## PREPARING FOR A SEA CHANGE IN FLORIDA

A Strategy to Cope with the Impacts of Global Warming on the State's Coastal and Marine Systems

# **Executive Summary**

### Florida Coastal and Ocean Coalition

Caribbean Conservation Corporation, Environmental Defense Fund, Gulf Restoration Network, National Wildlife Federation, Natural Resources Defense Council, Ocean Conservancy, Reef Relief, The Surfrider Foundation

## Foreword



Sylvia A. Earle, Marine Biologist

As a longtime Florida resident, as well as an ocean lover, explorer and scientist, I am deeply aware of the essential role that the coasts and ocean play in the life of this great state. From the coral reefs in the Keys to the glorious Panhandle beaches, from the quiet bays near Clearwater, where I grew up, to the oyster beds of Apalachicola Bay, the surfing beaches of the Atlantic and the estuaries of the Gulf, Florida possesses a rich coastal and ocean heritage. This heritage is threatened today as never before. Sea level rise, extreme weather patterns, warming waters and increasing ocean acidification are all predicted to result from the build up of  $CO_2$  in the atmosphere. No state is more likely to suffer these impacts than Florida, with its low- lying and flood- prone areas, extensive coastline and high coastal population density. Florida can and must be a leader not only in curbing the build up of  $CO_2$  and other greenhouse gases in the atmosphere, but also in implementing smart, common-sense coastal and ocean policies that will help preserve the state's natural coastal and ocean heritage. This guide, put together with careful thought by an impressive coalition of conservation organizations, lays out

a roadmap for State policymakers to follow in preserving that heritage. The pathway is clear; what is needed now is action.

Sylvia A. Earle, marine biologist, is the former chief scientist of the National Oceanic and Atmospheric Administration. She is chairman of Deep Ocean Exploration and Research and has served as explorer-in-residence at the National Geographic Society since 1998. She is a trustee of Florida's Mote Marine Laboratory and graduated from St. Petersburg College and Florida State University (Duke PhD). She serves on various corporate and nonprofit boards, including the Ocean Conservancy, the Explorers Club and as honorary trustee of the Natural Resources Defense Council.



## Executive Summary

Florida is unique not only for her beauty and wealth of marine resources but her position of leadership and ability to forge a path for coastal communities worldwide to proactively face the looming and potentially devastating impacts of climate change. The Florida Coastal and Ocean Coalition, a group of environmental organizations working together to conserve, protect and restore Florida's coastal and marine environment examines an ecosystem-based approach to coastal and ocean management in light of climate change, along with the important linkages between the health of Florida's economy and the health of its beaches and dunes, coral reefs, mangroves, sea grasses, wetlands and other natural resources.

Florida's coastal and marine habitats and the numerous ecological and economic resources they provide are invaluable to the millions of people who live in Florida or visit the state each year. The world class beaches generate tens of billions of dollars from tourism and recreation and provide habitat for numerous species of birds, sea turtles, and other wildlife. Coastal marshes, mangrove forests, seagrass beds, and other habitats remove excess nutrients and pollutants, act as a buffer against flooding, and support the vast majority of Florida's marine fish and shellfish. And the coral reefs in the Southeast and the Florida Keys are home to thousands of marine species, support a thriving tourism industry, and protect Florida's coasts from erosion and storm damage. These coastal and marine systems define Florida and frame the lives of Floridians.

Unfortunately, Florida's coastal and marine systems already have experienced serious degradation as a result of a variety of factors, including pollution, poorly sited coastal development, altered freshwater flows, and harmful fishing practices. Numerous restoration and protection efforts have been undertaken to tackle these problems, but the future of Florida's coastal and ocean resources also depends on addressing the very real threat of global warming. With Florida's human population expected to grow considerably in the coming decades, proactively confronting these challenges today is of paramount importance.

### Global Warming and Florida

Few coastal states are as vulnerable to the consequences of global warming as Florida, and we are already starting to see its effects. Average temperatures in parts of the state have increased by about 2 degrees Fahrenheit since the 1960s (U.S. EPA, 1997). Without a significant reduction in global emissions of carbon dioxide ( $CO_2$ ) and other heat-trapping greenhouse gases over the next few decades, average temperatures in Florida will continue to increase in the coming decades, with average low temperatures in winter increasing 3 to 10 degrees Fahrenheit and average high temperatures in summer increasing 3 to 7 degrees Fahrenheit by 2100 (Harwell, Gholz, and Rose, 2001).

