

The following pages present a variety of climate change adaptation strategies and actions suggested for and in use in coastal and marine areas.

Adaptation Terminology:

Adaptation goal: General characterization of what an adaptation activity is attempting to achieve.

Adaptation strategy: General statements of how to reduce climate vulnerabilities or increase resilience within a given goal.

Adaptation action: Specific activity that facilitate progress towards achieving an adaptation strategy.

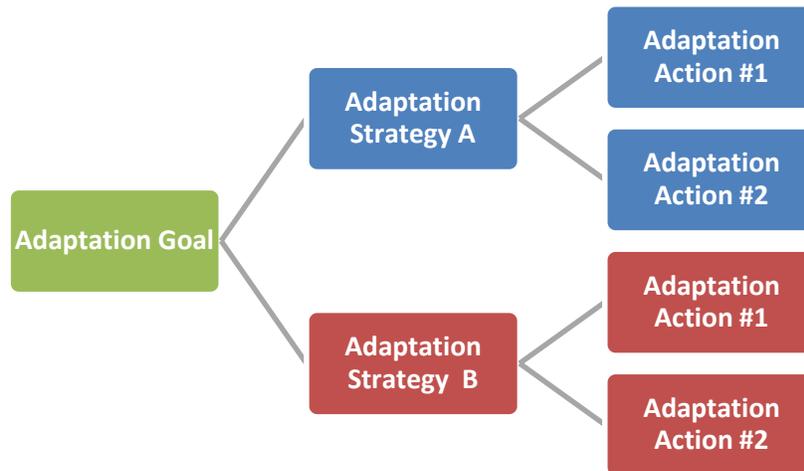


Figure 1. Visual representation of relationship between adaptation goals, strategies, and actions.

Most adaptation activities fall into the following five categories:

1. **Enhance Resistance.** Implementation of these strategies can help to prevent the effects of climate change from reaching or affecting a resource. One common type of resistance actions are activities designed to reduce non-climate stressors.
2. **Promote Resilience.** These strategies can help a resource weather the impacts of climate change by avoiding the effects of or recovering from changes.
3. **Facilitate Transition (or Response).** Transition or response strategies intentionally accommodate change and enable resources to adaptively respond to changing and new conditions.
4. **Increase Knowledge.** These strategies are aimed at gathering more information about climate changes, impacts, and/or the effectiveness of management actions in addressing the challenges of climate change.
5. **Enhance Coordination.** Coordination strategies help organize adaptation efforts across various groups (e.g., sectors, governments, project teams). They may help align budgets and priorities for a program of work across lands, or establish or expand collaborative monitoring efforts or projects, among others.

Resilient management requires implementing a variety of adaptation options!



