

ISSUE PAPER
September 2006

Florida's Coastal and Ocean Future

A Blueprint for Economic and Environmental Leadership

Authoring Organizations

Caribbean Conservation Corps and Sea Turtle Survival League
Clean Water Network of Florida
Environmental Defense
Natural Resources Defense Council
National Wildlife Federation
Reef Relief
Surfrider Foundation
The Ocean Conservancy

Endorsing Organizations

Coastal Angler Magazine
Conservation Alliance of St. Lucie County
Cry of the Water
Environment Florida
Florida Oceanographic Society
Hammerhead Dive Club
League of Women Voters of Florida
National Parks Conservation Association
Palm Beach County Reef Rescue
Save the Manatee Club
Sierra Club, Florida Chapter
West Palm Beach Fishing Club

Primary Author

Julie Hauserman

Acknowledgments

We would like to thank Julie Hauserman for her patience and hard work in writing this report. We also thank the following individuals for their expert guidance and help in overseeing the preparation and drafting of the report: Gary Appelton, Sarah Chasis, Ericka Davanzo, Gerald Karnas, Ken Lindeman, Lisa Novins, David White, and Linda Young. Thanks also to Mark Ferrulo, DeVon Quirolo, and Patti Thompson for their valuable contributions. We appreciate the help of Kathleen Goldstein and Jennifer Powers in preparing the report's release. Thank you to Lisa Goffredi for her editorial contributions. Finally, we thank Lisa Novins for so graciously shepherding this report through to publication.

About the author

Julie Hauserman has been writing about Florida's environment for 20 years. She has won many awards for her work, including two nominations for the Pulitzer Prize. She was a reporter and columnist for *The Stuart News*, the *Tallahassee Democrat*, and covered Florida's capitol for the *St. Petersburg Times*. She is now a freelance writer for the *Orlando Sentinel* and *St. Petersburg Times* opinion sections, and works as a political consultant.

Copyright 2006 by the Natural Resources Defense Council, Inc.

For additional copies of this report, please send \$7.50 each plus \$1.45 shipping and handling to: NRDC Publications 40 West 20th Street, New York, NY 10011. California residents must add 7.25% sales tax. Please make checks U.S. dollars only. This report is printed on 100% recycled paper with 25% post-consumer content.

About the authoring organizations



Caribbean Conservation Corps 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.



Clean Water Network of Florida

Clean Water Network of Florida is a statewide coalition of 155 environmental, civic and recreational groups that work together to strengthen, implement and enforce local, state and federal laws. The Network carries out its mission in a way that helps local groups more effectively participate in decisions that affect their community waters as well as their health and quality of life for their families.



Environmental Defense

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



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. 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.



The Ocean Conservancy

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

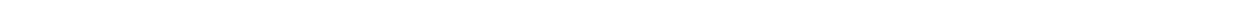


Table of Contents

Executive Summary	vi
Introduction	1
Responsibility for Florida's Oceans and Coasts	2
I. Curb Unwise Coastal Development and Protect Valuable Coastal Habitats	3
Risky Shoreline Development Disrupts the Beach-Dune System	4
Bulldozing Wetlands Destroys Water Quality and Water Supply	5
Recommended Actions	6
II. Reduce Coastal and Ocean Pollution	8
Florida's Coastal and Marine Resources Are a National Treasure	8
Government Has Failed to Control Water Pollution	9
Recommended Actions	11
III. Keep Offshore Drilling Away from Florida's Coast	13
Better Solutions to Meet Our Nation's Energy Needs	14
Recommended Actions	14
IV. Restore Marine Ecosystems, Ensure Robust Fisheries, and Protect Marine Species	15
Moving Toward Ecosystem Management in Florida's Oceans	15
Florida Depends on Its Fishery Resources	15
Recommended Actions for Protecting Marine Ecosystems and Ensuring Robust Fisheries	17
Florida Must Protect Sea Turtles and Manatees	18
Recommended Actions for Protecting Our Sea Turtles and Manatees	20
V. Reduce Global Warming Pollution	21
Global Warming Is Already Changing Florida	21
Recommended Actions	23
VI. Strengthen Ocean Governance	24
Recommended Action	25
Endnotes	26

Executive Summary

Nothing defines Florida more than its coast. People come from around the world to swim, boat, scuba dive, surf, fish, kayak, enjoy our beaches, and see our unique coastal wildlife. The coast is Florida’s economic engine. But alarming changes are taking place, from plummeting fish catches to outbreaks of harmful algae, dying marine life, and beach closures.

In 2005, tourists were greeted with algae-covered beaches and dead fish, dolphins, sea turtles, and manatees washing ashore. Hemmed in by development, our beaches are eroding and our reefs and fisheries continue to decline. Florida’s next governor can—and must—boldly act to stop this alarming decline and to reform coastal management policies before we lose the natural resources that fuel our economy and our identity as Floridians.

A Call to Action for Florida’s Coast and Oceans

A retiree trying his luck fishing off a pier in Pensacola describes one of the problems plainly: “Twelve years ago, you could catch three coolers (of fish) in three hours,” he said. “Now, you’re lucky to get a cooler in three days.”¹

Declining fish catch is just one symptom caused by a number of threats to the health and continued productivity of Florida’s ocean and coast: unwise coastal development, pollution, offshore drilling, overfishing and destructive fishing practices, lack of a comprehensive management system, and global warming.

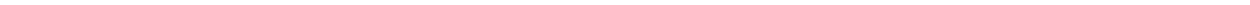
Florida restaurants, once renowned for fresh local seafood, are coming up short on popular local dishes as species decline and reliance on imported foreign seafood grows. Higher prices at local seafood markets are forcing consumers to turn to farm-raised imported seafood, and reduced catch limits on many species are frustrating both commercial fishermen and recreational anglers. Once-abundant species in the South Atlantic and Gulf of Mexico—including red snapper, a variety of groupers, red drum, amberjack, and black sea bass—are now classified by the government as “overfished,” or severely depleted. And pollution is taking a toll on the fish that remain: several wild Florida fish are too contaminated with mercury to eat.

