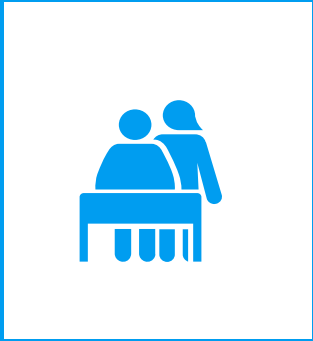


U.S. BENEFICIAL USE FRAMEWORK

PROVIDES NATURE-BASED SOLUTION AND NATURAL INFRASTRUCTURE OPPORTUNITIES

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OUTLINE

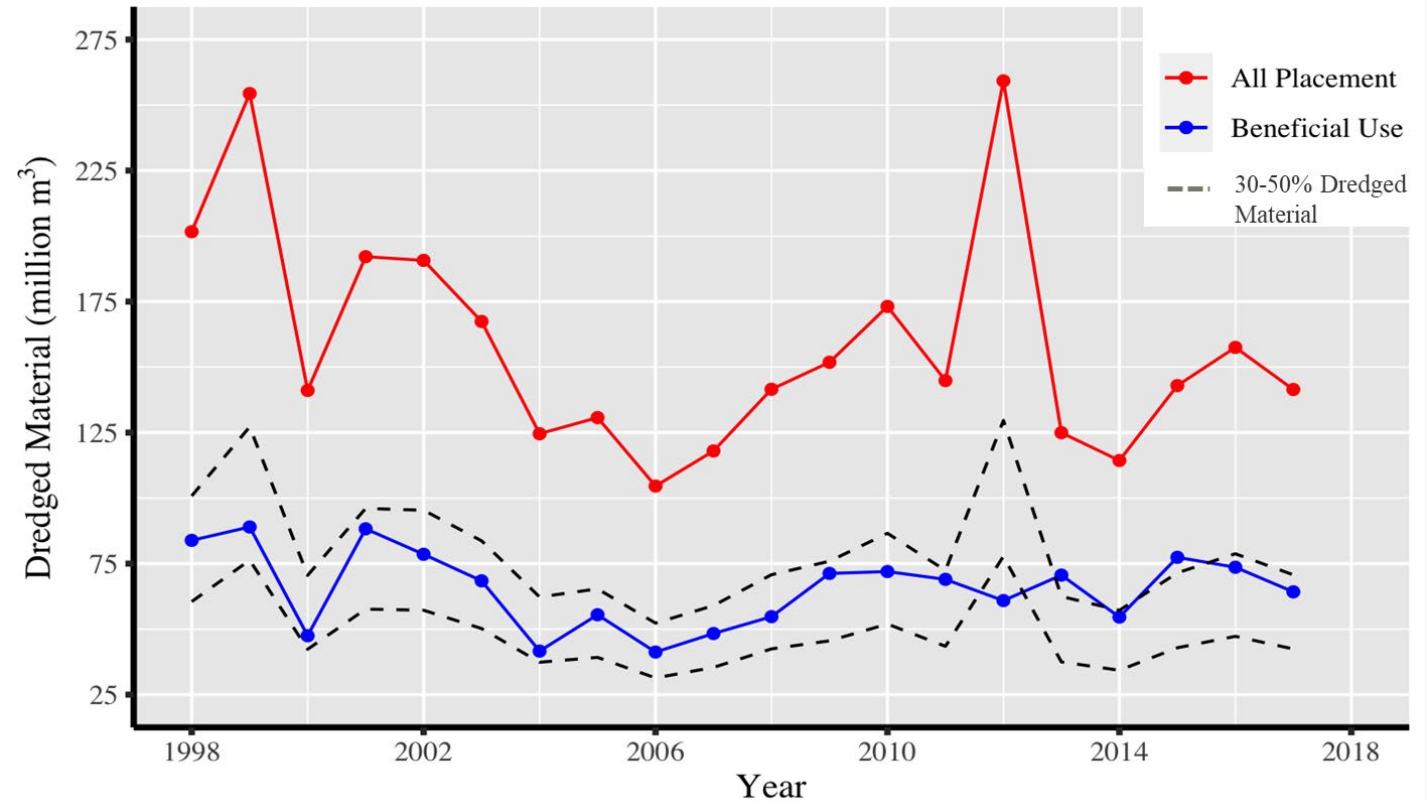
- 01** Introductory Information
- 02** Objectives
- 03** Beneficial Use Framework Overview
- 04** Implications for Nature-based Solutions and Natural Infrastructure
- 05** Summary