Global warming means more than just hotter weather. It is contributing to higher ocean temperatures, moreextreme weather events, and rising sea levels. In addition, the higher concentration of  $CO_2$  in the atmosphere is directly altering the chemistry of our oceans, causing the water to become more acidic (Kleypas, et al., 2005). Left unchecked, all of these changes will have a profound impact on Florida's coastal and marine ecosystems:

- *Rising sea levels will increase erosion of beaches, cause saltwater intrusion into water supplies, inundate coastal marshes and other important habitats, and make coastal property more vulnerable to storm surges.*
- More-extreme weather events, including intense rainfall, floods, droughts, and tropical storms, will alter freshwater flows into estuaries and lagoons, exacerbate polluted runoff and water supply problems, and damage coastal habitats and property.
- Higher ocean temperatures will cause extensive coral bleaching, enhance marine diseases, alter species' ranges and population abundances, and harm fisheries.

*Higher ocean acidity will inhibit the ability of corals and other marine organisms to build up calcium carbonate, the substance that forms their protective skeletons.* 

## Meeting the Challenge

While it may seem daunting, Florida has a real opportunity to confront these collective problems – but it will take a concerted effort on two important fronts: minimizing global warming by reducing greenhouse gas emissions, and preparing for changes that are already underway.

First and foremost, Florida and the rest of the nation must work to lessen the impact of global warming by reducing the pollution causing it. In particular, the State of Florida, Congress and the administration must place mandatory limits on the nation's global warming pollution to ensure we meet the necessary target of an 80 percent reduction in emissions below current levels by 2050 [see Box 1 on page 12].

However, even if we successfully achieve critical greenhouse gas reduction goals, Florida is still facing impacts from climate change over the coming decades due to the continuing effects of greenhouse gases that are already in the atmosphere and those that we will continue to emit while transitioning to new energy sources. New and enhanced ecosystem restoration and adaptation strategies will be needed.

This report outlines the issues and concerns, but more importantly, identifies a series of recommended actions for local, state and federal agencies to cope with the significant challenges posed by rising sea levels, more-extreme storm events, higher ocean temperatures, and acidification of ocean waters. Some of the recommended actions will require Florida's Governor, Legislature, and Congressional delegation to provide the directives, funding mechanisms, and leadership to move forward. However, many programs and policies are already in place and can be used to begin making adaptive changes to a warming world. These recommendations, more fully detailed within, can be summarized as follows:

### To prepare for sea-level rise,

Florida and the federal government must take steps to implement ecologically and economically sound adaptive policies and strategies that discourage development in vulnerable areas and support efforts to site structures farther landward of eroding shorelines. This is essential not only to help reduce the serious risks to human safety and well being of communities, but also to ensure the preservation of beaches, dunes, and other natural coastal habitats that are so important to our economy and quality of life. For example:

- The state should undertake a comprehensive reevaluation of the Coastal Construction Control Line regulatory program to ensure that it is accomplishing the intended goals of protecting life, property, and the beach/dune system.
- The Florida Department of Environmental Protection and other relevant agencies should develop state wetlands conservation and restoration plans that promote designation of wetland migration as sea levels rise, thereby protecting the valuable benefits they provide.
- Federal, state, and local governments should replace economic incentives for private development in high risk coastal areas with incentives to relocate and build in other areas and invest in coastal conservation.

### To deal with extreme weather events,

such as heavy downpours and droughts, Florida and federal agencies must emphasize the protection and restoration of shoreline and streamside riparian vegetation and wetlands, upgrade stormwater management to take account of

more frequent and heavier rainfall events, and increase water use efficiency and opportunities for beneficial reuse. For example:

- The Florida Department of Environmental Protection should upgrade stormwater regulations, taking the likelihood of heavier rainfall events into consideration. Policies should focus on Low Impact Development methods, both for new developments and retrofits in existing developed areas.
- The Florida Department of Environmental Protection should evaluate/revise the Florida Water Plan (and regional water management plans) to explicitly address climate change.
- The States of Florida, Georgia, and Alabama should actively engage in a collaborative effort to develop and implement a long-term regional water management plan that incorporates climate change and takes a more coordinated approach to water management.

### To reduce the impacts of higher ocean temperatures,

Florida and federal agencies must work to protect and restore coastal and marine ecosystems in order to enhance their ability to deal with the additional stresses caused by climate change. For example:

- The Florida Department of Environmental Protection should evaluate and monitor the effectiveness of the state's collective coastal and aquatic managed areas and coastal zone management programs in supporting biological diversity among fish and wildlife species and should develop strategies to strengthen these programs.
- The Fish and Wildlife Conservation Commission should promote the rebuilding of depleted coastal and ocean fish populations since depleted populations will have a harder time dealing with the additional stresses posed by climate change and warming waters.
- Congress should enact climate adaptation legislation that would provide funding as well as require federal and state agencies to protect and strengthen the health of coastal and ocean ecosystems.

### To address acidification,

Florida and the nation must be leaders in efforts to minimize global warming through significant reductions in greenhouse gas emissions, in addition to supporting research and monitoring efforts to assess and mitigate the impacts of acidification on fish and wildlife.