Among the states, Florida in particular has much to lose: Nearly 86 million tourists visited in 2005, making Florida one of the most popular travel destinations in the world. Tourism generated more than \$63 billion in 2005 and created more than 944,000 jobs.² The state is the number-one SCUBA diving destination in the United States and produces many of the world's top surfers.^{3,4} Florida's recreational fishery is among the largest in the country: Recreational fishing expenditures are \$8.3 billion, including everything from food, lodging, bait, charter, equipment, and gas.^{5,6}

The state's coastal constituency is growing in size and voice, alarmed by the changes to our beaches and our waters. Now our leaders can—and must—take action to protect our marine and coastal ecosystems by:

1. Strengthening controls on coastal development.
2. Reducing the pollution that degrades Florida's waters, and maintaining, if not improving, water quality standards.
3. Keeping offshore oil drilling away from Florida's economically valuable beaches.
4. Ending overfishing and preserving marine and coastal ecosystems.
5. Helping Florida become a leader in reducing pollution sources, especially carbon dioxide emissions, that contribute to sea level rise and more intense hurricanes.
6. Strengthening governance by establishing unified, coordinated leadership for ocean and coastal resources.

Florida's next Governor and Cabinet, and Florida's Legislature must act urgently to stop the coast's alarming decline before we lose the natural resources that fuel our state's economy.



Introduction

“Our oceans and coasts are among the chief pillars of our nation’s wealth and economic well-being. Yet our lack of full understanding of the complexity of marine ecosystems, and our failure to properly manage the human activities that affect them, are compromising the health of these systems and diminishing our ability to fully realize their potential.”

— U.S. Commission on Ocean Policy,
“An Ocean Blueprint for the 21st Century”

“The crisis in our oceans is such that many marine populations and ecosystems may be reaching the point where even a small disturbance can cause big change. We must therefore initiate large changes ourselves, not in the oceans, but in our governance of them and our attitude toward them.”

—Pew Oceans Commission Report,
“America’s Living Oceans: Charting a Course for Sea Change.”

Underneath Florida’s picturesque waters, out of sight to most tourists, our precious coral reefs are dying. And though this may not be the most visible sign of the damage to our coastal waters, it is a serious one. Two coral species, Elkhorn and Staghorn, have reached such perilously low numbers that the federal government has listed them as threatened because they have declined 97 percent since the 1970s.⁷

And there are other changes: Sponge divers have hung up their wet suits as sponge beds disappear. Along the Atlantic coast, algae blooms clog renowned fishing destinations like the St. Johns, St. Lucie, and Indian Rivers. In 2005, the Gulf of Mexico experienced the worst red-tide outbreak in 34 years, with dead fish, manatees, dolphins, sea turtles, and millions of pounds of fish washing ashore.⁸

Despite laws and policies designed to protect marine resources, Floridians and tourists still face beach closings, seafood health advisories, and closed oyster and clam beds—all caused by pollution. Inadequate management, oversight, monitoring, and controls on commercial and recreational fishing are causing declining catches as well as deteriorating marine communities and ecosystems.

Florida has the opportunity to be a leader in reversing the decline of marine and coastal resources. Two national blue-ribbon panels, the United States Commission on Ocean Policy and the Pew Oceans

Commission, recently reviewed the state of America's declining ocean resources. Their reports comprised the first such review in 35 years, and they provide a sobering look at the incredible resources that are being lost, right before our eyes.⁹ After exhaustive research, both commissions made recommendations to policy makers about critical changes needed in existing ocean and coastal laws and management. The commissions' findings stand as a strong call to action to every coastal state and underscore the specific actions needed in Florida.

We call upon Florida's incoming governor and legislature to:

- Curb unwise development and protect coastal habitats;
- Reduce coastal and ocean pollution;
- Restore marine ecosystems, ensure robust fisheries, and protect marine species;
- Reduce global warming pollution; and
- Strengthen ocean governance.

Responsibility for Florida's Oceans and Coasts

Florida's marine and coastal resources are expansive: The state's tidal shoreline extends 8,426 miles, with 825 miles of sandy beaches and more than 11,000 miles of rivers, streams, and waterways.^{10, 11, 12} Every place in Florida is essentially coastal; no part of the state is more than 60 miles from the Atlantic or the Gulf of Mexico.¹³ The state's governance extends three miles from its Atlantic shoreline and ten miles from its Gulf shores.

Florida's connection to and dependence on our coastal resources affords us unique stewardship obligations for ocean resources management. Florida's responsibility specifically requires that public uses and interests be preserved over private appropriation.¹⁴

The remainder of this report identifies the major threats to the health and productivity of Florida's ocean and coast: unwise coastal development, pollution, offshore oil drilling, overfishing and destructive fishing practices, lack of a comprehensive management system, and global warming. Fortunately, each of these threats can be minimized with targeted and immediate action. We outline those actions and recommend how state policy makers—including the governor, cabinet, legislature, and the public—can all help protect our oceans.

I. Curb Unwise Coastal Development and Protect Valuable Coastal Habitats

Rampant development threatens our environment and our quality of life. Florida is losing many coastal habitats as a result of weak and poorly enforced coastal and growth management laws. Although the state has passed many laws, coastal areas are still being overdeveloped and valuable natural habitats are disappearing. The consequences echo not only on coasts and in nearshore waters, but also across the submerged shelf to offshore reefs. Losing beaches, dunes, mangroves, and coral reefs affects the productivity and diversity of fish and wildlife populations. And without these natural barriers, millions of people living along the coast are at greater risk from storms.