TERMS

- **Beneficial Use (BU)** – Use of dredged sediment to achieve additional benefits beyond the purposes related to its removal, including other **economic, environmental, or social benefits** (Searcy-Bell et al., 2021)
- **Nature-based Solutions (NbS)** – A broad term for approaches to conserve, restore and engineer **natural systems for the benefit of people and ecosystems** we inhabit (Bridges, King, and Simm, 2021)
- **Natural Infrastructure (NI)** - Vegetation, soils, floodplains (i.e., landforms), and wetlands that store precipitation and runoff (Haring et al., 2021)
- **Engineering With Nature® (EWN)** – U.S. Army Corps of Engineers collaborative effort to sustainably deliver **economic, social, and environmental benefits** associated with water resources infrastructure (USACE, 2021)
- **Risk Assessment** - Quantitative estimate of how much of a chemical is present in an environmental medium, how much exposure a receptor has with an impacted medium, and the toxicity of the chemical (USEPA, 2021)

U.S. FRAMEWORK HIGHLIGHTS

- No federal law mandating Beneficial Use
- Beneficial use of dredged material has grown out of advocacy
- Most beneficially used dredged sediment is “clean”
 - “Clean” sediment is not managed under hazardous waste regulations



(Source: Searcy-Bell et al., 2021)

BU OPPORTUNITIES FOR NbS AND NI



Nature-based Solutions

- Flood-risk mitigation
- Coastal resiliency
- Ecosystem restoration



Natural Infrastructure

- Create landforms and hydrology for water quality treatment
- Create landforms and hydrology to reduce dredge frequency
- Create landforms and hydrology for erosion or flood mitigation

OBJECTIVES

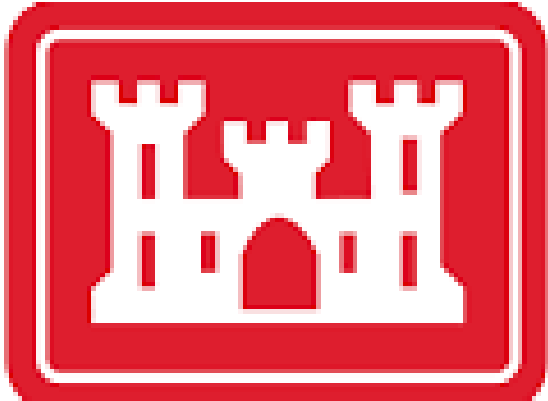
- Review how to apply U.S. EPA's guidance for the BU of industrial byproducts to dredged sediment
- Draw parallels between the U.S. EPA's guidance document for the BU of industrial byproducts and U.S. EPA's risk assessment process
- Review how risk assessment allows “clean” or “contaminated” determination for the end use environment
- Examine use of these tools for NbS and NI projects