Goal	Adaptation Strategy	Specific Adaptation Action	Examples and Case Studies
Enhance Resistance	Protect vulnerable areas from sea level rise, storm surge, higher wave action, erosion, and other climate impacts	Use “soft-engineering” techniques and/or natural infrastructure to replenish or mimic natural buffers ^{1,2,3}	<ul style="list-style-type: none"> - South Bay Salt Pond Restoration Project, California: restoring tidal marsh for coastal protection, as well as habitat, recreation, and water quality services - San Francisco Bay Living Shorelines Project, California: experimentally utilizing a variety of living shoreline techniques (e.g., native vegetation and natural materials placement) to increase shoreline protection and provide habitat - Alligator River National Wildlife Refuge, North Carolina: using oyster reefs to dissipate wave/storm surge energy, reduce shoreline erosion, and slow currents - Mass Audubon Wellfleet Bay Wildlife Sanctuary, Massachusetts: oyster reef habitat restoration project to enhance natural coastal buffering for salt marshes - The Nature Conservancy, Alabama: Gulf Coast oyster reef restoration projects to reduce shoreline erosion associated with sea level rise and storm surge - Aramburu Island Ecological Enhancement Project, California: utilizing sand and gravel nourishment to reduce erosion and stabilize beaches
		Where “soft-engineering” is not possible, use designs and permitting that incorporate climate change considerations and help minimize negative impacts of hard infrastructure (includes new construction and repair) ^{1,2,4}	<ul style="list-style-type: none"> - Alligator River National Wildlife Refuge, North Carolina: using water control structures to minimize saltwater intrusion and restore a natural hydrologic regime - Hamilton City, California: establishing river setback levee to reduce flood risk and reconnect river to large portion of floodplain - San Francisquito Creek, California: reducing flood risk and enhancing habitats through infrastructure upgrades (e.g., installing new bridges with higher flow capacity)
	Improve runoff water quality	Invest in urban forestry and green infrastructure projects ^{1,2}	<ul style="list-style-type: none"> - Sierra Club, Detroit, Michigan: utilizing green infrastructure to prevent sewage overflows during increasingly intense storms and downpours - City of Ann Arbor, Michigan: creating a climate-informed urban forestry plan update - Chicago Climate Action Plan, Illinois: green urban design to reduce flooding - Project Clean Lake, Ohio: investing in green infrastructure to reduce stormwater runoff
		Promote use and restoration of riparian stream buffers	<ul style="list-style-type: none"> - Nisqually Estuary, Washington: riparian surge plain forest restoration - Las Cienegas National Conservation Area, Arizona: restoring riparian areas to enhance floodplain capacity to capture sediment and slow runoff - Blackfoot River, Montana: riparian restoration to enhance stream resiliency - Chicago Wilderness Climate Action Plan, Illinois: promote use of riparian buffers in their climate action plan - Sky Island Region, Arizona and New Mexico: spring restoration to enhance habitat and wildlife resiliency
		Reduce impervious surface cover and/or increase open space ⁵	<ul style="list-style-type: none"> - Chula Vista, California: promoting low impact development and climate-informed open space management for stormwater prevention - Chicago Climate Action Plan, Illinois: green urban design to reduce flooding, including permeable pavement - Pima County, Arizona: acquisition and protection of open space



Goal	Adaptation Strategy	Specific Adaptation Action	Examples and Case Studies
Enhance Resistance (continued)	Practice climate-informed habitat restoration	Maintain and/or increase coastal habitat restoration efforts that incorporate climate information ^{1,2,3,5}	<ul style="list-style-type: none"> - South Bay Salt Pond Restoration Project, California: salt pond restoration project that incorporates sea level rise - Comprehensive Everglades Restoration Plan, Florida: everglades restoration efforts and development of long-term restoration plans that incorporate sea level rise - Estero de Limantour Coastal Watershed Restoration Project, California: dam removal to increase saltwater/freshwater connectivity and enhance anadromous fish habitat - Waihe'e Refuge, Hawaii: replacing invasive plants with native plants to increase refuge resilience - The Nature Conservancy, Alabama: Gulf Coast oyster reef restoration projects to reduce shoreline erosion associated with sea level rise and storm surge - Kayak Point County Park, Washington: restoration efforts designed to enhance park resilience to winter storms and sea level rise - Aramburu Island Ecological Enhancement Project, California: features habitat enhancement and shoreline protection projects that will enhance resilience to sea level rise, storm surge, and erosion - Mass Audubon Wellfleet Bay Wildlife Sanctuary, Massachusetts: oyster reef restoration to help mitigate climate change impacts on coastal marshes - Narragansett Bay, Rhode Island: eelgrass, salt marsh, and scallop restoration projects to enhance coastal resilience
		Remove hard structures that exacerbate climate impacts ^{2,3}	<ul style="list-style-type: none"> - Nisqually Estuary, Washington: estuary restoration efforts include dike removal to restore tidal flow to marsh - Kayak Point County Park, Washington: park restoration proposals suggest removing bulkheads that are exacerbating beach erosion and preventing beach migration
		Restore floodplain function ²	<ul style="list-style-type: none"> - Napa River, California: reconnecting river to floodplain, effectively enhancing 100-year flood protection and restoring tidal wetland and alluvial floodplain habitat
	Maintain or enhance sediment transport for accretionary processes	Develop local sediment management plans or policies ^{1,2,3}	<ul style="list-style-type: none"> - Aramburu Island Ecological Enhancement Project, California: utilizing sand and gravel nourishment to reduce erosion and stabilize beaches - Gulf of Mexico Regional Sediment Master Plan: organizing sediment management across five states to promote coastal habitat resilience - Delaware Sea Level Rise Initiative: multiple sediment studies to increase knowledge of local processes and inform marsh and other coastal management strategies - South Carolina Shoreline Change Initiative: 2010 report promotes improved planning of beach nourishment projects, including development and implementation of regional sediment master plan
Reduce erosion	Mitigate potential increases in erosion due to climate change ²	<ul style="list-style-type: none"> - Port Susan Bay, Washington: reintroduction of large logs to trap sediment and reduce erosion from flooding and sea level rise - The Nature Conservancy, Alabama: Gulf Coast oyster reef restoration projects to reduce shoreline erosion associated with sea level rise and storm surge 	