More than half of Florida's beaches are eroding.¹⁵ Coastal development is increasingly moving seaward, while the sea is moving landward. But Florida's coastal development policies don't take into account predicted increased storm activity and sea level rise. Today, miles and miles of seawalls and perpetual "beach renourishment" projects exist to protect this risky upland development.

The coasts are getting more crowded every year. In the early 1940s, Floridians numbered 2 million. By 1990, the state's population had reached just under 13 million. Now, the state has more than 16 million permanent residents, a 23 percent increase in 10 years.¹⁶ And the population just keeps growing: about 1,000 people move to Florida every day.¹⁷ Florida is expected to pass New York by 2010 to become the nation's third-largest state, and by 2030 our population is expected to reach 26 million.¹⁸ Eighty percent of Floridians live or work in one of the state's 35 coastal counties. Population growth rates in most coastal counties have approached 20 percent since 1990.¹⁹

The population boom is affecting even the undeveloped stretch of the Florida Panhandle. The vast timber holding of the area's shallow, fragile bays and valuable springs, wetlands, and rivers are in danger of being converted to massive residential development designed to lure new residents from throughout the United States. It is ironic that Florida, arguably the most important coastal destination in the United States, has failed to ensure the long term protection of its beach and dune environment.



Hundreds of sea wall permits were issued in Walton County immediately after Hurricane Dennis. This unprecedented sea wall building frenzy may become more common as beaches continue to erode. Photograph by Richard Fowlkes.

It has been 20 years since the Florida Legislature adopted the current coastal-protection policies, and many of the policies are outdated. The state needs to change how it subsidizes coastal development, including on barrier islands, to prevent environmentally damaging development. The first priority must be to protect key features, including dunes, mangroves, estuaries, and coral reefs. These natural habitats buffer storm surge and provide key habitat for economically important fish and wildlife.

If development isn't better controlled, Florida could lose revenue from three top recreational and tourism industries—fishing, diving, and surfing. It also faces increasing threats to public health and safety from storms.

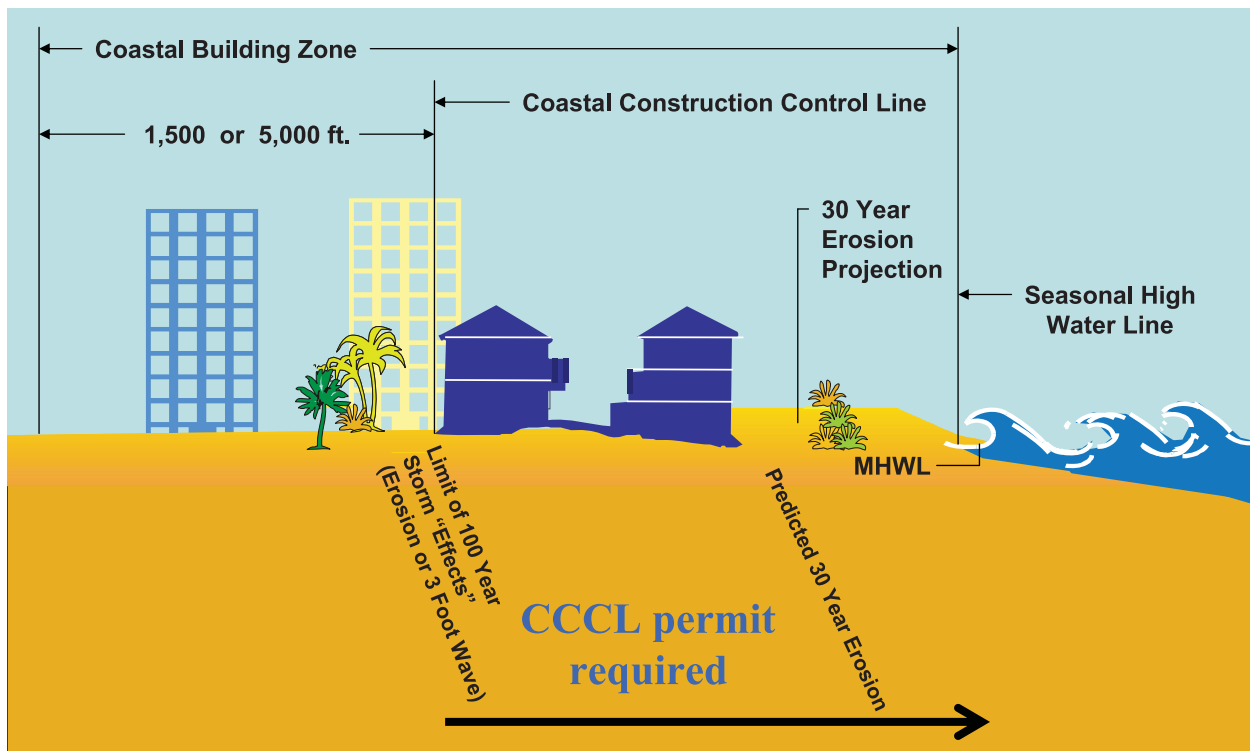
Risky Shoreline Development Disrupts the Beach-Dune System

Of Florida's 825 miles of sandy beaches, 38 percent are in a state of "critical erosion" and, as noted above, more than half are eroding due to factors such as beachfront building, navigational inlets, and natural causes.²⁰ In 2005, the state and federal governments spent almost \$200 million on Florida's beach and dune restoration programs.²¹ On the east coast, dredging for these so-called beach renourishment projects has—either directly, or indirectly due to increased turbidity—smothered critically important near-shore reefs.²²

Sea walls now extend along an estimated 14 percent to 20 percent of Florida's sandy beaches, and even more in some coastal counties.²³ Because of erosion and the need to protect oceanfront development, major coastal storms are often followed by a frenzy of sea wall construction. Immediately following Hurricane Francis in 2004, almost three miles of new sea walls were built.²⁴ Walton County, in the Panhandle, issued over 250 sea wall permits in the four months following Hurricane Dennis in 2005.²⁵ The walls exacerbate beach erosion, deprive the public of beach access, and adversely impact sea turtle nesting. Following the hurricanes, state redevelopment funds policies and funding encourage unsustainable rebuilding, regardless of whether rebuilding would occur next to a critically eroding beach.²⁶

The state's rules for coastal building that were designed to ensure the protection of beaches and dunes are inadequate and riddled with loopholes. For example, the Florida Department of Environmental Protection regulates construction near the shoreline through its Coastal Construction Control Line permitting program. The Coastal Construction Control Line is based on a 100-year storm event. The line, drawn inland along the coast, defines the area where buildings are predicted to suffer substantial damage in a 100-year storm.