BENEFICIAL USE FRAMEWORK OVERVIEW

1. Permitting Framework
2. Risk-based Approach
3. Testing and Evaluation
4. Alternatives Evaluation

BU REGULATORY FRAMEWORK

FEDERAL



- Issues dredging permit



- Provides environmental performance criteria
- Permit review and concurrence

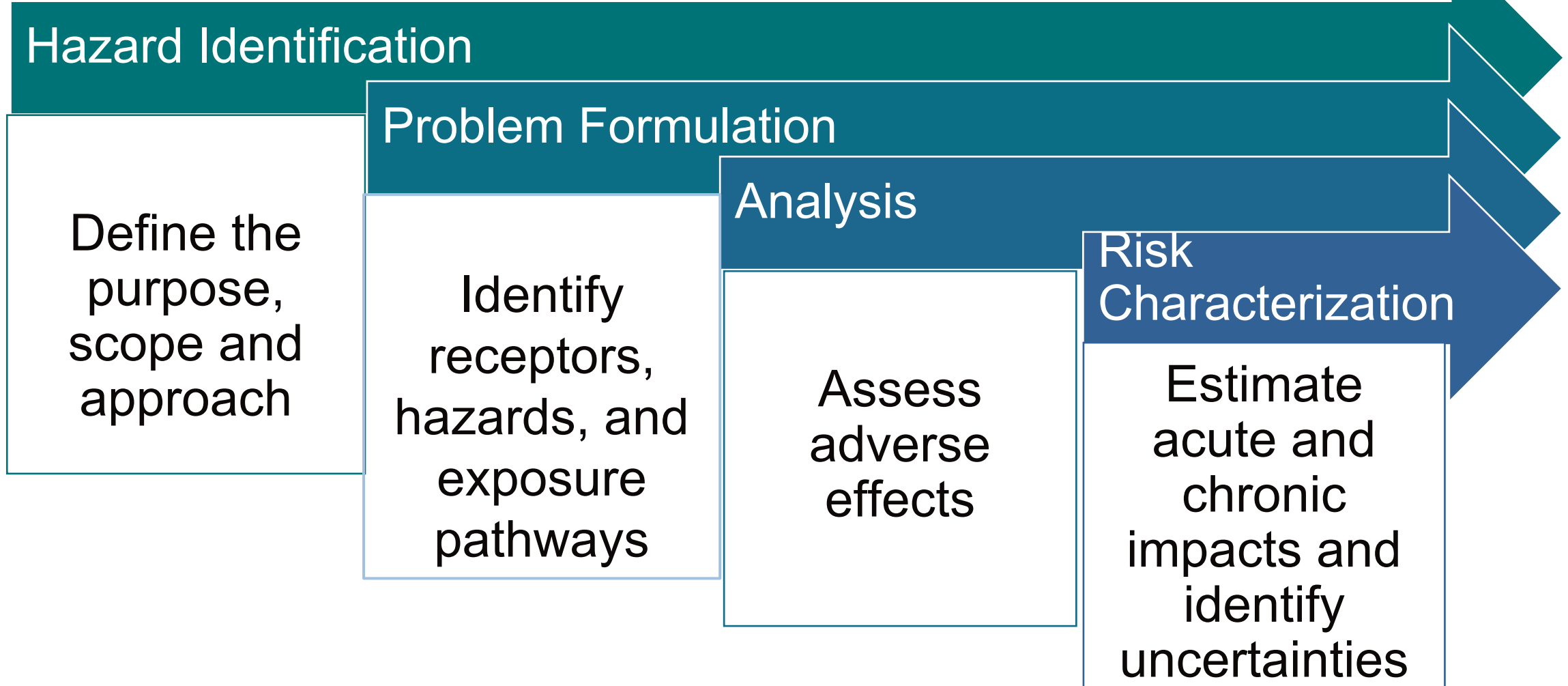
STATE/TRIBAL/LOCAL



- Provides disposal authorization
- Issues water quality certifications
- Coastal zone consistency