- Federal and state agencies should make monitoring of ocean pH and calcification rates a part of the coral monitoring plans in the Tortugas Ecological Reserve, the Florida Keys National Marine Sanctuary, Biscayne National Park, and Oculina Bank Habitat Areas of Particular Concern.
- Relevant federal and state agencies should invest in studies to better understand the ecological impacts of ocean acidification.

By implementing these and the other recommendations expounded in the full report (available at: <u>www.</u> <u>flcoastalandocean.org/PreparingforaSeaChange</u>), we can help change the forecast for Florida's coastal and ocean resources and ensure that the economic opportunities, ecological benefits, and outdoor traditions they provide will endure for generations to come.

## Acknowledgements

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The Steering Committee members of the Florida Coastal and Ocean Coalition each developed, directed, and authored significant portions of this report. Steering Committee members are: Gary Appelson, Caribbean Conservation Corporation; Sarah Chasis, Natural Resources Defense Council; Ericka D'Avanzo, The Surfrider Foundation; Paul Johnson, Reef Relief; Gerald Karnas, Environmental Defense Fund; Joe Murphy, Gulf Restoration Network; and David White, Ocean Conservancy. The Steering Committee would like to thank and recognize its Coordinator, T.J. Marshall, and his Assistant, Georgia Bell, for their professional and dedicated work in keeping us on track and schedule in preparing this report.

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## About the Primary Author

Patty Glick, Senior Global Warming Specialist at the National Wildlife Federation (NWF), has more than 18 years experience working on the issue of climate change. She has developed a targeted campaign at NWF to build greater awareness and understanding of the known and potential impacts of climate change on North America's fish and wildlife and identify and implement meaningful solutions. Ms. Glick has led several research studies on sea-level rise and coastal habitats in Florida, the Chesapeake Bay, and the Pacific Northwest, and she is the author or co-author of numerous public reports, including *An Unfavorable Tide*; *Coral Reefs and Climate Change*; *A Great Wave Rising*; and *The Gardener's Guide to Global Warming*. Ms. Glick has a Master's Degree in economics from the University of North Carolina at Chapel Hill.

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# About the Authoring Organizations.



#### Caribbean Conservation Corporation and Sea Turtle Survival League

Caribbean Conservation Corporation (CCC), founded in 1959 by Dr. Archie Carr and based in Florida, is the oldest sea turtle conservation organization in the world. It is dedicated to the conservation of sea turtles through research, training, advocacy, education and protection of habitats. Learn about CCC and sea turtles at www.cccturtle.org.



#### **Environmental Defense Fund**

Environmental Defense Fund, a leading national nonprofit organization, represents more than 400,000 members. Since 1967, Environmental Defense Fund has linked science, economics, law and innovative private-sector partnerships to create breakthrough solutions to the most serious environmental problems. Visit us at www. environmentaldefense.org or www.oceansalive.org



The Gulf Restoration Network (GRN) is a network of environmental, social justice, and citizens' groups and individuals committed to restoring the Gulf of Mexico to an ecologically and biologically sustainable condition. The GRN was formed in 1994 to raise awareness of environmental issues in Gulf States and to increase communication and coordination of member activities across the region. We are playing a pivotal role in providing our members and partners with the technical information, Gulf-wide networking opportunities, and communication that empowers local communities to successfully address the environmental threats that they face. Visit us at www.healthygulf.org



#### Natural Resources Defense Council

NRDC (Natural Resources Defense Council) is a national nonprofit environmental organization with more than 1.2 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, and Beiijing. Visit us at www.nrdc.org.



#### National Wildlife Federation

National Wildlife Federation inspires Americans to protect wildlife for our children's future. Through a nationwide network—a federation of grassroots activists and wildlife enthusiasts dedicated to protecting wildlife and wild places, NWF has built a national coalition of members who carry our message to cities and rural communities, homes and town halls, Congress and state legislatures, elementary schools and universities, courts and international venues. Visit us at www.nwf.org.



#### **Ocean Conservancy**

Ocean Conservancy works to protect ocean ecosystems and conserve the global abundance and diversity of marine wildlife. Through research, education and science-based advocacy, Ocean Conservancy informs, inspires, and empowers people to speak and act on behalf of the oceans. Learn more at www.oceanconservancy.org.



Start a Sea Change

#### **Reef Relief**

Reef Relief is a nonprofit grassroots membership organization dedicated to Preserve and Protect Living Coral Reef Ecosystems through local, regional and international efforts. Visit us at www.reefrelief.org.



#### The Surfrider Foundation

The Surfrider Foundation is a nonprofit environmental organization dedicated to the protection and enjoyment of the world's oceans, waves and beaches for all people, through conservation, activism, research and education. Represented by over 50,000 members and 64 local chapters in the U.S., the Surfrider Foundation also has affiliations in Australia, Japan, France, and Brazil. Visit us at www.surfrider.org.

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