



THE FUTURE OF COASTAL PROCESSES RESEARCH

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106th AMS Annual Meeting, Houston, TX
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San Francisco Chronicle



California King Tides Project



San Francisco Chronicle

Pacific Northwest coastal Tribes face barriers in adapting¹

Changes in storm severity and wildfire risk are impacting fisheries of economic and cultural importance.

Risk of landslide and coastal erosion²

5,900 tons of riprap placed along rail lines to stabilize potential runoff that may obstruct transportation and commerce.

land every year³

Community has already spent \$160 million and estimates vary from \$100-400 million and rising to relocate.

1 of Mississippi has closed due to toxic algae¹³

Harmful Algal Blooms (HAB) have been reported in every U.S. coastal state, and their occurrence may be on the rise.

Tsunami warning puts focus on evacuation plan⁴

A powerful reminder of the need for research and training to increase preparedness and response.

Hurricane Ian — 2 million people without power¹²

Severe flooding damaged homes and blocked crucial roadways, leaving many trapped.

Puerto Rico is eroding under rising seas, stronger storms, and development¹¹

These coastlines are vital to the culture, economy, and local food security of the island.

 Infrastructural Challenges
  Safety Challenges
  Economic Challenges

The beach
 the
 of the
 Accelerating
 Michigan is
 June and
 infrastructure.

Toxic blooms on Lake Erie⁶ Still a problem 10 years after Toledo issued a 'do not drink' order.⁶

Jersey Shore towns see more sunny day floods as seas rise⁷ USACE wants to elevate 6,000 NJ homes.

Climate change and flooding a threat to national security⁸ Sea level rise and heavier rains pose logistical challenges to Norfolk naval base.

Back-to-back hurricanes wreak havoc on supply chains⁹ Widespread flooding and infrastructure damage disrupted automotive, retail, pharmaceuticals, and agriculture industries.

Gulf shrimp prices reveal hidden economic impact of dead zones¹⁰ Hypoxic dead zones in the Gulf drive up the price of large shrimp relative to smaller sizes, causing economic ripples that can affect consumers.

Coastal Challenges In the News

Examples of news article headlines of coastal challenges from across the U.S. and its territories including infrastructure damage, safety hazards, and economic losses, highlighting the urgent need for science-based strategies to build resilience in vulnerable coastal communities.

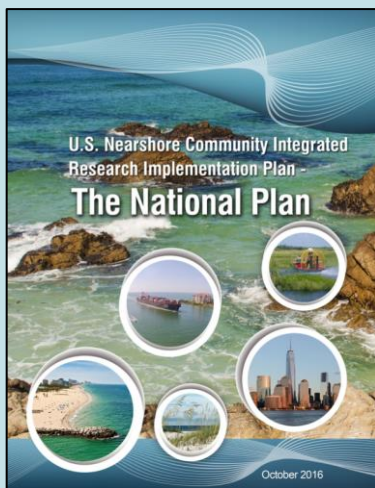
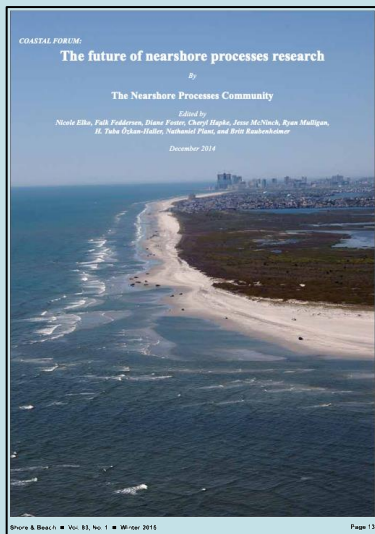
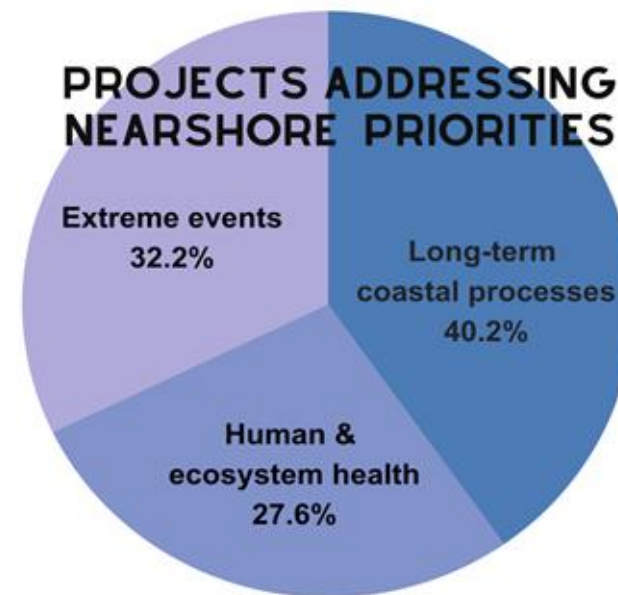
Each headline is reproduced with attribution to its source: 1—Coastside News (2022); 2—Los Angeles Times (2025); 3—Associated Press (2024); 4—University of Hawai'i (2025); 5—Scienceline (2025); 6—Michigan Public (2024); 7—WHYY (2025); 8—PBS SoCal (2025); 9—ISM World (2024); 10—Lab Manager (2024); 11—Office of Representative Hernández, U.S. House of Representatives (2025); 12—CNBC (2022); 13—AL.com (2019). Complete citations are provided in the reference list.