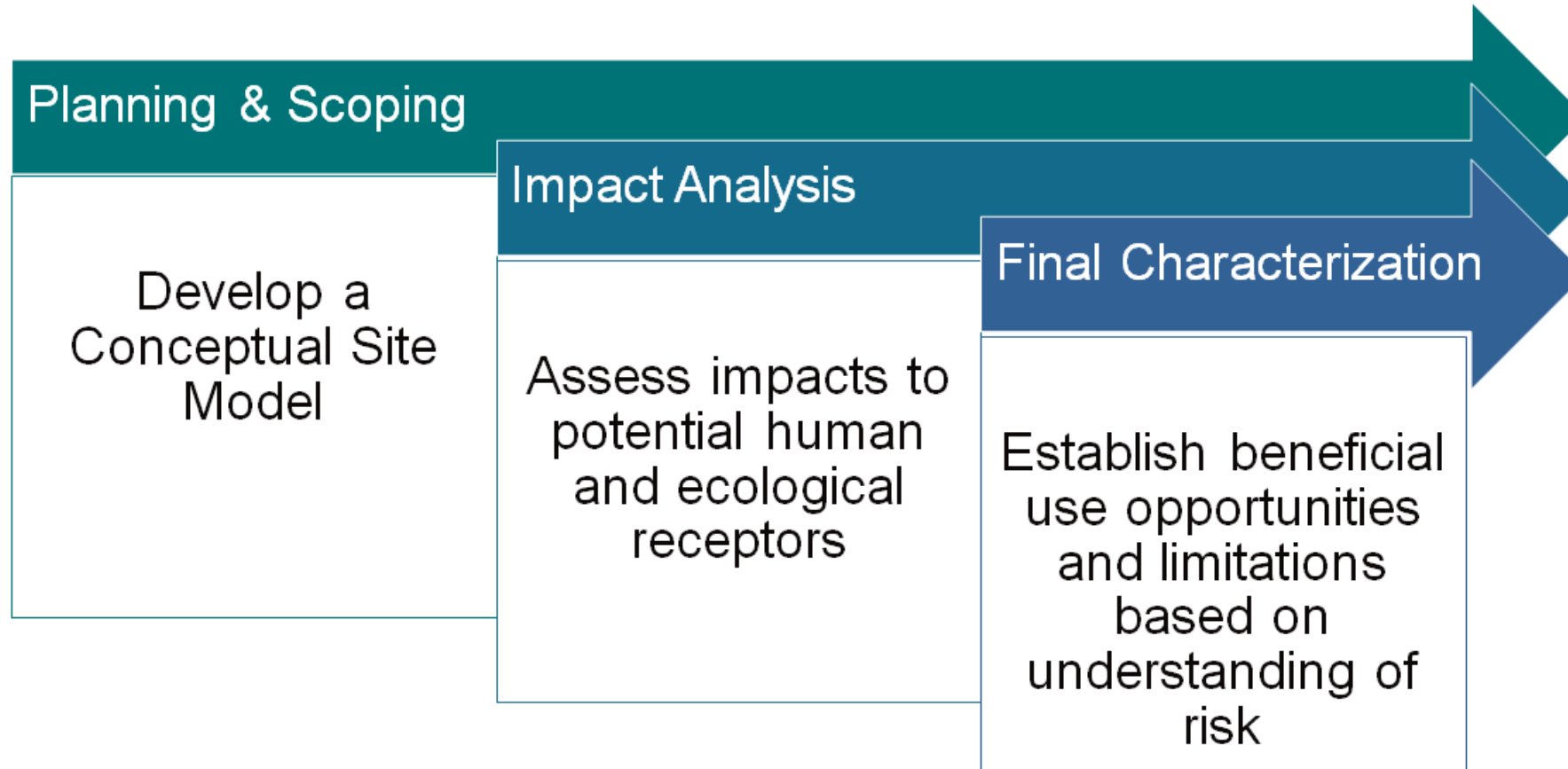


U.S. EPA's RISK-ASSESSMENT FRAMEWORK



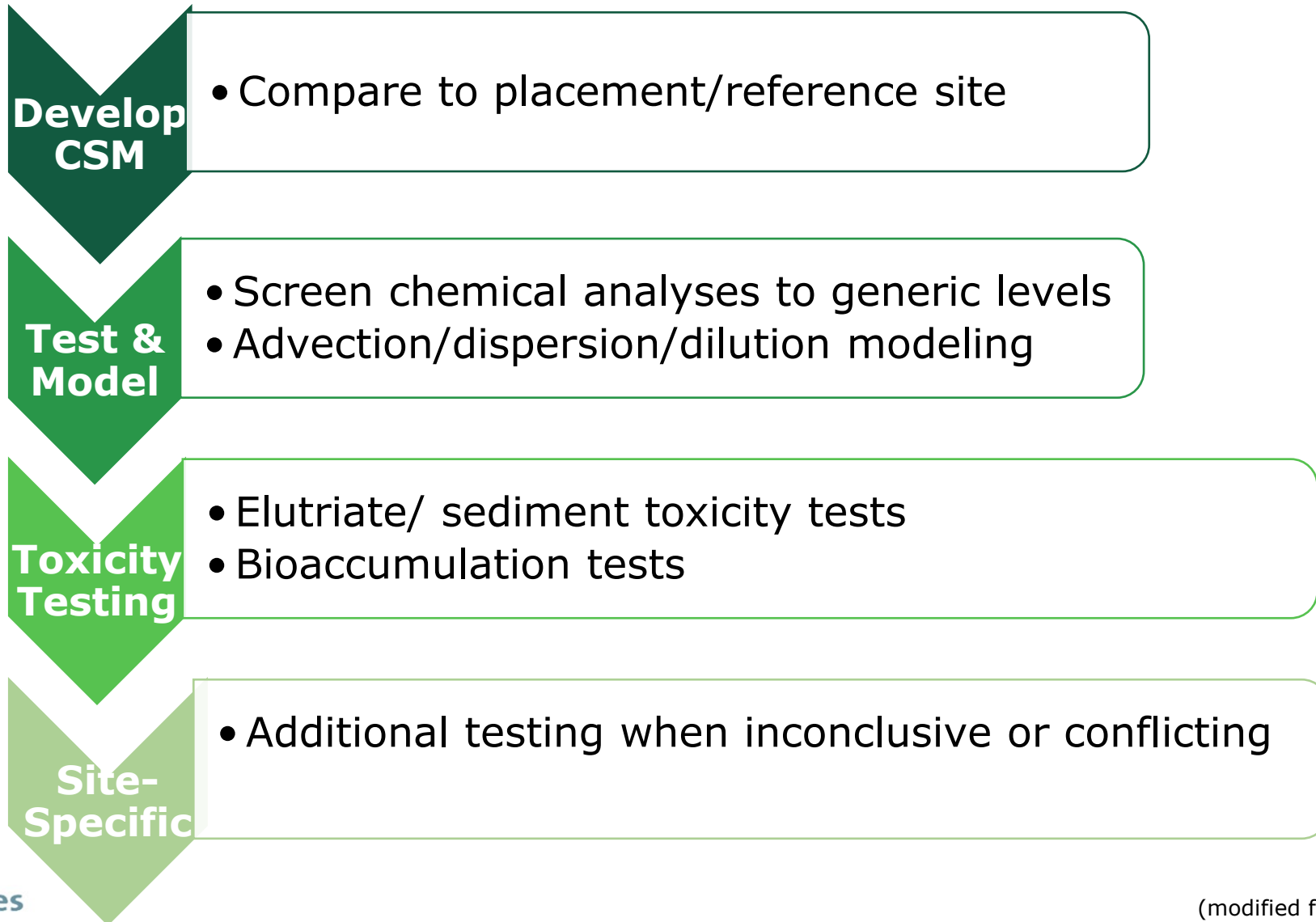
(Adapted from U.S. EPA 2022)