Figure 1: Zones of Coastal Regulation



Source: Department of Environmental Protection.

Buildings that sit on the ocean side of the coastal line are expected to be impacted by high winds and storm surge.²⁷ This area typically includes frontal and secondary dune systems.

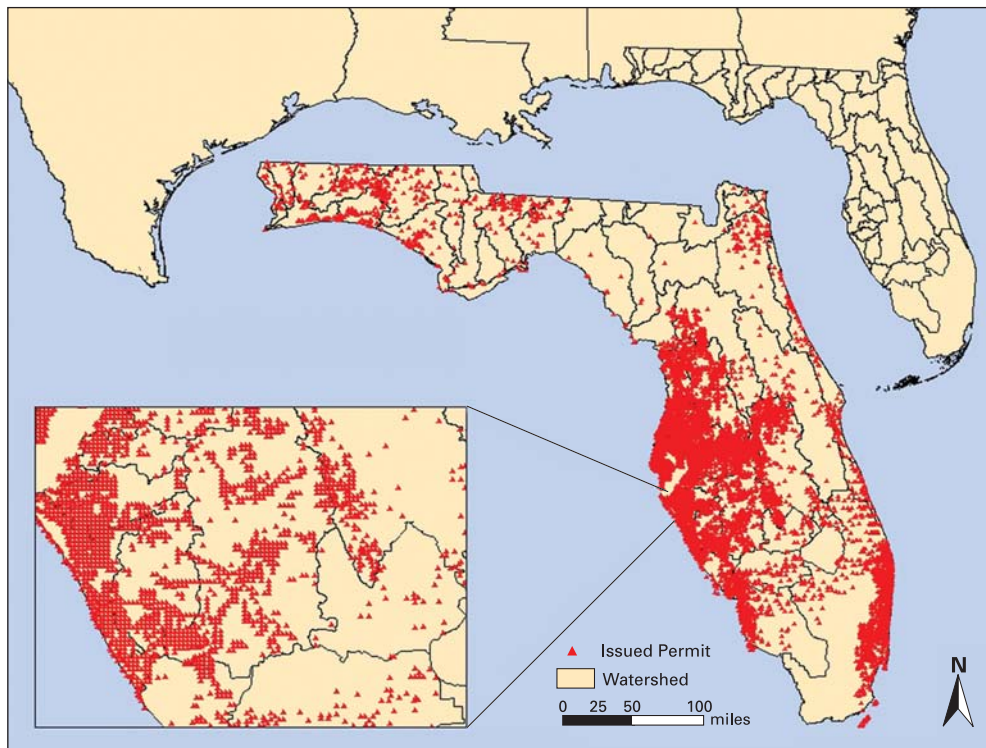
Though the name may imply it, the coastal construction line is not a setback line. Florida regulates design and building codes when people build on the ocean side of the coastal construction line, but the state doesn't prevent building there. That means development often occurs up to, and directly on top of, the very dunes that buffer the coast from storms, even on critically eroding beaches. As the beaches continue to erode, this development prevents natural recovery of the beach/dune system after storm events. The need to protect this risky shoreline development necessitates the need for more sea walls.

Florida also has a "30-year erosion projection line" that requires buildings to be set back landward of the line—but again, exceptions abound. This line is drawn where scientists predict the ocean will be in 30 years, based on erosion trends.²⁸ In theory, development is supposed to be prohibited on the ocean side of this line. However, single-family homes on lots platted before 1985 are exempt. Florida also allows new building on the ocean side of the 30-year erosion line up to "the established line of construction." That means if there is already a row of "grandfathered" beachfront development seaward of the 30-year erosion line, new buildings may be located in similar proximity to the beach.

Bulldozing Wetlands Destroys Water Quality and Water Supply

Wetlands—which filter runoff, protect from storm surge, recharge drinking water supplies, and help maintain healthy estuaries—are destroyed daily, despite policies in place to protect them. The state has no accurate data for how many tidal and freshwater wetlands are in Florida, but an in-depth analysis of satellite imagery by the *St. Petersburg Times* shows Florida has lost 84,000 acres of wetlands to development since 1990.²⁹ The U.S. Army Corps of Engineers approves more permits to destroy wetlands in Florida than any other state.³⁰ Between 1999 and 2003, it approved more than 12,000 wetland permits and rejected just one.³¹

Figure 2: Mapped Wetlands Permits, 1993–2002



Source: Brody, S.D. and Wesley E. Highfield. “Does Planning Work? Testing the Implementation of Local Environmental Planning in Florida,” *Journal of the American Planning Association*, 2005, Vol. 71, No. 2, pp. 159-175. Mapped permits relative to watersheds in Florida. Map created by Wes Highfield, EPSSL. Base map layers from Florida Department of Environmental Planning (DEP) and 404D township range section unit analysis.

Note: Does not include permits issued in the Florida Keys.

The state’s permitting rules for wiping out wetlands do not require developers to filter out nutrients, the most common pollutants hurting our waterways. Excess nutrients cause algae blooms and invasive aquatic weed infestations, harming habitat and sea life. The areas of the state that suffer the most from water pollution problems have also lost the most wetlands to urban development.³²

State law discourages regulators from calculating the cumulative toll of issuing thousands of wetland permits every year, even though losing wetlands makes the coast more vulnerable to hurricanes. Without wetlands to filter runoff, Florida’s shallow-water aquifers—and thus our drinking water supplies—are at risk.