What is the USCRP?

The **U.S. Coastal Research Program (USCRP)** is a multi-agency led effort to **coordinate** federal activities, **strengthen** academic programs, and **address** coastal community needs by *identifying* coastal research priorities, *enhancing* funding for coastal academic programs, *fostering* collaboration, and *promoting* science translation.

US Coastal Research Program (2016 – 2023)

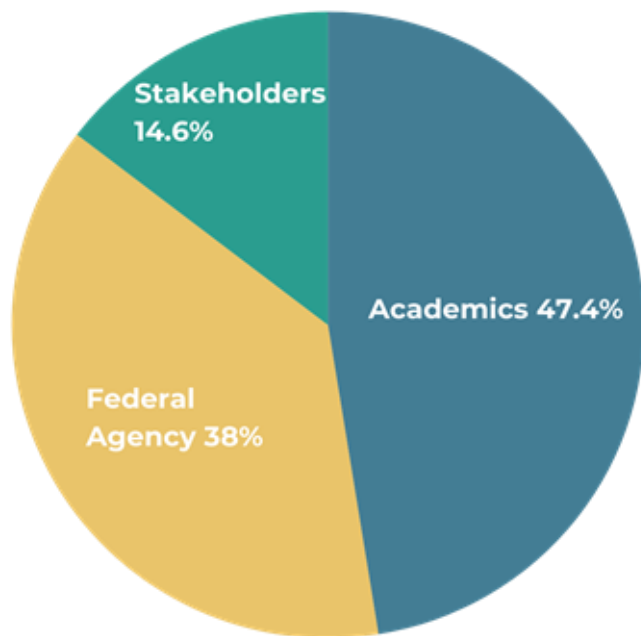
- 516 Proposals Received
- 77 Proposals Funded
- \$150M Requested
- \$23.5M Awarded



Federal participants



116 participants



Consensus Needs

- **Conduct research at all scales** to transition from foundational science to operational models to public information
- **Collaborate across disciplines** to co-develop effective solutions to coastal challenges
- **Integrate influences of humans and ecosystems** necessary to understand current and future coastal change
- **Consider Nature Based Solutions** on a continuum
- **Measure the effectiveness of adaptation strategies**



