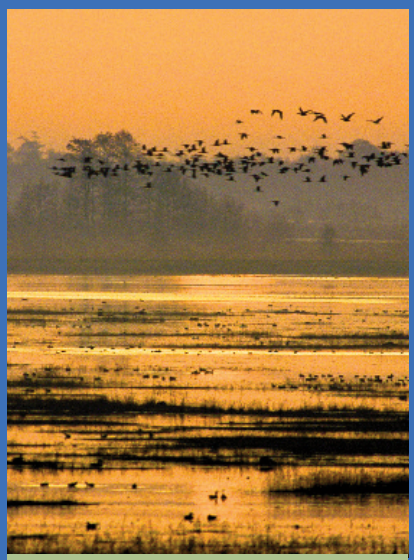
SAFEGUARDING COASTS AND ESTUARIES

Coastal Ecosystem Adaptation to Global Warming

Global warming is already affecting America's coasts and estuaries. Even with aggressive reductions in greenhouse gas emissions, climate change will place additional strain on our coastal systems. The fate of fish, wildlife, and people who depend on the nation's coastal ecosystems will depend on steps we take to help them survive in the face of a changing climate. **Climate change adaptation** – actions designed to safeguard our coasts, estuaries and other natural systems – will largely define a new era in America's conservation.



Lacassine National Wildlife Refuge, LA.

BETWEEN LAND AND SEA

Tracing a fluid boundary between land and sea, America's coasts and estuaries are unparalleled in their importance to the nation's economy and ecological well-being. Stretching over more than 88,000 miles, our tidal shorelines are inlaid with vast stretches of beach and coastal wetlands, and—where major rivers meet the sea—with more than 100 estuaries. This narrow coastal fringe not only supports an incredible array of fish and wildlife species, but is home to more than half the nation's human population. With so many drawn to the ocean's edge, it is not surprising that coastal habitats are under severe pressure from threats ranging from rampant development, water pollution, and invasive species, to overfishing. Our coasts and estuaries are also, unfortunately, among the most vulnerable ecosystems to the impacts of climate change.

IMPACT OF GLOBAL WARMING ON COASTS AND ESTUARIES

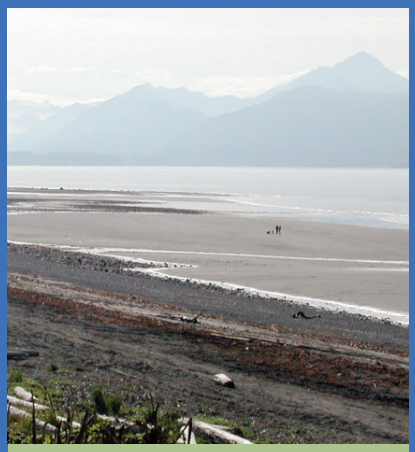
Once viewed as inexhaustible in their abundance, many of our most productive coastal waters already are on life support, cut-off by upstream dams from the sediment that nourishes their fringing wetlands, and receptacles for all manner of contaminants that flow downstream. Even as we make progress in restoring America's great waters, however, climate change poses a new set of challenges to protecting our coasts and estuaries. Several of the major impacts of climate change on coasts and estuaries are:

Rising Sea Levels ~ Sea levels are rising at an accelerating rate due to the thermal expansion of the oceans and melting of ice fields, compounded in some regions by subsidence of coastal lands. Higher sea levels will increase beach erosion, cause saltwater intrusion into water supplies, inundate coastal marshes and other important habitats, and leave coastal property more vulnerable to storm surges and flooding.

Warming Waters ~ Higher ocean water temperature will contribute to extensive coral bleaching and the spread of marine diseases. Warmer water is also causing marine species' to shift ranges and may contribute to the depletion and collapse of fisheries.

Ocean Acidification ~ Absorption of excess carbon dioxide by sea water is increasing the ocean's acidity, setting the stage for potentially devastating impacts on marine life and food webs. Higher acidity inhibits the ability of corals, shellfish, and other marine organisms to build calcium carbonate skeletons and shells.

More Powerful Storms ~ An increase in the frequency and severity of extreme weather events, including hurricanes, intense rainfall, floods, and droughts will alter freshwater flows into estuaries, exacerbate polluted runoff and water supply problems, and damage coastal habitats and communities.



Low tide at Bishop's Beach, AK.

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Sea otters off the California coast.

COASTAL ADAPTATION TO CLIMATE CHANGE

Safeguarding the nation's coasts and estuaries in the face of climate change will require looking at coastal management and conservation through a different lens, one that acknowledges and addresses problems of the past but recognizes and prepares for those of the future. Given the extensive use of coastal areas for human settlements and activities, and the enormous financial investments involved, there inevitably will be trade-offs between strategies aimed at protecting coastal property and infrastructure and those designed to safeguard natural systems. Efforts to protect human uses of our coastal systems and efforts to restore and maintain important natural habitats are, however, more often than not mutually beneficial. Indeed, healthy coastal ecosystems not only enhance quality of life, but provide important services to communities, such as protecting people and property from severe storms, improving water quality, and providing habitat for commercially and recreationally important fish and shellfish.

Adaptation strategies for coasts and estuaries include:

- **Protect and restore marshes and other coastal habitats.** Natural coastal habitats are critical for sustaining fish and wildlife populations, and can buffer human infrastructure from increasingly powerful storms. Restoring natural tidal flows will be important for rehabilitating many currently degraded coastal wetlands.
- **Preserve the ability of habitats to migrate inland as sea levels rise.** Remove or prevent coastal armoring, such as seawalls, bulkheads and dikes, which can block landward retreat of marshes, dunes, and other shoreline habitats. Use of "rolling easements" can aid inland migration of habitats.
- **Facilitate replenishment of sediments in coastal wetlands and beaches.** Restoring the capacity for natural replenishment of sediments may enable some wetlands to keep pace with rising sea levels. Where this is not possible, the use of artificial renourishment or "assisted accretion" may be appropriate.
- **Use ecosystem-based management to improve coastal resilience.** Promote the maintenance of key ecological processes and native biodiversity through assuring connectivity among systems and reducing non-climate stressors, such as over-fishing and pollution. Climate impacts, however, will require us to be strategic in identifying where, when and how to address existing stressors.
- **Eliminate public subsidies for development in high risk coastal zones.** Revise eligibility rules for providing flood insurance in coastal flood hazard zones to discourage risky development in the face of more powerful storms and rising sea levels.

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For additional information on ecosystem adaptation see P. Glick, A. Staudt, and B. Stein. 2009. *A New Era for Conservation: Review of Climate Change Adaptation Literature*, Washington, DC: National Wildlife Federation (available at: http://www.nwf.org).

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