Recommended Actions

- **Give high priority to protecting dwindling coastal habitats.** Reefs, coastal forests, dunes, beaches, and coastal wetlands provide buffer from sea level rise, storm surge, and protect Florida’s fisheries. Florida should review and strengthen coastal setback laws and strictly enforce the coastal habitat protection policies and laws already on the books.
- **Reduce subsidies that encourage growth in high-risk areas or in sensitive coastal systems.** Florida subsidizes coastal growth in many ways—for example, by financing infrastructure in coastal high hazard areas, through beach renourishment, and with homeowner’s insurance—so that the true cost of high-risk coastal development isn’t apparent. Coastal development will be more equitable and sustainable when the private sector assumes more of the risks.
- **Explore a policy of “strategic retreat” to encourage moving development away from eroding shorelines.** This policy should utilize tax incentives, buyouts of condemned properties, restrictive

setbacks when rebuilding after storms on critically eroded shorelines, and other creative strategies to encourage the private sector to build as landward as possible.

- **Fully fund and expand the Florida Forever conservation land-buying program.** This would allow for a strategically targeted coastal land acquisition program that keeps pace with rising land values.
- **The Florida Legislature should reevaluate the Coastal Construction Control Line program.** The Legislature should convene a committee of stakeholders, outside experts, and agency staff to determine if the program is accomplishing its coastal resource protection goals as originally intended, and to recommend changes.
- **Further research and invest in fixed-sand transfer plants as a long-term solution to coastal erosion problems caused by existing navigational inlets.** Fixed-sand pumps at existing navigational inlets would provide compatible sand, which some marine species need to survive. The pumps would also decrease expensive and damaging dredging for navigation, and would curb damage to nearshore habitats and endangered coral reefs.
- **Abandon the state's effort to assume delegation of wetlands permitting from the federal government.** Not only are federal rules more protective than state rules, but the Florida Department of Environmental Protection has an extremely poor track record on its implementation of other federally delegated programs.³³
- **Change permit requirements for wetlands destruction.** Requirements should consider cumulative wetland loss and require developers to prove that wetland impacts cannot be avoided in the first place.
- **Stop allowing wetlands destruction in exchange for wetlands re-creation, also known as mitigation.** Scientific experts document that wetland mitigation has not lived up to its promise.³⁴

II. Reduce Coastal and Ocean Pollution

Florida's incredible resources are silently slipping away. Pollution from development, agriculture, and industry is killing reefs and seagrass beds and fouling once-clear springs. And even though Florida remains a top destination for anglers, many fish are now too contaminated to eat. The crisis of our polluted waters demands leadership: Florida needs to enforce and strengthen clean water rules to serve as an example to other states. The health of the ecosystems must be a priority over continued damaging industrial pollution and overdevelopment.

Florida's Coastal and Marine Resources Are a National Treasure

Florida is a biodiversity hot spot. The state has 87 natural community types, some of which are quite rare. Every one of them, from the Everglades to the bay heads, is dependent on clean water.³⁵ Florida is also home to 41 aquatic preserves, three of the nation's National Estuarine Research Reserves, and one of the world's largest underwater refuges.³⁶ The Florida reef tract off the Keys is the most extensive living coral reef system in North American waters and the third-largest system in the world.³⁷

Florida has more than 700 springs, the largest concentration of freshwater springs in the world.³⁸ Water from the springs feeds rivers and creeks that flow into marine waters. Spring water also flows out of aquifers at and beyond the land's edge, introducing a delicate balance of fresh water into marine systems. Some species discovered in Florida's underground limestone labyrinths are found nowhere else on Earth. But pollution from runoff, agriculture, and sewage is causing the water that pumps up from the springs to show increasingly high levels of nitrate pollution. This is changing water quality in the springs, fueling algae and weed growth and turning the once-clear spring water opaque.

The enjoyment and economic value of these places depend upon clean water, but pollution from towns, businesses, and agriculture, coupled with misplaced beach and ocean management policies, jeopardize Florida's waters.



Image of the Delray, Florida, sewage outfall. The outfall is the subject of a challenge to the permit renewal application pending before the Florida Department of Environmental Regulation based on its proximity to a coral reef that is exhibiting signs of algal overabundance from too many nutrients. Coral reefs need clear, clean, nutrient free waters to thrive. Photograph by Steve Spring compliments of Palm Beach County Reef Rescue.

Government Has Failed to Control Water Pollution

Numerous reports have documented the steep decline in environmental protection in Florida, despite a myriad of state, federal, and local government agencies which are entrusted with enforcing pollution rules.³⁹ Citizen groups have had no other alternative but to sue the state and the U.S. Environmental Protection Agency to stop attempts to weaken Florida's water-quality standards.

Florida has over 1,000 waters considered too polluted for drinking, fishing, and swimming.⁴⁰ The state has chosen to address this problem by changing the definition of pollution to remove waters from the cleanup list, instead of pursuing cleanup.⁴¹ Florida had 3,345 beach warnings or advisories in 2004 due to unsafe bacteria levels.⁴² In 2006, the Florida Department of Environmental Protection (DEP) created a new loophole in Florida's water quality standards that weakened criteria for eight important pollutants. The U.S. Environmental Protection Agency approved this loophole and environmental groups have filed suit to stop it. The loophole was created to avoid the Clean Water Act requirement to reduce pollution when waters become too polluted to support their intended uses.

The state has also failed to take action to curb pollution from stormwater, which overflows into oceans, bays, and rivers after periods of rain. Storm water rules currently deal only with sediments; not with pollution. Polluted storm water is allowed to run into public waters, and there is no effort by the state to require it to meet water quality standards.