The Future Of Coastal Processes Research Report

COASTAL SCIENTIFIC RESEARCH THEMES

COASTAL
FLOODING

MORPHODYNAMICS AND
SEDIMENT TRANSPORT

ECOSYSTEM CHANGE
AND HEALTH

Part 1: A Community Driven Vision for the Next Decade of Coastal Science

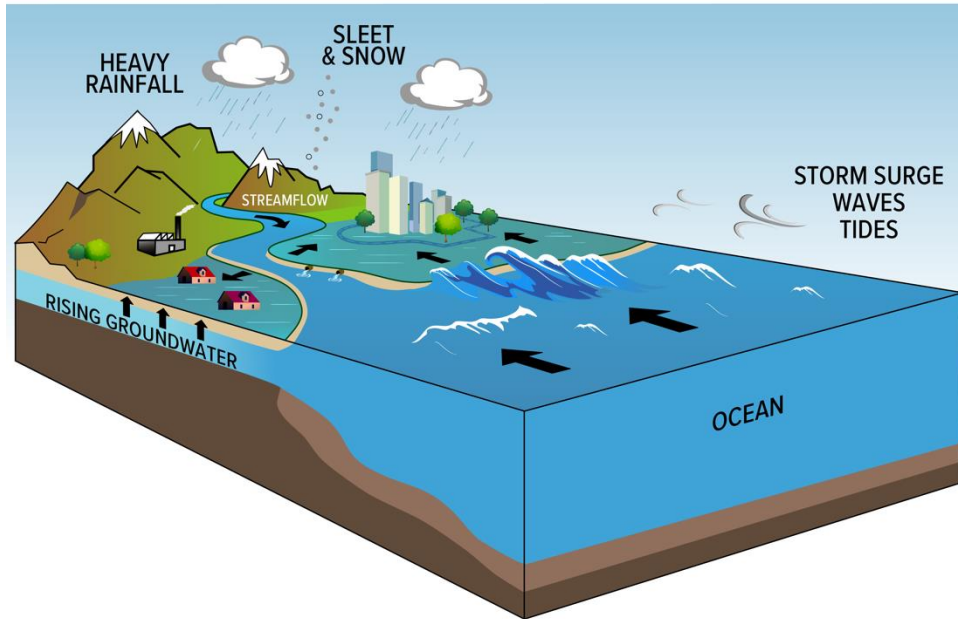
Part 2: State of the Science

Part 3: A History of Coastal Research

COASTAL FLOODING



Meeting the challenge of coastal flooding requires the ability to predict the extent, frequency, and severity of inundation at the coast.

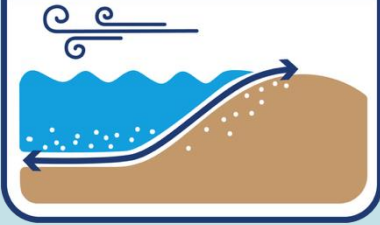


Adapted from Green et al., 2025

Key Research Questions

- How do landscape and morphology changes affect coastal flooding over short and long timescales?
- How do multiple processes contribute to and/or exacerbate flooding hazards?
- How do both chronic and extreme coastal flooding impact people and communities, and how are risks most effectively communicated?