Coastal and Marine Adaptation Strategies and Actions

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Enhance Resistance (continued)	Reduce recreational impacts	Increase public education to minimize disturbance and/or degradation of vulnerable habitats and species ³	<ul style="list-style-type: none"> - Kailua Beach Management Plan, Hawaii: promoting public education and collaboration to enhance proper management and use of vulnerable beach and dune habitats - Sierra Nevada, California: in developing adaptation strategies for regional national forests, stakeholders suggested working with recreational anglers to reduce invasive species spread and non-native fish stocking in fishless lakes - Wisconsin: outreach and education for coastal communities regarding climate change impacts to the natural environment
	Reduce current and future invasive species pressure	Maintain and/or increase invasive species monitoring and eradication efforts ^{1,2}	<ul style="list-style-type: none"> - San Francisco Estuary Invasive Spartina Project, California: removing non-native cordgrasses to help prevent loss of native marshes and mudflats that are particularly susceptible to sea level rise - Waihe'e Refuge, Hawaii: replacing invasive plants with native plants to increase refuge resilience
		Create or enhance regulations and technology to prevent future invasive species introductions and spread ⁵	<ul style="list-style-type: none"> - Great Lakes Restoration Initiative, Illinois: action plan outlines intention to develop ballast water treatment to minimize invasive species introductions
Promote Resilience	Incorporate changing climate conditions into policy, planning efforts, and regulatory, legal, and financial mechanisms	Update or amend comprehensive and zoning plans ^{1,2,3}	<ul style="list-style-type: none"> - Maryland: regional strategy for reducing Maryland's vulnerability to climate change recommends integration of sea level rise into comprehensive and zoning plans - Somerset County, Maryland: updated comprehensive and zoning plan incorporates current and future floodplains and suggests moving vulnerable structures - Huron River Watershed Council, Michigan: working with several communities to incorporate climate change considerations into regulations and permitting
		Update floodplain management regulations ⁴	<ul style="list-style-type: none"> - Somerset County, Maryland: updated floodplain management ordinance based on sea level rise projections, requiring structure elevation and adopting new adjacent "floodplain planning area" which will likely be inundated by 2050 - Malibu, California: city's land use and land use implementation plan require all new development be elevated above base flood levels
		Require setbacks and buffers for all future development ^{1,2,3,4}	<ul style="list-style-type: none"> - Somerset County, Maryland: updated comprehensive and zoning plan requires buffers for most streams, tributaries, and conservation easements - Malibu, California: city's land use and land use implementation plan require setbacks for all new development - Hawaii: both state and county governments require significant setbacks from shoreline
		Require real estate disclosures on vulnerability of properties to sea level rise and erosion ⁴	<ul style="list-style-type: none"> - Delaware: considering legal mechanisms available for adapting to sea level rise, including potential use of real estate disclosures
		Incorporate climate-informed conditions and exactions when issuing development permits ^{3,4}	<ul style="list-style-type: none"> - Rhode Island Coastal Resources Management Council: working with the state building commission to incorporate higher freeboard regulations in new development guidelines



