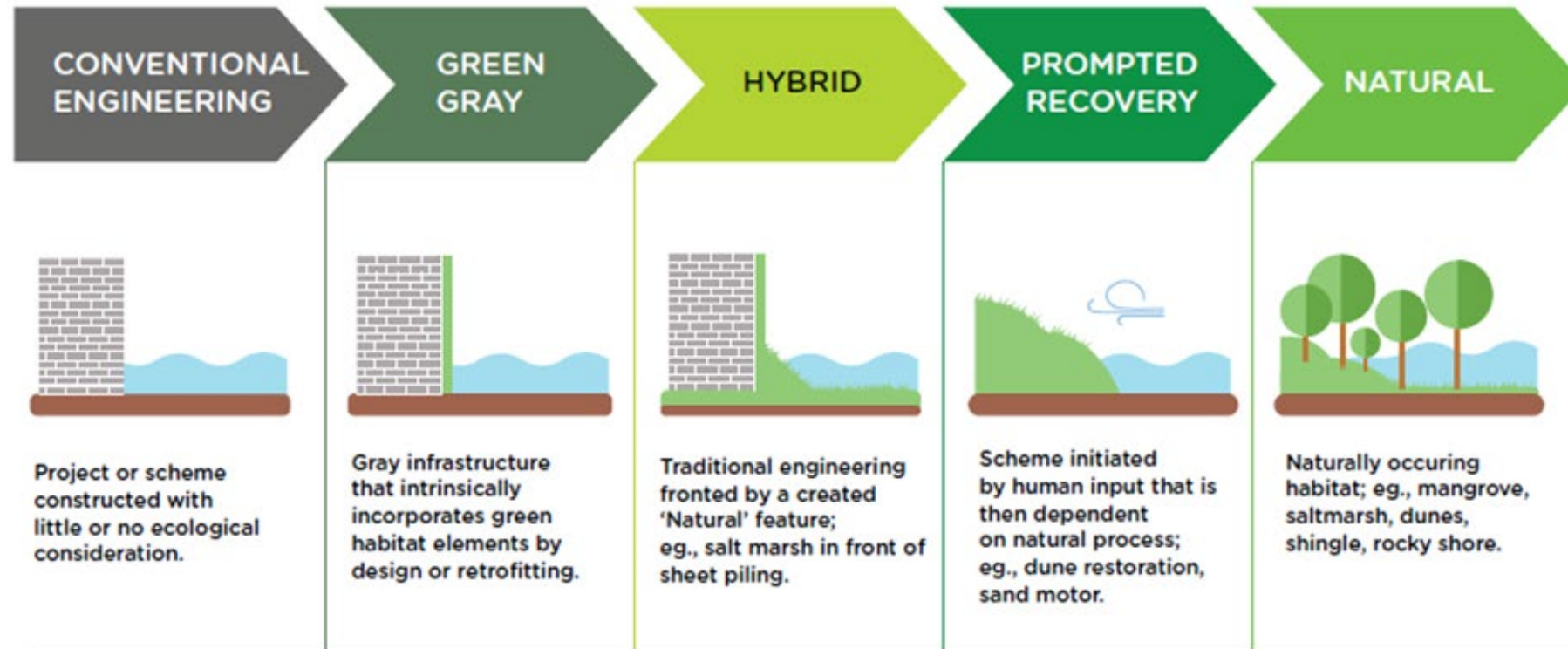
16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOALS

