Engineering With Nature

Sustainable development of water resources infrastructure is supported by solutions that beneficially integrate engineering and natural systems. With recent advances in the fields of engineering and ecology, there is an opportunity to combine these fields of practice into a single collaborative and cost-effective approach for infrastructure development and environmental management.

Engineering With Nature (EWN) is an initiative of the U.S. Army Corps of Engineers (USACE) to enable more sustainable delivery of economic, social and environmental benefits associated with water resources infrastructure. EWN directly supports USACE's "Sustainable Solutions to America's Water Resources Needs: Civil Works Strategic Plan 2011 – 2015" and contributes to the achievement of its Civil Works Mission and Goals.

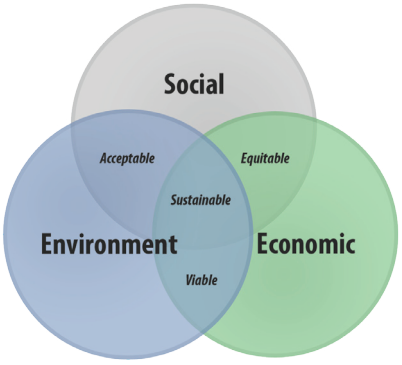
What is EWN?

We define Engineering With Nature as the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

The Essential Ingredients of Engineering With Nature:

- Use science and engineering to produce operational efficiencies supporting sustainable delivery of project benefits.
- Use natural processes to maximum benefit, thereby reducing demands on limited resources, minimizing the environmental footprint of projects, and enhancing the quality of project benefits.
- Broaden and extend the base of benefits provided by projects to include substantiated economic, social, and environmental benefits.
- Use science-based collaborative processes to organize and focus interests, stakeholders, and partners to reduce social friction, resistance, and project delays while producing more broadly acceptable projects.

Long-distance pumping of dredged sediment for beneficial use and wetland restoration in the Gulf of Mexico.



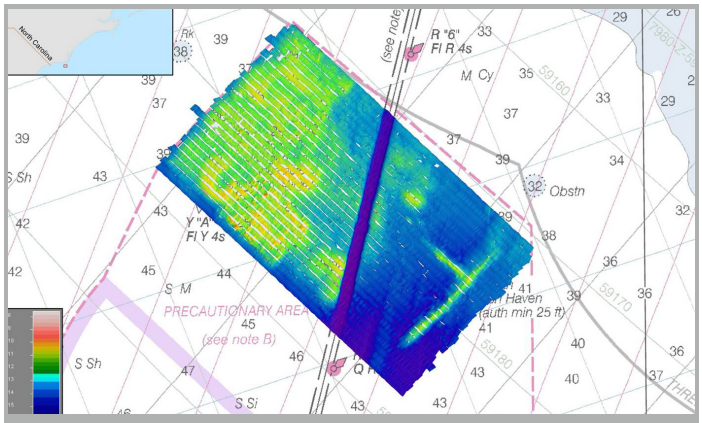
Moving Toward Sustainable Practices

Triple-win outcomes can be achieved through EWN by systematically integrating social, environmental and economic considerations into decision making and actions at every phase of a project. The result will be innovative and resilient solutions that are more socially acceptable, viable and equitable and, ultimately, more sustainable.

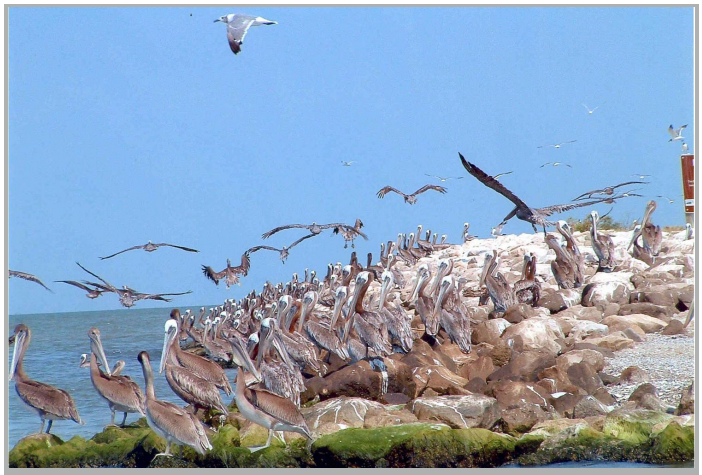
EWN Guiding Principles

As a leading practice, EWN is:

- **Holistic** – an ecosystem approach for planning, designing, constructing and operating projects where social, economic and environmental factors are equitably weighed in the decision-making process.
- **A Systems Approach** – reflecting the reality that USACE projects exist in complex physical and social/cultural systems, and that a single action influences many other parts of the system.
- **Sustainable** – focused on the long-term sustainability and resilience of project solutions and the benefits streams provided by the system over time.
- **Science-based** – built on first understanding, then working deliberately with natural forces and processes to accomplish engineering goals.
- **Collaborative** – based on effective partner and stakeholder communication, engagement and collaboration through the entire life cycle of a project, beginning at the earliest conceptual stages.
- **Efficient and cost effective** – reducing time and rework, while minimizing social friction.
- **Socially responsive** – aligned with the values, objectives, interests and priorities of USACE, partners, stakeholders and society at large.
- **Innovative** – embracing new and emerging technologies and incorporating continuous learning, technology transfer and adoption of new and leading practices.
- **Adaptive** – demonstrating adaptive attitudes, structures and processes that enable a living, evolving and sustainable practice.



Wilmington Offshore Fisheries Enhancement Structure (WOFES): The L-shaped structure is one of the largest constructed reefs in the United States and was built with rock placed during navigation dredging operations for the Cape Fear River, NC.



Evia Island, Galveston Bay, TX. Birds making use of habitat provided by this 6-acre island that was constructed of sediment dredged during the deepening of the Houston Ship Channel in 1998.

Example EWN Opportunities

1. Strategic placement of sediments for beneficial use of dredged material – making use of hydrodynamics and natural transport processes to build near-shore habitats.
2. Use of engineering features to focus natural processes to minimize navigation channel infilling and to transport and focus sediments for positive benefits.
3. Cost-efficient engineering practices for enhancing the habitat value of infrastructure.
4. Optimizing the use of natural systems, such as wetlands and other features, to reduce the effects of storm processes and sea level rise on shorelines and coasts.
5. Science-based communications processes to significantly improve stakeholder engagement, collaboration and communication.

Implementing Engineering With Nature

Advancing the use of Engineering With Nature within current and future practice will be pursued through innovative demonstrations, communicating about lessons learned, focused research and development, and active engagement and collaboration with our partners and stakeholders.

For More Information:

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