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<p>Promote Resilience (continued)</p>	<p>Incorporate changing climate conditions into policy, planning efforts, and regulatory, legal, and financial mechanisms (continued)</p>	<p>Implement conservation subdivision/cluster development ordinances^{3,4}</p>	<ul style="list-style-type: none"> - Chula Vista, California: revised grading ordinance and subdivision manual according to sea level rise projections
		<p>Consider climate risks and vulnerabilities in project planning, siting, design, construction, maintenance, and rehabilitation, including those related to infrastructure (e.g., retrofit infrastructure)^{1,3,4}</p>	<ul style="list-style-type: none"> - Somerset County, Maryland: updated comprehensive plan suggests incorporating new codes/law related to sea level rise into all infrastructure projects - Malibu, California: city’s land use and land use implementation plan require that all future development projects consider the impacts of coastal storms, erosion, and sea level rise - King County, Washington: recommends that sea level rise projections be a key factor when exploring future wastewater facility retrofits and site selection - Deer Island, Massachusetts: incorporated sea level rise projections into wastewater facility update, resulting in elevation of facility to reduce flooding risk
		<p>Consider climate change in species management and policy decisions (e.g., threatened and endangered species listings)²</p>	<ul style="list-style-type: none"> - U.S. Fish and Wildlife Service: listing of polar bears as a threatened species under the Endangered Species Act (ESA) due to climate impacts to habitat - National Marine Fisheries Service: listing of two stony coral species as threatened under the ESA due to a variety of climate vulnerabilities
		<p>Designate areas requiring special protection in light of climate change (e.g., beaches, wetlands, priority habitat) and limit new development in these areas^{3,4,5}</p>	<ul style="list-style-type: none"> - Maryland Department of Natural Resources, Maryland: utilized mapping tool (GreenPrint) to find, prioritize, and protect lands suitable for inland retreat of coastal wetlands - Rhode Island Coastal Resources Management Council: plans to identify key retreat areas for salt marshes and develop new policies to protect those areas - Papahānaumokuākea Marine National Monument: designation as a monument enhances protection and provides framework for collaborative management
	<p>Enhance habitat and species resilience</p>	<p>Prioritize ecosystem-based management, rather than single-species based management¹</p>	<ul style="list-style-type: none"> - Pacific Fishery Management Council: developing an ecosystem fishery management plan (as opposed to species-based traditional fishery management plans) to allow broader analysis and management of natural and anthropogenic stressors that may affect various fish stocks
		<p>Develop genetic “banks” (e.g., seed banks, captive breeding programs)</p>	<ul style="list-style-type: none"> - Oyster Emergency Project, West Coast: identifying genetic oyster stocks that are more resilient to ocean acidification and other stressful environmental conditions
		<p>Incorporate climate information into traditional management activities (e.g., adjust restoration priorities, build in climate safeguards)^{1,3,5}</p>	<ul style="list-style-type: none"> - North Pacific Fisheries Management Council: taking a precautionary approach to commercial fishery regulations, prohibiting certain actions until more information becomes available



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Facilitate Transition/Respond	Prepare the landscape for change	Remove structures that are exceedingly vulnerable, exacerbate climate impacts, and/or that prevent habitat migration ^{1,2,3,4,5,6}	<ul style="list-style-type: none"> - City of Ventura, California: removing rip-rap, concrete barriers, and asphalt adjacent to beach to reduce erosion and enhance beach resilience (part of larger managed retreat effort of local infrastructure) - Estero de Limantour Coastal Watershed Restoration Project, California: removal of two flood- and sea level rise-vulnerable dams to enhance freshwater/saltwater habitat connectivity and enhance anadromous fish habitat - Worcester County, Maryland: removing components of hardened shorelines to protect low elevation wetlands and beaches - Pacifica State Beach, California: removal of vulnerable beach structures
		Acquire properties with high natural resources value (e.g., climate refugia, future or priority habitat, migration corridors) ^{1,2,3}	<ul style="list-style-type: none"> - Pima County, Arizona: acquisition and protection of open space - Pacifica State Beach, California: purchased two properties adjacent to beach, removed structures and restored dunes - Scenic Hudson Land Trust, New York: prioritizing and acquiring land parcels that provide habitat connectivity and enhance resilience (e.g., act as sea level rise buffers)
		Utilize various easement types to protect adequate space and migration corridors (e.g., conservation easements, rolling easements, climate change adaptation easements) ^{1,2,3,5}	<ul style="list-style-type: none"> - ClimAID, New York: climate action and adaptation plan suggests using rolling easements to move structures out of flood-prone areas
		Upgrade infrastructure to mitigate potential failures ^{2,3}	<ul style="list-style-type: none"> - Piscataqua Region Estuaries Partnership, New Hampshire: identified coastal culverts vulnerable to increased flooding, whose failures could affect habitat, public health, and residential properties - East Bay Municipal Utility District, California: evaluating reliability of water supply infrastructure in face of sea level rise and exploring adaptation options - Somerset County, Maryland: instituted required updates of onsite septic systems in preparation for more frequent flooding and different groundwater conditions - Deer Island, Massachusetts: elevated wastewater treatment plant to reduce vulnerability to sea level rise and minimize need for future construction to protect facility - Project Clean Lake, Ohio: upgrading sewer infrastructure to better capture stormwater and reduce sewer overflows in the face of more frequent heavy downpours
	Anticipate and facilitate migration	Manage non-protected and/or mixed use areas between protected landscape zones to facilitate habitat and species movement ²	<ul style="list-style-type: none"> - British Columbia Ministry of the Environment: using GIS to assess landscape connectivity and identify areas that could function as habitat bridges - Mesoamerican Biological Corridor Project, Mexico: planning for and implementing landscape connectivity of priority habitats, including identification and management of low development corridors and multiple use areas