Conventional & Nature-based Infrastructure

Gray —————> Nature Based and Green-Gray solutions —————> Green



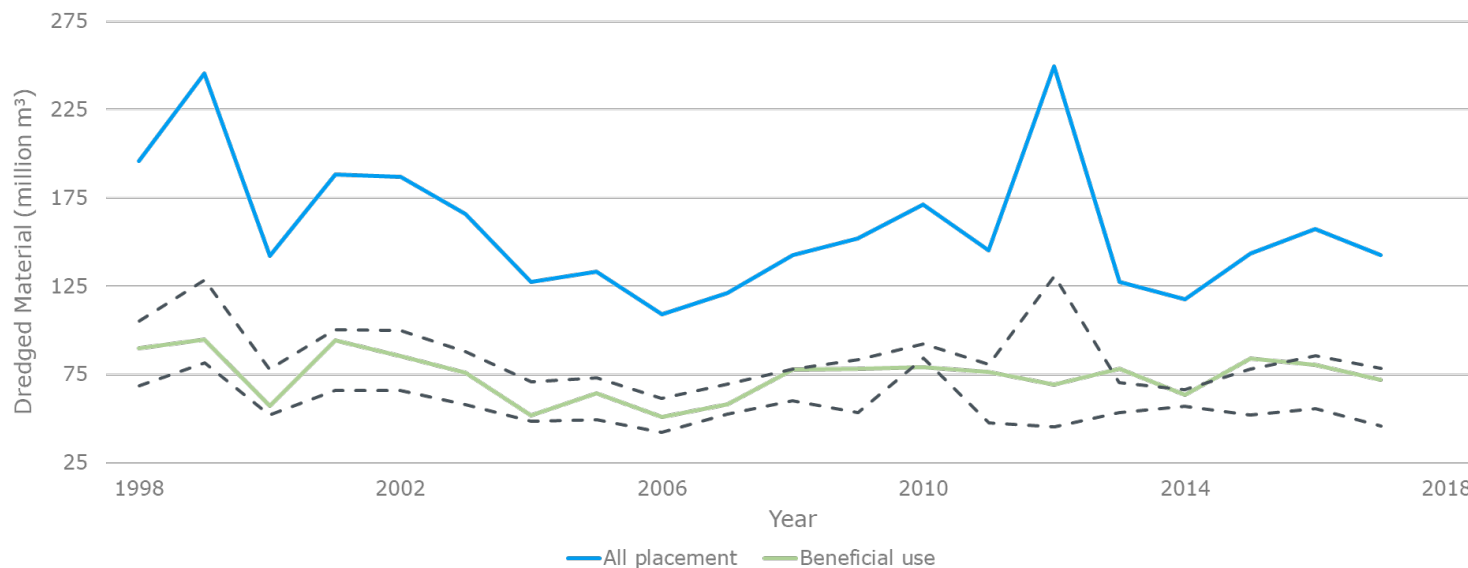
\$\$\$ Short Term cost
 \$ Long Term O & M cost
 \$ Ecosystem services value

\$ Short Term cost*
 \$\$\$ Long Term O & M cost*
 \$\$\$ Ecosystem services value

modified from Suedel et al, 2021

Deployment and Funding

WRDA 2020 requires USACE to **maximize beneficial use** of dredged material, considering **environmental and economic benefits**



Data from the USACE RSM BU Database (<https://rsm.usace.army.mil/BUDB>). Adapted from Searcy Bell et al. (2021).

“Natural Infrastructure” in the Infrastructure Investment and Jobs Act 2021

- Billions invested in nature-based solutions
- 17+ references to “natural infrastructure” in the bill
- USACE: ~\$17B in appropriations, including:
 - \$2.5B for CSRM, \$1B for multi-purpose
 - \$2.5B for inland FRM, \$750M for multi-purpose
- DOT, surface transportation NI
- DOE, hydropower and FRM NI
- BoR, Western Water Infrastructure NI
- Other supporting investments with NRCS, FEMA, NOAA, EPA, USFWS, Bureau Indian Affairs



Nature-Based Solutions: A White House Priority

2022
Earth Day EO



BRIEFING ROOM

Executive Order on Strengthening the Nation's Forests, Communities, and Local Economies

APRIL 22, 2022 • PRESIDENTIAL ACTIONS



OFFICE OF SCIENCE AND TECHNOLOGY POLICY

WHITE HOUSE
ROUNDTABLE –
“KNOWLEDGE IN NATURE:
HOW NATURE CAN HELP
GROW A BETTER FUTURE”



BRIEFING ROOM

Executive Order on Tackling the Climate Crisis at Home and Abroad

JANUARY 27, 2021 • PRESIDENTIAL ACTIONS

*America the Beautiful
30x30*

Justice40 Initiative

***Sec. 4. Deploying Nature-Based Solutions to Tackle Climate Change and Enhance Resilience:
“To further amplify the power of nature, including its ability to absorb climate pollution and increase resilience in all communities, today’s Executive Order calls for the following:”***

- 1) Report on Nature-Based Solutions***
- 2) Guidance on Valuing Nature***
- 3) First U.S. National Nature Assessment***