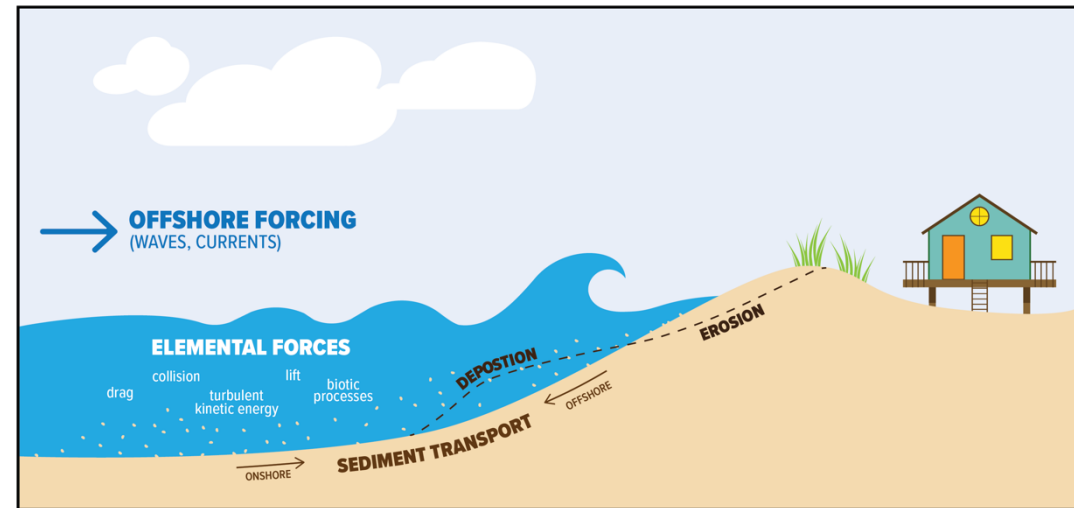
MORPHODYNAMICS AND SEDIMENT TRANSPORT



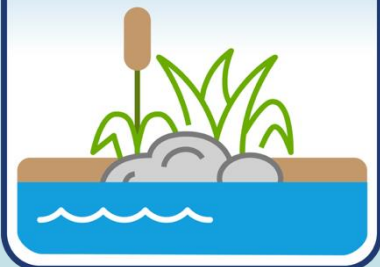
Improved understanding and prediction of sediment transport and coastal response on short, medium, and long-term temporal and spatial scales are essential for addressing societal challenges related to coastal change.

Key Research Questions

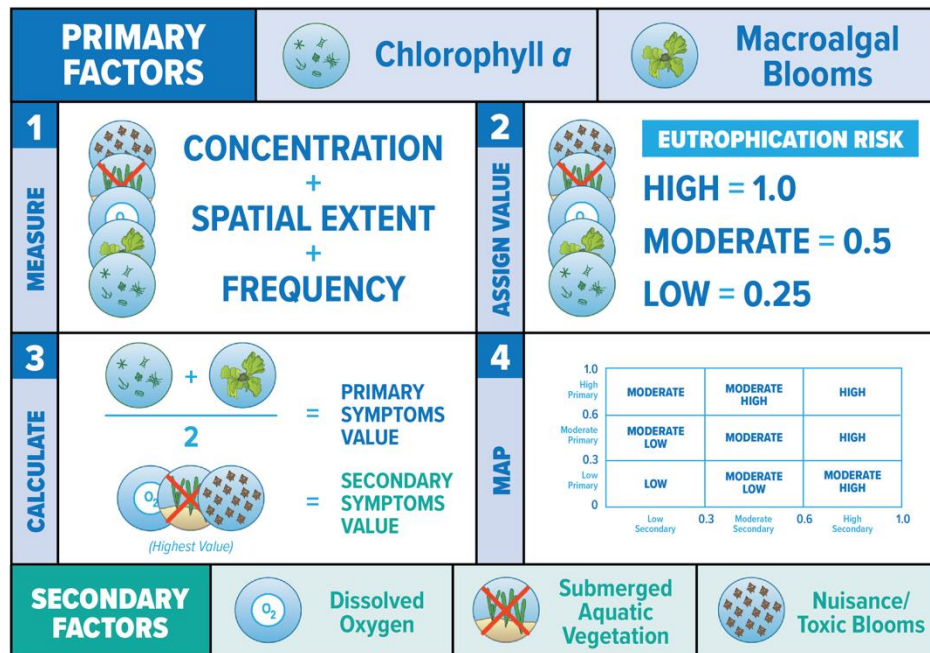
- How important are grain scale processes in altering larger scale sediment transport?
- Are radically different predictive frameworks required for sediment transport and morphodynamics predictions?
- How can human-induced changes and ecological processes be used to alter morphodynamics in a mutually beneficial way?



ECOSYSTEM CHANGE AND HEALTH



Coastal ecosystems are the foundation of both human and environmental well-being, sustaining biodiversity, protecting communities from hazards, and supporting livelihoods that depend on healthy coasts.