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<p><i>Facilitate Transition/Respond (continued)</i></p>	<p>Anticipate and facilitate migration (continued)</p>	<p>Maintain and/or increase habitat connectivity to facilitate species migrations^{1,2,3}</p>	<ul style="list-style-type: none"> - Estero de Limantour Coastal Watershed Restoration Project, California: dam removal to increase saltwater/freshwater connectivity and enhance anadromous fish habitat - Pacifica State Beach, California: enhanced tidal wetlands and restored creek banks, enhancing steelhead habitat connectivity - High Divide Project, Idaho and Montana: developing and implementing conservation tools to maintain wildlife habitat connectivity corridors - Washington Wildlife Habitat Connectivity Working Group: using GIS to identify key future habitat connectivity areas and incorporating into a master plan - Chicago Wilderness Climate Action Plan, Illinois: climate action plan promotes landscape connectivity - Climate Change Action Plan for the Florida Reef Tract: updating marine zoning plan to ensure reef connectivity - Mesoamerican Biological Corridor Project, Mexico: planning for and implementing landscape connectivity of priority habitats
<p><i>Increase Knowledge</i></p>	<p>Enhance understanding of vulnerability</p>	<p>Continue to gather and integrate data for refinement of vulnerability assessment and adaptation plans^{1,2}</p>	<ul style="list-style-type: none"> - Delaware Sea Level Rise Initiative: conducting research and gathering data to inform vulnerability assessments - ClimAID, New York: incorporating new climate projections into climate action plan as new science becomes available
		<p>Assess vulnerability of state, regional, and local infrastructure¹</p>	<ul style="list-style-type: none"> - East Bay Municipal Utility District, California: evaluating reliability of water supply infrastructure in face of sea level rise and examining adaptation options - King County, Washington: identifying infrastructure and facility vulnerability to climate change impacts and developing adaptation options - Water Utility Climate Alliance: coalition helping wastewater and water utilities adapt to climate change - RAND Corporation, Southern California: utilizing a decision-making tool to compare various utility water management plans under different climate scenarios to inform long-term planning
	<p>Gather non-habitat baseline data and/or conduct studies/modeling to better understand non-climate stressor distribution and potential synergistic or cumulative impacts^{1,2}</p>	<ul style="list-style-type: none"> - Mission-Aransas National Estuarine Research Reserve, Texas: investigating linkages between coastal land use changes and coastal/marine ecosystem impacts 	
	<p>Gather and integrate traditional ecological knowledge into adaptation plans and projects²</p>	<ul style="list-style-type: none"> - Kotzebue, Alaska: conducted a study to gather traditional ecological knowledge from Qikiktagrugmiut members to serve as reference point for monitoring future changes 	