Natural Resource Economics

Natural capital = natural assets that generate “ecosystem services” that yield goods and services, which provide value to humans

CASH FLOW



PUBLIC COMMENT DRAFT – [Federal Register](#) Document ID 2022-17993
[Regulations.gov](#) Docket Number OMB-2022-0009

NATIONAL STRATEGY TO DEVELOP STATISTICS FOR ENVIRONMENTAL-ECONOMIC DECISIONS

A U.S. System of Natural Capital Accounting and Associated Environmental-Economic Statistics

Office of Science and Technology Policy
 Office of Management and Budget
 Department of Commerce

AUGUST 18th, 2022



Capital Asset Approach

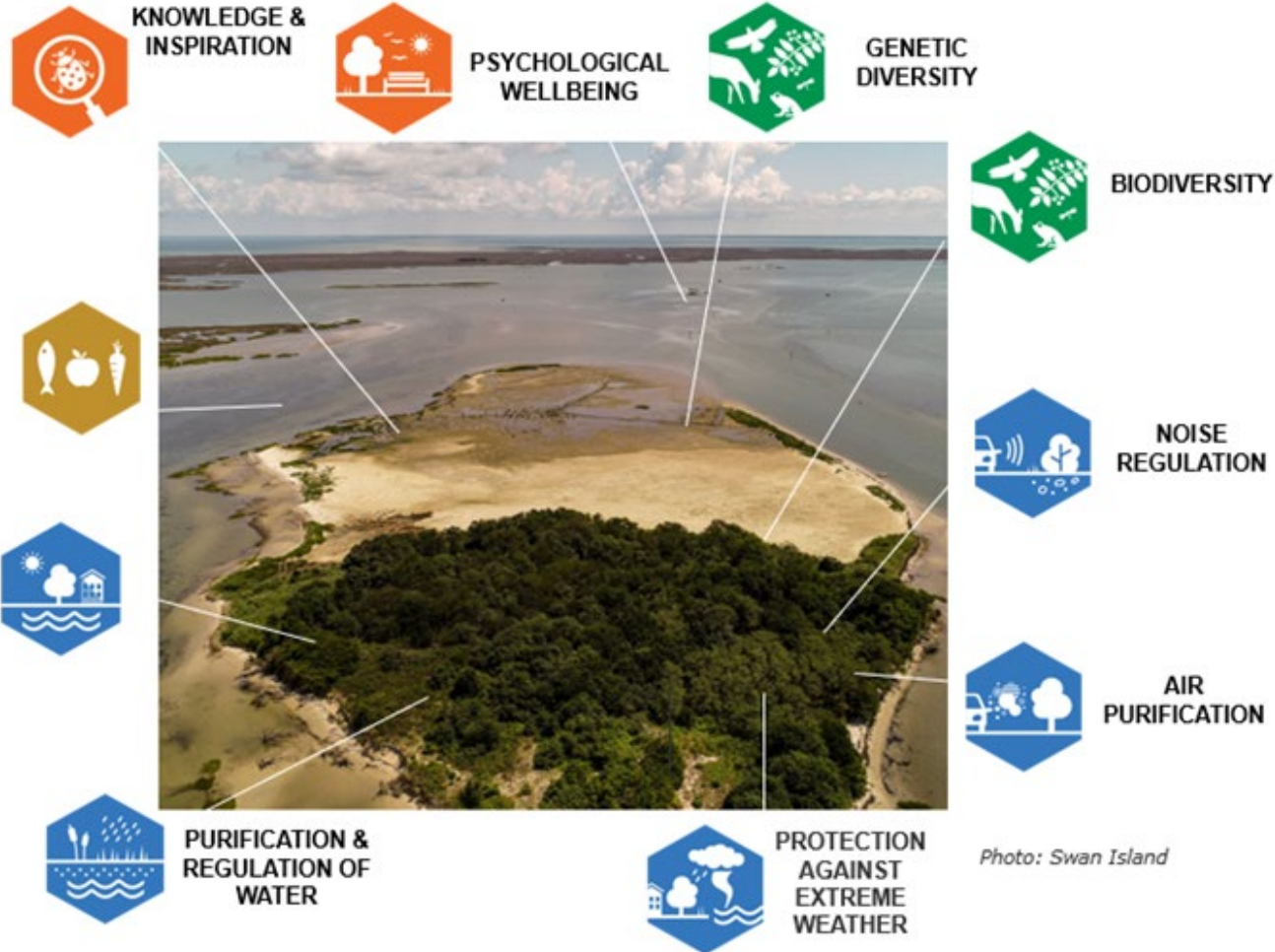
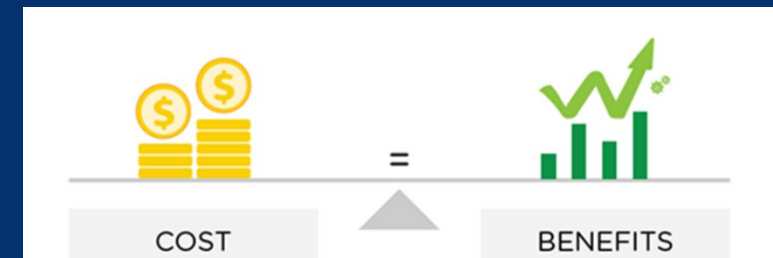