RISK-BASED EVALUATION OF INDUSTRIAL BYPRODUCTS



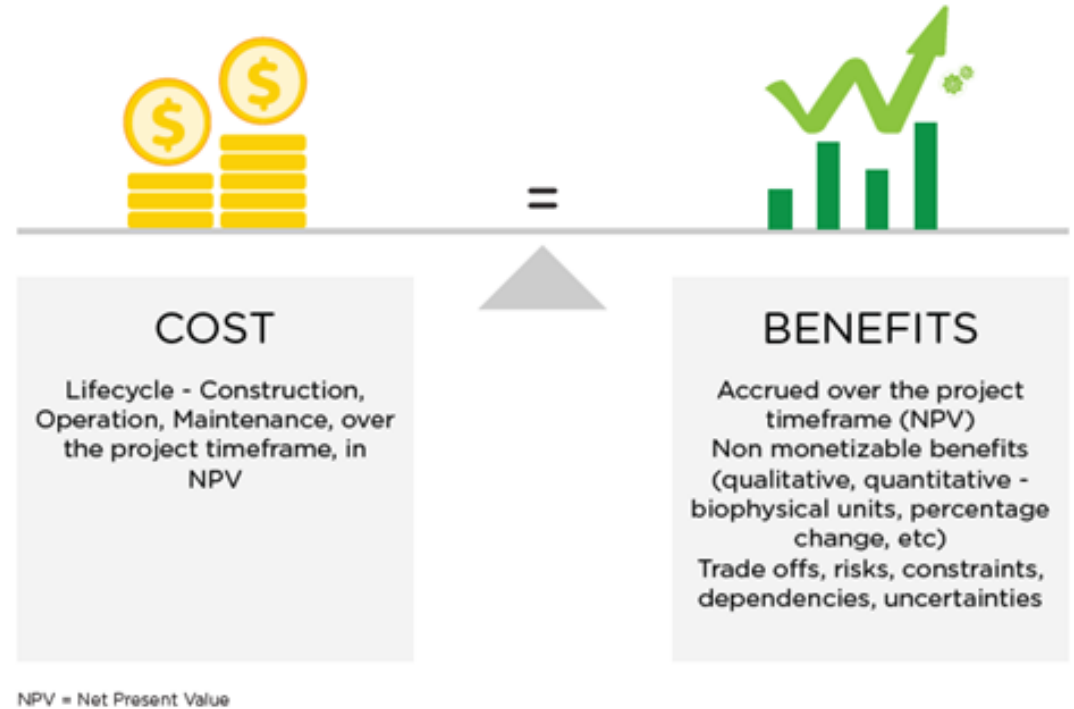
(Adapted from USEPA 2016).