Threats to Florida's Water Quality

Industrial facilities, many of them operating in violation of water quality laws, pose serious pollution threats to our coast.⁴³ There are 62 Superfund sites along the Gulf of Mexico, five of them in Pensacola alone.⁴⁴ Contamination at these sites threatens public waters, particularly during hurricanes. Radioactive and nutrient-filled wastewater sits in giant pits near phosphate plants, polluting Florida waters and causing fish kills.⁴⁵

Also posing serious pollution threats to our coast are the 3 million to 4 million onsite sewage disposal systems in Florida, which leak nutrients into the ground and tip the biological apple cart in Florida's waters, spurring algae blooms and the growth of invasive water weeds. There are thousands of sewage disposal systems in even the most sensitive areas of the Florida Keys, and 30,000 to 40,000 new systems are permitted in the state every year.⁴⁶ It isn't just septic tanks or old sewer plants; underground injection wells, which pump sewage wastewater into the underground aquifer, are leaking. The leaks send nutrients into the east-coast's nearshore reef system through groundwater uprisings.⁴⁷

Florida's entire coastline, as well as every lake and river in the state, is subject to mercury consumption advisories.⁴⁸ Mercury consumption advisories have been issued for popular fish such as snook, gag grouper, redfish, cobia, spotted sea trout, flounder, pompano, and king mackerel. Florida has responded by making



Elkhorn coral has recently been added to the U.S. Endangered Species List. This shallow branching coral has been decimated by white pox disease, caused by a common bacteria found in sewage. Photograph by Craig Quirolo/Reef Relief.

mercury pollution a low priority. Other industrial contaminants have turned up in Florida fish: PCBs were found in high levels in mullet in Pensacola Bay, and high dioxin levels have been found in fish near paper mills. Florida's Department of Health responded by raising the dioxin threshold for fish consumption advisories from 1.2 parts per trillion to 7 parts per trillion. This allowed some advisories to be lifted and others to be avoided.⁴⁹ ⁵⁰ The state concedes it has little data for contaminants in many other species, due to limited funding for tests. Tests by the Mobile (Ala.) Register newspaper found methylmercury in several Gulf species, including redfish and amberjack, at levels so high that the U.S. Food and Drug Administration would prohibit selling them to the public.⁵¹

Agricultural operations send nutrients streaming into coastal waters via river inlets, increasing algae blooms. One large-scale dairy can generate 350,000 gallons of wastewater—not including manure—per day.⁵² The state has hundreds of large dairies and other animal feeding operations that pollute ground and surface waters every day without permits, despite a court order that requires these operations to comply with permitting requirements in state and federal law. Sugar and vegetable farming in the Everglades sends nutrient-laden runoff into coastal systems. Golf courses and manicured suburban lawns foul near-shore waters with chemicals and nutrients.

One of Florida's biggest industries—cruise ships and an expanding gambling boat fleet—also pose a threat to air and water quality. With as many as 5,000 people aboard, a cruise ship is a floating city where people shower, clean, cook, develop photographs, dryclean clothes, and run hair and nail salons. The waste from these activities, however, is not regulated like waste from cities. In one week, a typical cruise ship generates 210,000 gallons of black water (sewage); a million gallons of gray water (shower, sink, dishwashing water); 37,000 gallons of oily bilge water; more than eight tons of solid waste; millions of gallons of ballast water, which may carry invasive marine species; and toxic waste from dry cleaning, beauty salons, and photo labs. Despite the pollution they produce from a single source, cruise ships are exempt from regulation under the Clean Water Act's point-source permitting system. The Clean Water Act allows discharge of untreated black water anywhere beyond three miles from shore, and does not require any treatment of gray or ballast water.⁵³

Harmful algae blooms, such as red tide, are increasing. As noted earlier, a continuous bloom of red tide in 2005 persisted in the Gulf from the southern tip of the Florida Keys along the entire Florida Gulf coast into Alabama. Hundreds of dead manatees, dolphins, sea turtles, fish, and other marine creatures washed up on Florida beaches.⁵⁴ This outbreak correlated with a 54 percent increase in emergency room admissions for human respiratory illnesses, including pneumonia, asthma attacks, and other problems as people breathed in the airborne red tide toxin.⁵⁵

Casualties of Florida's Water Pollution

Many of Florida's unique natural resources and animal species are on the verge of being destroyed by pollution. Florida's coral reefs, for example, are an emblem of the state, a mecca for divers, and a possible source of new medical and ecological discoveries. But the corals are dying, possibly the victims of polluted runoff, sewage discharges, overfishing, and global warming. Between 1996 and 2001, over a period of just five years, the Keys experienced a staggering 40 percent decrease in coral cover.⁵⁶

The vast seagrass beds off Florida's coasts are a marine nursery ground and a feeding area for gamefish, shellfish, manatees, and turtles. Seagrasses are dying due to water pollution, leaving biological "dead zones" in their wake. Along Florida's Big Bend Coast, paper mill pollution has left a 10-mile dead zone near the Big Bend Seagrasses Aquatic Preserve, a critical marine refuge. Historically, the state has not shown the political will to effectively enforce the Clean Water Act and require point-source violators to clean up illegal discharges.⁵⁷

The waters off Apalachicola, in the Panhandle, produce 90 percent of the oysters in Florida and 15 percent of the oysters harvested in the United States.⁵⁸ But shellfish beds are closed during much of the season due to unsafe bacteria levels in the waters.⁵⁹ The same is true for the growing clam aquaculture industry off Cedar Key, the Indian River Lagoon, and Charlotte Harbor.