Photo: Swan Island

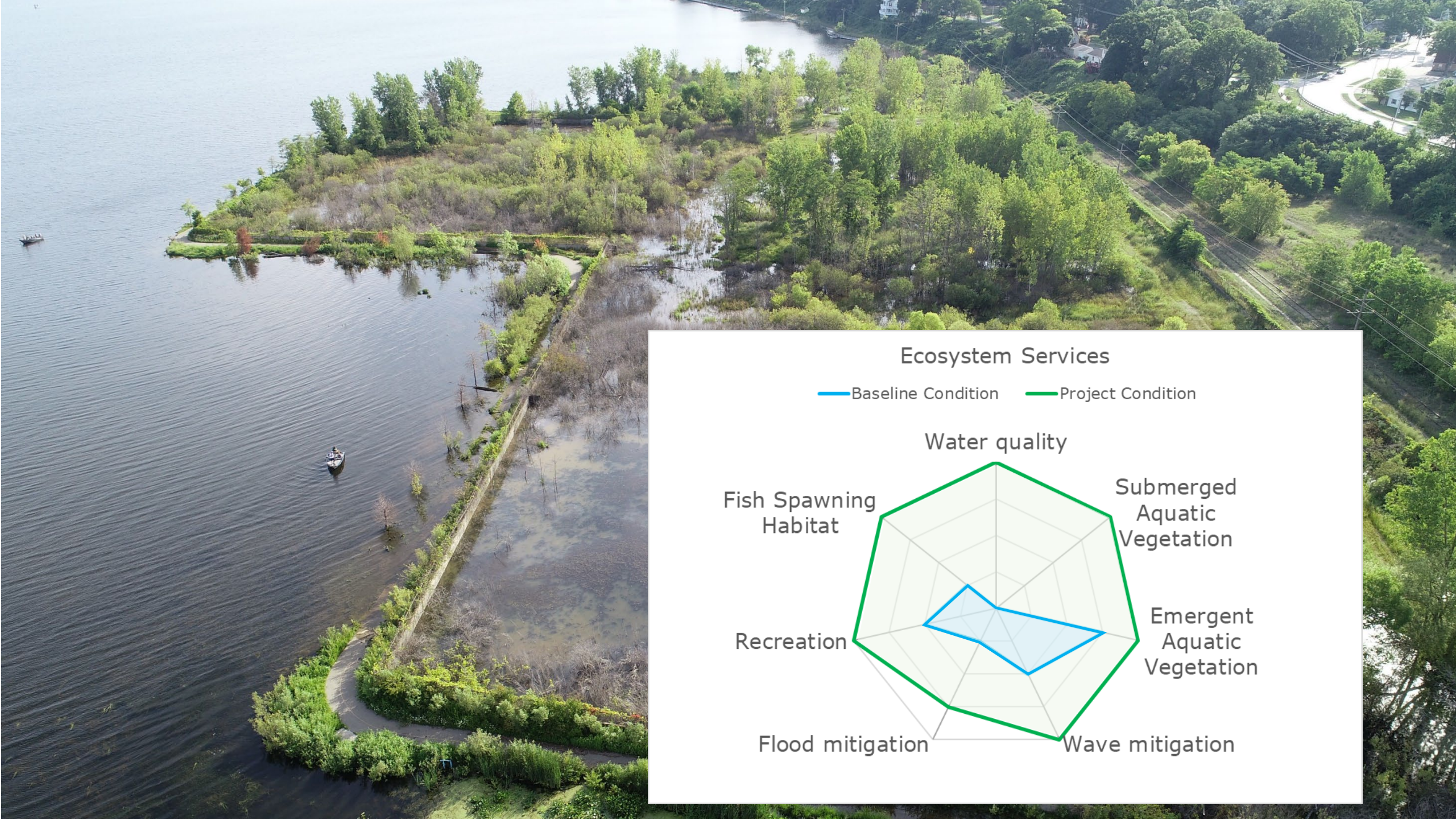
- Holistic cost evaluation
- Net environmental and social benefit analysis (\$ and non\$)