TESTING AND EVALUATION



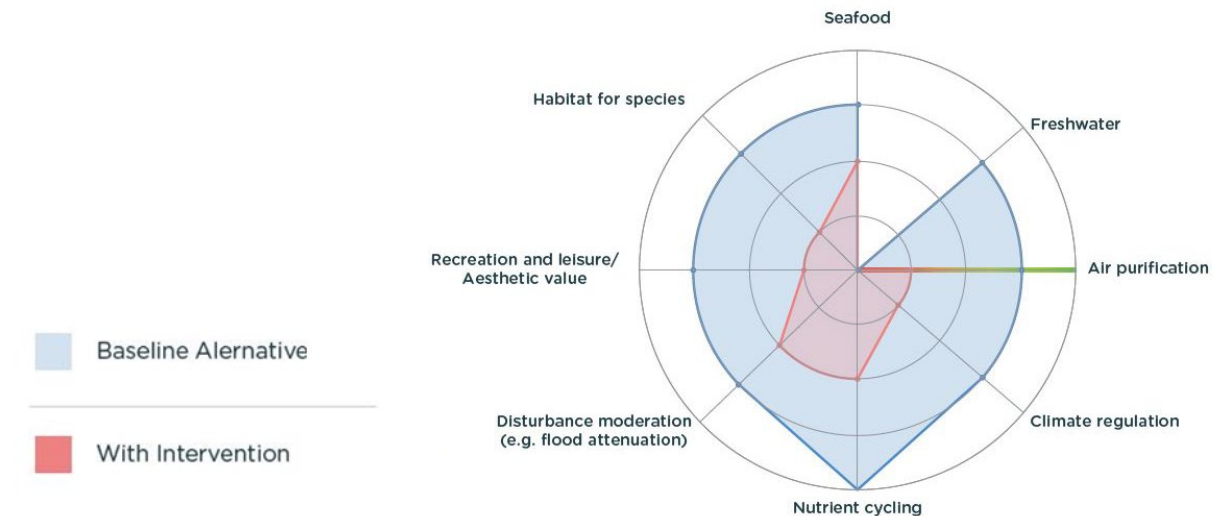
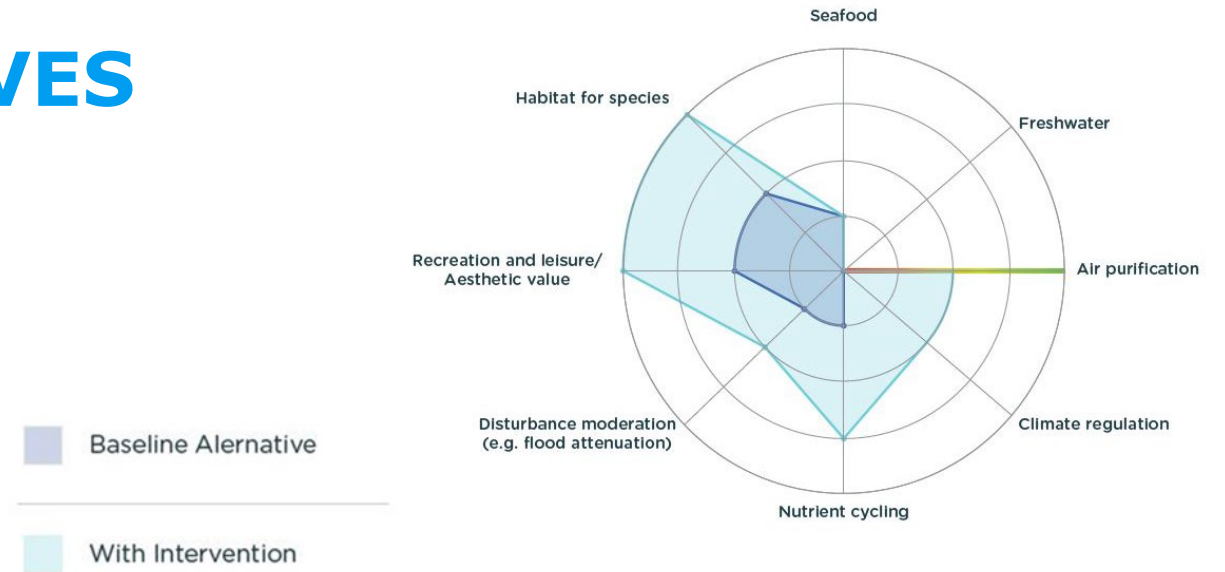
BU ALTERNATIVES EVALUATION