Goal	Adaptation Strategy	Specific Adaptation Action	Examples and Case Studies
Increase Knowledge (continued)	Increase or enhance monitoring	Incorporate climate change considerations into current monitoring frameworks ²	<ul style="list-style-type: none"> - Marine Protected Area Monitoring Enterprise and EcoAdapt, California: held focus groups to identify what climate change impacts are currently being monitored in temperature marine ecosystems and how current monitoring might be adapted in context of climate change - Minnesota Department of Natural Resources: results from four year lake monitoring period will inform development of long-term monitoring plan that evaluates habitat, climate change impacts, and land use change impacts - Fond du Lac Reservation, Minnesota: incorporating climate change considerations into existing water quality monitoring program
		Identify and develop monitoring frameworks for critical climate-related data and extreme events ^{1,2}	<ul style="list-style-type: none"> - Gulf of the Farallones National Marine Sanctuary, California: developed a climate change monitoring inventory and plan for the North-Central California Coast - Coral Reef Ecosystem Studies Project, Florida: monitoring coral response to climate change and sea level rise - North Pacific Climate Regimes and Ecosystem Productivity Program: monitoring and observing marine ecosystems in Gulf of Alaska and Bering Sea to track ecosystem response to climate variability - The FLaSH Project, Florida: monitoring impacts of ocean acidification and climate change on ecosystems of the Florida Shelf
		Monitor baseline habitat and species conditions to monitor changes and inform adaptive management ^{1,2}	<ul style="list-style-type: none"> - Northwest Stream Temperature Project: organizing all stream temperature monitoring data gathered by various agencies to create maps and models and to inform restoration, conservation, and future stream monitoring activities - Fond du Lac Reservation, Minnesota: baseline water quality and flow data will be used to inform planning and management of key tribal resources
		Adjust fisheries monitoring to incorporate climate change ^{1,2,5}	<ul style="list-style-type: none"> - North Pacific Fisheries Management Council: preventing commercial fishing activity in some areas until monitoring and scientific studies indicate that fishing pressure will not exacerbate climate impacts and/or negatively affect fish stocks
		Design and implement citizen science monitoring projects ^{1,2}	<ul style="list-style-type: none"> - Mass Audubon Wellfleet Bay Wildlife Sanctuary, Massachusetts: using citizen science to monitor oyster reef restoration success - Sky Island Region, Arizona and New Mexico: using citizen science to conduct an inventory of local springs to improve landscape-wide, climate-informed management - What's Invasive Project, California: citizen monitoring to map invasive species locations - California King Tides Project: citizen photos document king tide flood risk, are used for comparison and validation of models, and help visualization and communication of future flood risk - Salmon Watcher, Washington: citizens document barriers to upstream salmon migration and conduct salmon species identification and population counts during breeding season to inform larger studies on salmon population fluctuations in response to environmental variability



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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Increase Knowledge (continued)</p>	<p>Improve availability and use of spatial information</p>	<p>Update maps and spatial data sets to reflect most current available knowledge¹</p>	<ul style="list-style-type: none"> - EcoAdapt and the Geos Institute, Washington: collaborated to create climate-informed blueprint maps of western Washington that identify priority ecological areas and evaluate stability in face of climate change for use in decision-making - Northwest Stream Temperature Project: organizing all stream temperature monitoring data gathered by various agencies to create maps and models and to inform restoration, conservation, and stream monitoring activities
	<p>Practice climate-informed research</p>	<p>Conduct adaptive management studies^{1,2,5}</p>	<ul style="list-style-type: none"> - South Bay Salt Pond Restoration Project, California: adaptive management plan implements restoration efforts in multiple phases and uses lessons learned to determine future actions - Alligator River National Wildlife Refuge, North Carolina: utilizing adaptive management to increase shoreline resilience to sea level rise
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Enhance Coordination</p>	<p>Work across jurisdictions</p>	<p>Increase communication and idea sharing amongst local, regional, and state entities^{1,2}</p>	<ul style="list-style-type: none"> - Northwest Stream Temperature Project: organizing all stream temperature monitoring data gathered by various agencies to create maps and models and to inform restoration, conservation, and stream monitoring activities - Bald Head Island Conservancy, North Carolina: developing a knowledge sharing network amongst various barrier island communities
		<p>Increase collaboration amongst local, regional, and state entities^{1,2,5}</p>	<ul style="list-style-type: none"> - Wisconsin Initiative on Climate Change Impacts: unifies efforts of various stakeholders to identify climate change risks and adaptation options - Climate Change Action Plan for the Florida Reef Tract: organizes federal, state, and local government action to enhance resilience of Florida’s coral reefs - The Southeast Florida Regional Climate Change Compact: ensures coordination on mitigation and adaptation activities between four counties - Comprehensive Everglades Restoration Plan, Florida: joint effort between multiple agencies and groups to implement restoration projects and to develop and provide guidance on sea level rise
		<p>Identify opportunities where resources can be leveraged to benefit multiple parties¹</p>	<ul style="list-style-type: none"> - Hamilton City, California: establishing river setback levee to reduce community and agricultural flood risk while restoring river floodplain habitat - Nisqually Estuary, Washington: river delta restoration project to increase estuary resiliency by enhancing tidal wetlands and facilitate salmon recovery efforts by reconnecting floodplain and restoring juvenile salmon habitat - Estero de Limantour Coastal Watershed Restoration Project, California: removal of two flood- and sea level rise-vulnerable dams to minimize failure risk, enhance freshwater/saltwater habitat connectivity, and enhance anadromous fish habitat - Pacifica State Beach, California: managed beach retreat combined with wetland and stream bank restoration to improve habitat, reduce flood risk for adjacent residents, and enrich recreation