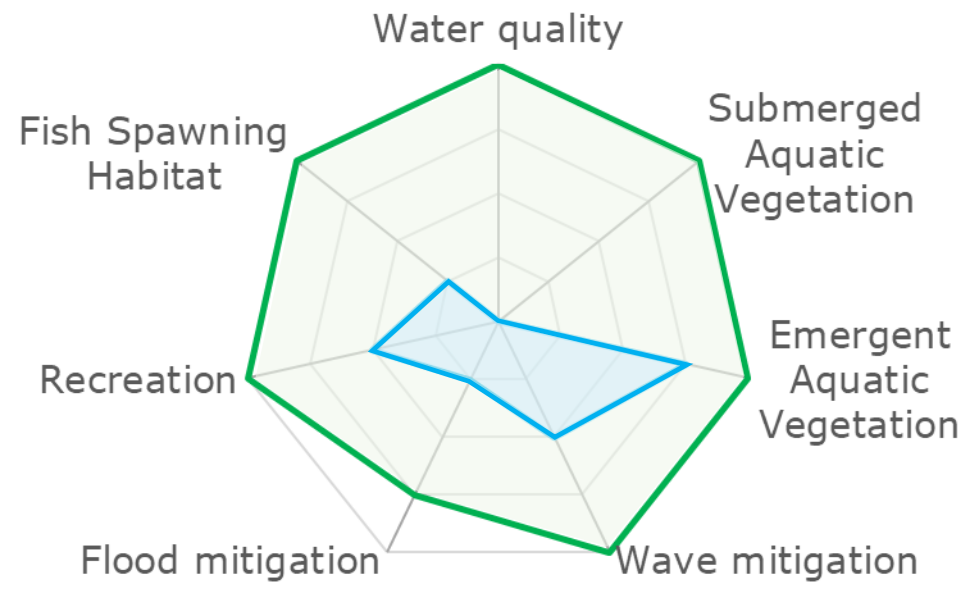
Project Highlight – Amoco Fish & Wildlife Restoration

- Ramboll (Dusty Tazelaar, Marcus Byker, Tony Eallonardo)
- Job Site Services, Inc
- Great Lakes Dock and Materials, LLC
- Cardno
- West Michigan Shoreline Regional Development Commission
- NOAA/Great Lakes Regional Partnership and the Great Lakes Restoration Initiative
- City of Muskegon
- Muskegon Lake Watershed Partnership