- Provides EWN[®] Opportunities
- Weigh multiple lines-of-evidence
- Legal considerations
- Social, economic, and environmental aspects of alternatives



ECOSYSTEM SERVICES ANALYSIS OF ALTERNATIVES

- Changes in ecosystem services with various alternatives
- Top Graph: Sediment placement to create island habitat
 - Ecosystem services increase compared to baseline
 - Increased Recreation
 - Increased Habitat
- Bottom Graph: Sediment placement in wetlands
 - Ecosystem services decline compared to baseline
 - Decreased Recreation
 - Decreased Habitat



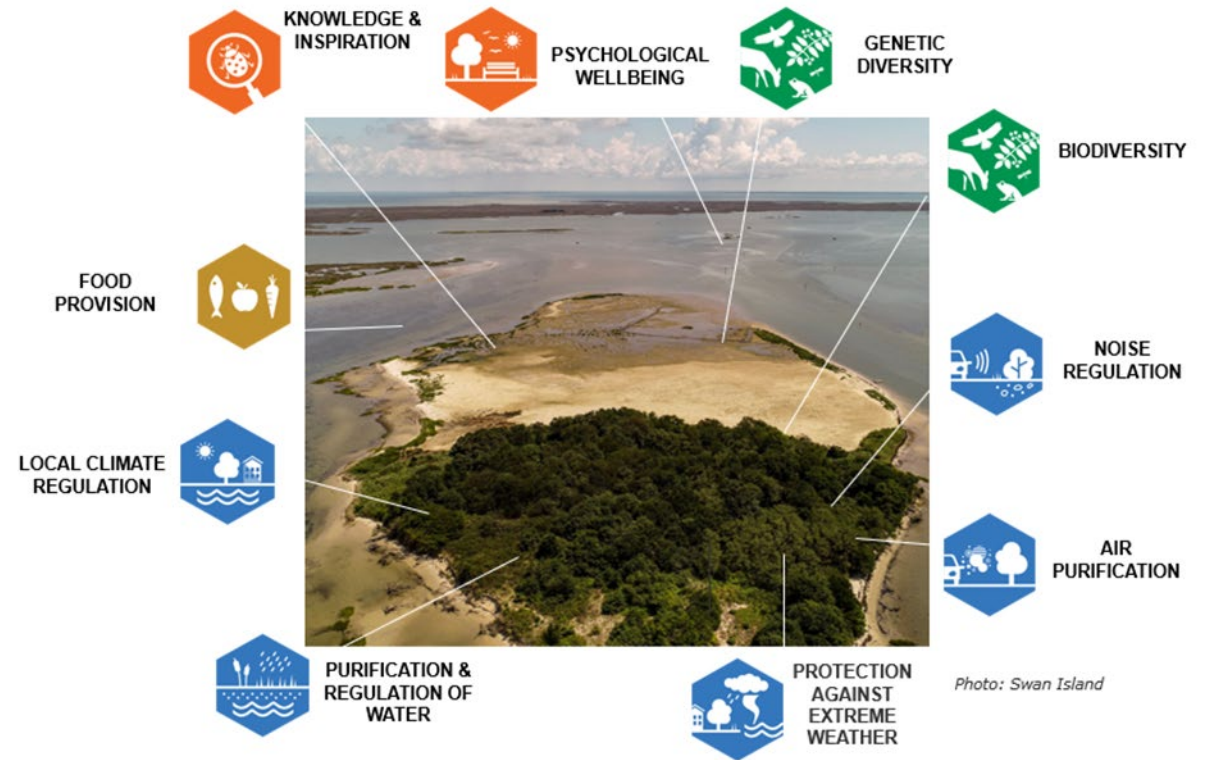
IMPLICATIONS OF BU FOR NbS AND NI

1. Value

2. Opportunities

DREDGED MATERIAL HAS ECONOMIC AND NATURAL CAPITAL VALUE FOR NbS and NI SOLUTIONS!