Adapted from Bricker et al., 2007

Key Research Questions

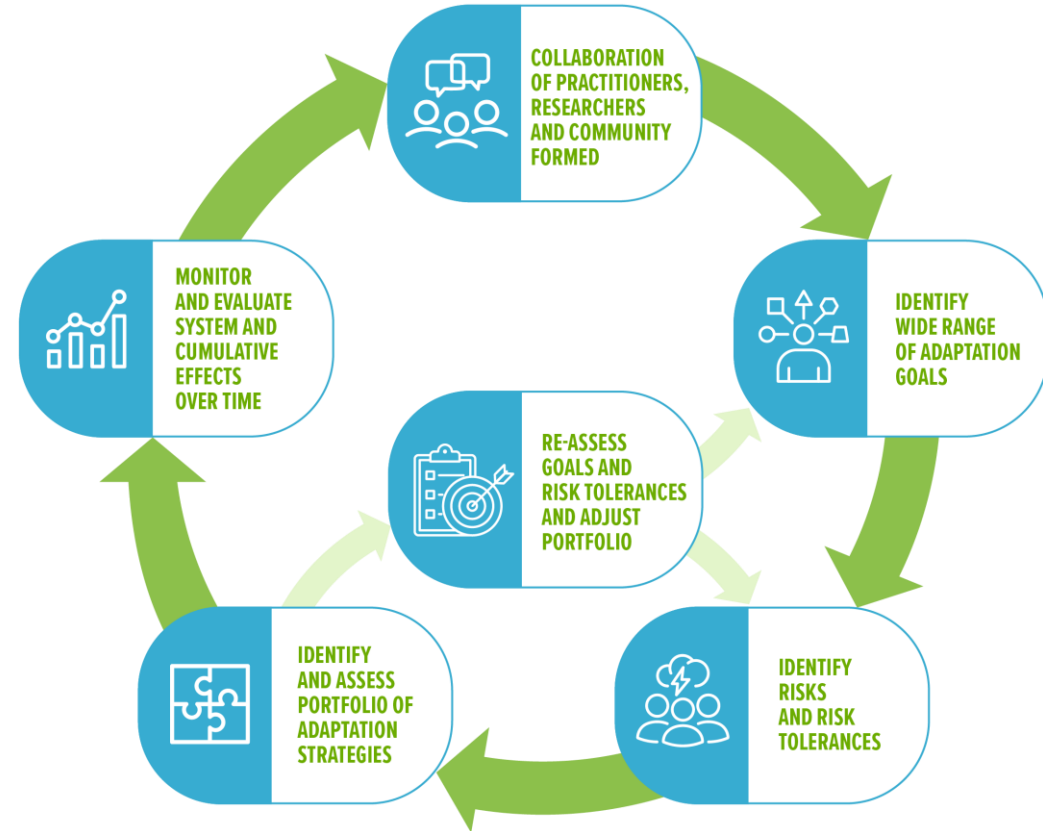
- How do we evaluate ecosystem health holistically?
- To what degree have connections across major fundamental processes and disciplines been identified, parameterized, and modeled?
- How can data collection and modeling best inform guidance and reinforce and build decision-support tools?
- How can we monitor, measure, and manage ecosystem health to sustain resilience across regions and time?



Coastal adaptation describes actions taken to prepare for, respond to, and reduce the harms caused by changing and evolving coastal hazards.

Key Research Questions

- What factors limit local capacity to engage in coastal adaptation, and how can those barriers be reduced?
- What mechanisms support the uptake and use of scientific information in local adaptation decision-making?
- How can the cumulative impacts of adaptation outcomes be evaluated?
- What institutional structures and data systems are needed to enable long-term, coordinated adaptation portfolios and flexible pathways?



As in Hossain et al., 2024

Observations

Modeling

Decision Support

Key Research Questions

- What methods and data are needed to improve accuracy and forecast horizon of models used to predict coastal hazards at timescales of hours to decades?
- How does physical science research incorporate social science methodologies and anthropogenic factors?
- What information and tools do stakeholders in coastal communities need to make decisions or help others do so?



Adapted from USACE, 2020

Recommendations

RECOMMENDED KEY ACTIONS

- Meaningfully and deeply **embed social science into coastal research** and community risk assessment
- **Enhance the translation** and uptake of scientific knowledge
- Collect more **comprehensive and higher-resolution data**
- **Maintain shared**, open-source, long-term, **national data sets** and co-production platforms
- Develop coupled and holistic **modeling frameworks**
- Strengthen approaches to **promote integrated solutions**
- Apply **artificial intelligence and machine learning** approaches
- Support **funding mechanisms**

Join the discussion

Join the USCRP



Read the *FUTURE OF COASTAL PROCESSES RESEARCH REPORT*

Coming April 2026 in ASBPA's Shore and Beach

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