

Building Resilience for Estuaries and Coasts in the United States

BACKGROUND

Estuaries, partially enclosed coastal bodies of water where freshwater from rivers mixes with salt water from the ocean, are some of the most **biologically productive environments on the planet**. Thousands of species of birds, fish, and mammals depend on estuaries for food and shelter, and humans rely on the economic benefit of tourism, fisheries, and public infrastructure made possible by these protected waters. Estuaries themselves are extremely efficient filters for heavy metal, chemical, and sediment pollution.¹ This ability is compounded when considering the role estuaries play in providing habitats for oysters and marsh grasses, organisms that are known to be vital for filtering carbon and contaminants from the water.

Though coastal counties represent less than 10% of the total U.S. land mass, **39% of the country's population lives in these areas**, including along estuarine shorelines.² Across six sectors of the marine economy—tourism and recreation, marine transportation, offshore mineral extraction, ship building, living resources, and marine construction—businesses dependent on coastal environments contributed \$369 billion to the United States GDP in 2021.³

KEY FACTS

- Together with lagoon systems, estuaries occupy 80-90% of the Atlantic and Gulf of Mexico coasts.⁴
- The U.S. Environmental Protection Agency's National Estuary Program acts to protect and restore the water quality and ecological integrity of 28 estuaries of national significance.⁵
- Tidal marshes inhabiting estuary environments have been calculated to remove 25-50% of heavy metal contamination from rivers.⁶
- Estuaries produce nearly 70% of the United States commercial fish catch and nearly 80% of its recreational catch.⁷
- **Nearly half of the threatened and endangered species in the U.S. rely on estuaries** at some point in their lives.⁸
- One acre of coastal wetlands can absorb up to 1.5 million gallons of floodwater, enough to cover a football field in more than 4 feet of water.⁹
- On the hurricane-prone Atlantic and Gulf coasts, each square mile of coastal wetland saves almost \$700,000 in storm damage.¹⁰

THREATS TO ESTUARIES

Estuaries are facing an increasing number of threats as a result of human activity and climate change. Eutrophication occurs when nutrients like nitrogen and phosphorus in agricultural runoff or sewage stimulate the growth of incredibly harmful algae blooms.¹¹ This explosive growth blocks sunlight and lowers oxygen levels, suffocating fish and plant life below the surface. For decades, estuaries have faced large-scale conversion through damming, dredging, and draining. These activities have resulted in **38% of coastal wetlands in the United States being lost to agriculture, shipping ports, or urban waterfront**.¹²

As sea-surface temperatures continue to rise, the range of habitability for many coastal species is shifting. Mollusks, crustaceans, and bottom-dwelling worms that play crucial roles in cycling nutrients and stabilizing sediment are being forced to move to deeper waters and/or higher latitudes.

As the frequency of intense hurricanes becomes greater, higher storm surges and larger waves can uproot mangroves and marsh plants, limiting their effectiveness in filtering pollution. Combined with an increasing rate of sea level rise at 3.9 millimeters per year (roughly 1.6 inches per decade), coastal communities **continue to face increasing frequency and severity of erosion, flooding, and saltwater intrusion.**¹³

There are many options to pursue for greater estuarine restoration and resilience. Enhancing salt marsh and seagrass habitats allows for greater capture of carbon from the atmosphere, while implementing living shorelines and oyster reefs dissipate wave energy and improve water quality. Greener infrastructure, water quality monitoring systems, and restoration initiatives must work **in tandem with public policy** aimed at protecting estuaries and increasing public awareness of how important these habitats are.



ENDNOTES

1. U.S. EPA. "Basic Information about Estuaries." <https://www.epa.gov/nep/basic-information-about-estuaries>
2. NOAA Digital Coast. "Socioeconomic Data Summary." <https://coast.noaa.gov/data/digitalcoast/pdf/socioeconomic-data-summary.pdf>
3. NOAA Digital Coast. "Socioeconomic Data Summary." <https://coast.noaa.gov/data/digitalcoast/pdf/socioeconomic-data-summary.pdf>
4. U.S. Army Corps of Engineers Institute for Water Resources. "Drowned Valley Coast." <https://www.iwr.usace.army.mil/Missions/Tales-of-the-Coast/Americas-Coasts/Drowned-Valley/>
5. U.S. EPA. "Estuaries and the National Estuaries Program." <https://www.epa.gov/nep>
6. Teuchies et al. "Estuaries as Filters: The Role of Tidal Marshes in Trace Metal Removal." <https://doi.org/10.1371/journal.pone.0070381>
7. NOAA Fisheries. "5 Reasons Why We Love Wetlands." <https://www.fisheries.noaa.gov/feature-story/5-reasons-why-we-love-wetlands>
8. NOAA Fisheries. "5 Reasons Why We Love Wetlands." <https://www.fisheries.noaa.gov/feature-story/5-reasons-why-we-love-wetlands>
9. NOAA Fisheries. "5 Reasons Why We Love Wetlands." <https://www.fisheries.noaa.gov/feature-story/5-reasons-why-we-love-wetlands>
10. Fanglin Sun & Richard T. Carson. "Coastal wetlands reduce property damage during tropical cyclones." <https://doi.org/10.1073/pnas.1915169117>
11. NOAA National Ocean Service. "What is eutrophication?" <https://oceanservice.noaa.gov/facts/eutrophication.html>
12. NOAA National Ocean Service. "Human Disturbances to Estuaries." https://oceanservice.noaa.gov/education/tutorial_estuaries/est09_humandis.html
13. American Scientist. "Estuaries Face a Stormy Future." <https://www.americanscientist.org/article/estuaries-face-a-stormy-future>



Uniting science, wonder,
and action for a sustainable,
just and peaceful future.

The Rachel Carson Council (RCC), founded in 1965, is the national environmental organization envisioned by Rachel Carson to carry on her work after her death. We promote Carson's ecological ethic that combines scientific concern for the environment and human health with a sense of wonder and reverence for all forms of life in order to build a more sustainable, just, and peaceful future. The Rachel Carson Council is a nonpartisan 501(c)(3) nonprofit organization. www.rachelcarsoncouncil.org