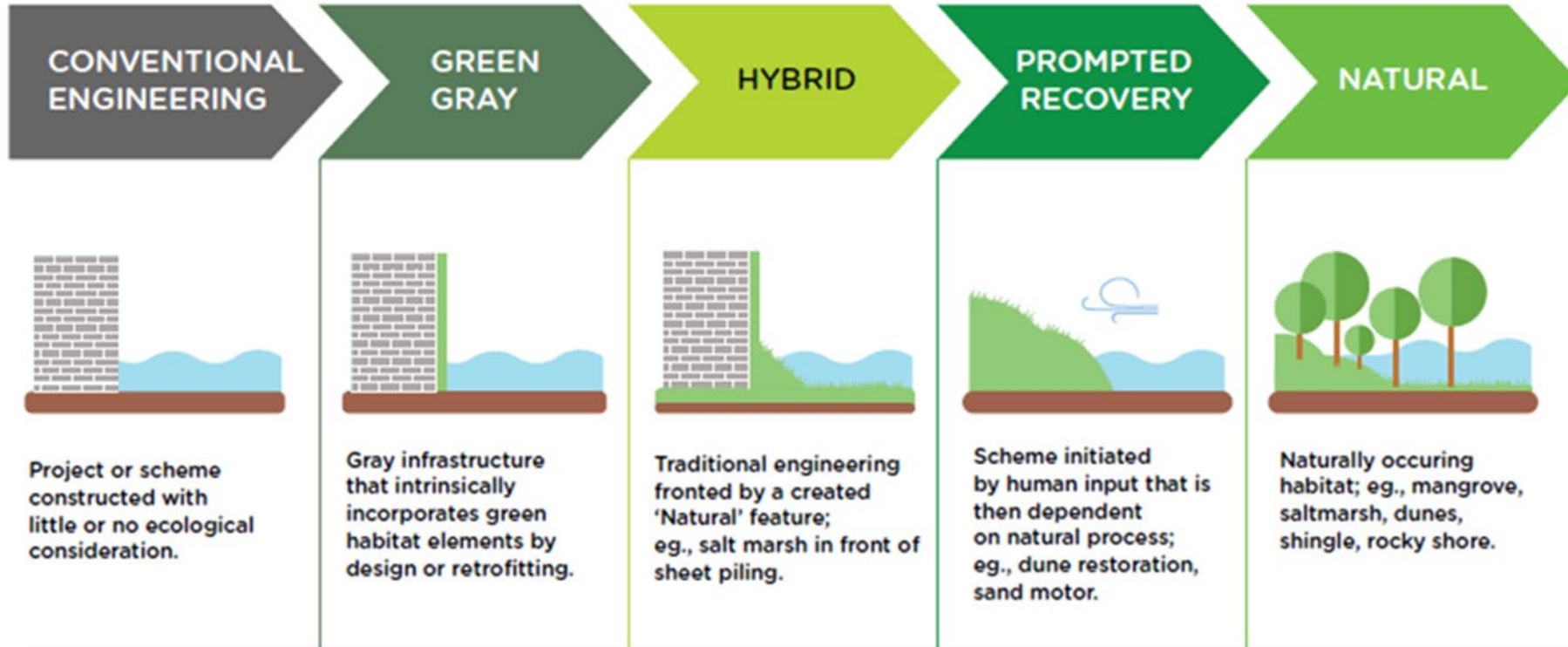
- Economic value = market worth as a commodity
- Capital asset = resource for use in the production of goods and services
- Natural capital = natural assets that generate “ecosystem services” that yield goods and services, which provide value to humans



ECOSYSTEM SERVICES: PROVISIONING (BROWN), REGULATING (BLUE), CULTURAL (ORANGE), SUPPORTING (GREEN)

CREATIVE BU OPPORTUNITIES EXIST!

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

BU OPPORTUNITIES FOR FROZEN TUNDRA NbS?



Nature.org

U.S. BENEFICIAL USE FRAMEWORK SUMMARY

- Is broadly accepted at the federal, regional, and state levels of governance
- Provides a standard approach to making site-specific determinations about the suitability of dredged material for BU
- Provides testing and evaluation flexibility based on project goals and CSM
- Supports progressive testing and BU modification to reduce risk
- Uses multiple lines of evidence for decision-making
- Leads to more creative opportunities!

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