Recommended Actions

- **Halt the state's misguided efforts to weaken water quality standards.** The state should instead develop stronger standards, including numeric criteria for nutrients.
- **Require developers who apply for Environmental Resource Permits (ERP) to prove they have first made all efforts to avoid impacts to the state's water resources.** The ERP has become a program where developers are entitled to a permit as long as they simply offer mitigation. Independent experts have repeatedly documented that wetlands mitigation has not lived up to its promise.⁶⁰ In light of this, the state should not allow any more avoidable wetlands destruction.
- **Include an enforceable nitrogen standard in the Everglades Restoration Plan.** Reducing nitrogen is the only way to save the downstream coral reefs of the Florida Keys. Current plans to address phosphorus only are incomplete. Just as for sewage treatment, nitrogen and phosphorus must be removed from the agricultural and stormwater runoff that runs into Florida Bay and onto North America's only living coral barrier reef.
- **Strengthen watershed-based planning to protect springs and sinkholes, which feed coastal waters.** Construction permits must include parameters for water quality, not just water management, to keep aquifers healthy. In particular, upgrade water-quality standards and enforcement to control nutrient pollution. The state should have enforceable regulations, and not rely on presumption of compliance with voluntary "best management practices."
- **Upgrade the state's stormwater regulations.** Regulations should include protection from both dissolved and solid pollutants to ensure that water quality is not degraded by construction or new development. To avoid excess pollutants in coastal waters, require that waters drain off the construction site or newly developed area no faster than they drained off the undeveloped area.
- **Require at a minimum that adequate capacity and infrastructure for sewage and stormwater treatment exists prior to issuing permits for new development.**
- **Require that any waste injected underground be treated to advanced nutrient-stripping levels.** Used by some municipalities as a way to deal with wastewater, these can leak and contaminate groundwater as well as nearshore waters. Leaks have been detected in underground injection wells in Pinellas, Miami-Dade, Palm Beach, Broward, and Brevard Counties.⁶¹
- **Use energy efficiency, renewables and other clean energy technologies to meet growing energy needs.** At the same time, we must prohibit dirty coal plants and coal-based cement kilns from venting

mercury, toxics, and global warming gasses into the air. Air pollution rules should be strengthened to reduce mercury releases from existing plants.

- **Bring polluting industrial facilities, such as paper mills and power plants, into compliance with modern pollution regulations.** Some facilities are operating on permits written two decades ago, and public waters are suffering as a result.
- **Update management plans for the 41 aquatic preserves.** We must ensure that pollution isn't fouling these waters held in the public trust.
- **Develop a comprehensive program to treat, regulate, and reduce wastes from the many cruise ships and gambling boats that dock in the state's ports.** Require ballast water treatment as a condition of entry to prevent biological and chemical pollution.

III. Keep Offshore Drilling Away from Florida's Coast

Offshore drilling is a dirty business. Proposals to allow offshore drilling in the eastern Gulf of Mexico off the Florida coast pose serious threats to the intricate mosaic of sea grasses, wetlands, bays, reefs, beaches, and sand dunes, as well as the marine creatures that depend upon these habitats.

Recent studies have shown that seismic surveys used in oil and gas exploration seriously affect gray whales, sperm whales, and other marine mammals. The ears of fish are particularly vulnerable to the underwater explosions used in seismic surveys, and many species rely heavily on their hearing to avoid predators, locate prey, and communicate.⁶²

Moreover, massive amounts of waste muds and cuttings are generated by drilling operations—an average of 180,000 gallons per well. Most of this waste is legally dumped, untreated, into surrounding waters. Drilling muds contain toxic metals, including mercury, lead, and cadmium. Mercury, in particular, has been found in high concentrations around rigs in the Gulf of Mexico.⁶³

Another concern is the polluting discharge known as “produced water,” or the water brought up from a well along with oil and gas. Each drilling platform discharges hundreds of thousands of gallons of produced water every day, which typically contains a variety of toxic pollutants, including benzene, arsenic, lead, naphthalene, zinc, and toluene. It can also contain varying amounts of radioactive pollutants.⁶⁴

The infrastructure that carries oil and gas from drilling rigs to land can significantly damage ecosystems both on shore and in the waters close to the coast. For example, Louisiana, where significant offshore oil and gas development first began 50 years ago, has lost vast amounts of its original coastal wetlands. The state continues to have an estimated wetland loss rate in excess of 100 square kilometers per year.⁶⁵ Based on the experience of other Gulf drilling operations, small spills would become common in Florida, like the 500-gallon spill off a Louisiana rig last June that killed hundreds of endangered pelicans in a National Wildlife Refuge.⁶⁶ Larger spills, like the six oil spills of more than 1,000 barrels that were caused by Hurricane Katrina, would also not be uncommon if our coasts were invaded by oil drilling.⁶⁷ A catastrophic spill, one that could spoil the ecology and economic value of Florida beaches for generations, is a real possibility.

Better Solutions to Meet Our Nation's Energy Needs

Offshore oil and gas drilling is the slowest, dirtiest, and most expensive way to produce energy. Opening our coasts to drilling would do little to lower prices or make our nation more energy independent, but it would threaten Florida's beaches with pollution and potential oil spills and destroy billion-dollar tourism and fishing industries.

There are cheaper, cleaner, faster, and more sustainable energy solutions. Energy efficiency and clean, renewable energy will start saving consumers and businesses money today—and protect Florida's coastal waters, beaches and economies for future generations.

Improved vehicle standards would do more to lower gas prices than wiping out animal habitat to drill for more oil. If cars and trucks got an average of a couple more miles per gallon, we'd save more oil than exists off the entire coast of Florida.⁶⁸ Yet federal gas mileage standards haven't significantly changed in 20 years. Instead of allowing oil companies to drill off the Florida coast, our elected officials should be leading the fight in Washington for better gas mileage and clean energy alternatives such as wind, solar, and biomass.