Coastal and Marine Adaptation Strategies and Actions

Goal	Adaptation Strategy	Specific Adaptation Action	Examples and Case Studies
Enhance Coordination (continued)	Engage the public	Practice education and outreach through a variety of platforms (e.g., technology, personal interactions, signage) to communicate climate risks and adaptation options and to garner public support ^{1,2,5}	<ul style="list-style-type: none"> - National Park Service: using national parks to communicate climate impacts and highlight adaptation options - Apostle Islands National Lakeshore, Wisconsin: developed a climate change exhibit that highlights impacts on local indigenous cultures and other residents; now working on translating this exhibit into a curriculum for school teachers - Channel Islands National Marine Sanctuary, California: identified a variety of public outreach methods to increase climate change communication (e.g., education programs, website updates, climate change issue of sanctuary publication, brochures, teacher workshops, public lectures) - Narragansett Bay, Rhode Island: developed guidebook for coastal property owners to encourage low impact development and natural shoreline management (e.g., install natural vegetative buffers) - Bald Head Island Conservancy, North Carolina: using graphics, lecture series, and turtle conservation program to educate and engage public in climate adaptation - Many Strong Voices Programme, Arctic Canada: Portraits of Resilience photography project to highlight climate change impacts and local responses - Baldwin County, Alabama: Grasses in Classes Program engages local schools to cultivate and plant native grasses for coastal habitat restoration

¹ California Natural Resource Agency. 2014. *Safeguarding California: Reducing Climate Risk*.

http://resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf

² Gregg, R.M., L.J. Hansen, K.M. Fiefel, J.L. Hitt, J.M. Kershner, A. Score, and J.R. Hoffman. 2011. *The State of Marine and Coastal Adaptation in North America: A Synthesis of Emerging Ideas*. EcoAdapt. Bainbridge Island, WA.

http://ecoadapt.org/data/library-documents/EcoAdapt_Marine%20and%20Coastal%20Synthesis%20Report_2011_Final.pdf

³ California Coastal Commission. 2015. *California Coastal Commission Sea Level Rise Policy Guidance: Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits*.

http://documents.coastal.ca.gov/assets/slr/guidance/August2015/0_Full_Adopted_Sea_Level_Rise_Policy_Guidance.pdf

⁴ Georgetown Climate Center. 2011. *Adaptation Tool Kit: Sea-Level Rise and Coastal Land Use*.

http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/Adaptation_Tool_Kit_SLR.pdf

⁵ Boicourt, K. and Z.P. Johnson (eds.). 2010. *Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change, Phase II: Building Societal, Economic, and Ecological Resilience*. Report of the Maryland Commission on Climate Change, Adaptation and Response and Scientific and Technical Working Groups. University of Maryland Center for Environmental Science, Cambridge, Maryland and Maryland Department of Natural Resources, Annapolis, Maryland.

http://www.dnr.state.md.us/climatechange/climatechange_phase2_adaptation_strategy.pdf

⁶ California Emergency Management Agency. 2012. *California Adaptation Planning Guide*.

http://resources.ca.gov/docs/climate/O1APG_Planning_for_Adaptive_Communities.pdf