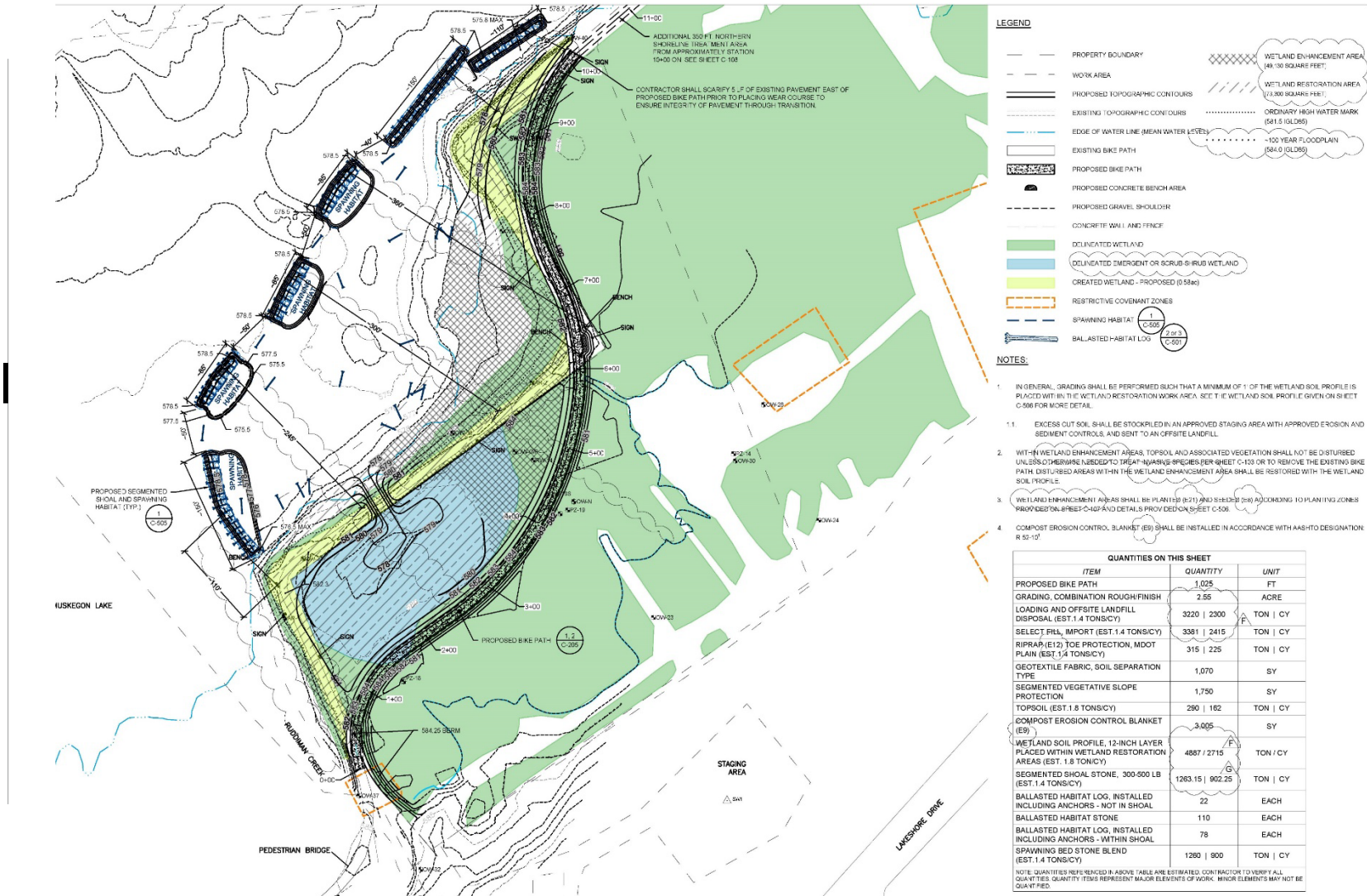
Ecosystem Services

— Baseline Condition — Project Condition



Grading and Wetland Creation

- Lake connection re-established
- Removal
 - 900 tons concrete
 - 40 tons debris
 - 2,700 tons historical fill
- Grading
 - Shaped bed for habitat
- NbS shoreline
- NbS coastal structures



Aerial image of lake connection



NbS Shoreline

- New placement of bike path
- Nature-based shoreline; segmented vegetative slope protection
- Protection of Muskegon Lake from surface sheet landward of project area



NbS Coastal Structures

- NbS aquatic habitat and wave attenuation structures
- Six segmented shoal structures
- 78 habitat logs and 1,150 tons of stone
- 1,102 tons of spawning bed stone



Aerial image of segmented shoal



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LESSONS-LEARNED/SUMMARY

- Policies and guidance are advancing sustainable development goals- e.g. WwN, EwN, NbS,
- Beneficial use of dredged material is expected to increase under WRDA 2020
- Evaluating project costs and benefits of natural capital may be difficult but is necessary
- Funding is available for coastal resiliency and habitat restoration, but need to be able to demonstrate value
 - US government is evaluating value of US resources
 - Expect to demonstrate monetary and non-monetary benefits of projects





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