Recommended Actions

- **Oppose offshore drilling and related activity off the Florida coast.** The entire central and western Gulf of Mexico is open to offshore drilling. The eastern Gulf waters off Florida's coast should remain free from such industrialization.
- **Support renewal of the annual congressional moratorium against new offshore drilling leasing.** This 25-year, bipartisan moratorium on offshore oil and gas leasing is Florida's most important protection against drilling activity.
- **Oppose legislation that would allow individual states to “opt-out” of the congressional moratoria against new offshore drilling leases.** Water pollution, air pollution and oil spills don't adhere to state boundaries.
- **Oppose the Department of Interior's plan to open 2 million acres off Florida's coast to drilling.** The Department of Interior's Five Year Plan 2007-2012, as currently drafted, would allow the first new drilling leases off the coast of Florida since the 1980s.
- **Support the cancellation of the 98 existing drilling leases off the coast of Florida.** These leases, some as close as eleven miles from Florida's coast, were sold to oil companies back in the 1980s. Although there is no activity happening on these 98 leases, they remain active and a potential threat.
- **Oppose legislation that would provide a financial incentive to the state for allowing offshore drilling in Florida waters.**

IV. Restore Marine Ecosystems, Ensure Robust Fisheries, and Protect Marine Species

Florida’s expanding population, coupled with increased tourism, is overexploiting marine resources and degrading marine ecosystems. Over the past 30 years, our understanding of ocean ecosystems has expanded. Marine scientists have become aware of the many linkages within and among ecosystems, and have called for a more sophisticated approach called ecosystem-based management.

Moving Toward Ecosystem Management in Florida’s Oceans

Marine ecosystems are composed of all of the organisms living in a certain place and their interactions with each other and with their environment. Weather, currents, seafloor topography, and human activity are all important influences on ecosystems. The goal of ecosystem-based management is to maintain the health of the whole as well as the parts by recognizing the connections among all the components.

The continued health of Florida’s ocean resources depend on sustaining diverse marine ecosystems that support multiple uses. As our coastal areas experience increased population, habitat degradation, and overexploitation, it is apparent that the state needs to consider implementing special ocean zoning designations, such as marine protected areas. The Florida Keys National Marine Sanctuary (FKNMS) is an excellent example of how ocean zoning can effectively balance resource protection with recreational, commercial, scientific, cultural, and educational uses. The FKNMS has implemented several successful marine reserves —areas in the ocean in which all extractive and most disruptive activities are eliminated—which are proving to be a promising approach to marine conservation and a key tool in moving toward ecosystem-based management.

Florida Depends on Its Fishery Resources

Florida’s fishery resources are supported by extraordinarily diverse geographic systems: the Gulf of Mexico, the Florida Keys, and the east Florida mainland. Each of these regions has distinct bottom and surface fisheries representing diverse climatic and shelf regions. This fishery diversity is a key to the economic value as well as the pure recreational thrill of fishing in Florida, and is part of the legacy we leave for our children.

Florida's is one of the nation's premiere destinations for recreational fishers.⁶⁹ Approximately \$8.3 billion per year is spent on the industry, including everything from food, lodging, bait, charter, equipment and gas.⁷⁰ Each year, more than 6.5 million recreational fishers make about 27 million fishing trips and harvest approximately 187 million fish.⁷¹ Another 90 million fish are captured and released "alive," although many of these do not survive.⁷² Florida is also the number-one SCUBA dive destination in the United States, and is one of the five most popular dive destinations in the world.⁷³

Commercial fishing and shell fishing contribute \$1.1 billion each year, and create 15,000 jobs. Florida oysters are a delicacy worldwide, and farmed clams are a growing seafood export industry.⁷⁴ In 2004, commercial fishermen harvested over 110 million pounds of marine life, including over 53 million pounds of finfish. About 170,000 finfish and more than 8 million invertebrates (e.g., anemones, starfish, and snails) were harvested for the aquarium trade.⁷⁵

When fishermen inadvertently catch, injure and kill marine life they did not intend to catch—called "bycatch"—it has an enormous effect on marine ecosystems. Scientists estimate that fishermen in some fisheries discard 25 to 30 percent of what they catch. Much of the bycatch is made up of juvenile fish that die, depleting populations of key species. In the Gulf, bycatch in shrimp trawl fisheries contributes to overfishing of popular species such as red snapper, depleting that valuable fishery in complex ways that are not fully accounted for in management decisions. In the Atlantic longline fishery, bycatch may be jeopardizing the continued existence of loggerhead and leatherback sea turtles along the eastern coast.⁷⁶

Overcapacity in marine fisheries is the driving force behind overfishing, high levels of bycatch, and habitat damage throughout the Gulf of Mexico. Transitioning to ecosystem-based fishery management and saving fisheries requires a new approach.

It is critical to recognize that ecosystems are complex, adaptive systems. There are limits to our knowledge, and to protect fisheries, we must consider the level of fishing that has detrimental effects in the ecosystem, even though it may not have an adverse effect on a particular target species. Broader types of fisheries data are needed to make adaptive management decisions and to support models that can answer pressing questions about appropriate fishing levels.

While some traditional fisheries management tools are necessary, the integrated use of ecosystem-based tools must be achieved within a management framework that substantially offsets the tragedy of the commons, including marine zoning and limited access for both recreational and commercial sectors. Innovative approaches deserve more consideration in Florida.

Disappearing Fish and Degraded Habitat

Our fisheries are under tremendous pressure. Catches of some species continue to decline, and our management decisions often are too little, too late. Fish sought by one interest group is thrown over the side of the boat as unwanted bycatch by another interest group. Fishery managers seek to increase harvests of individual species of fish to "maximum sustainable yield," with little or no consideration given to the impacts on other species, communities or habitats. Commercial and recreational fishing interest groups continue to dispute access to and allocation of available fish stocks, each blaming the other for declining catches, wasteful fishing practices, and who has the greatest "entitlement" to these depleted public resources.

Florida has 1.4 million acres of shellfish beds, filled with commercially valuable clams, oysters, and scallops. Many of these beds are closed during certain times of the year largely because pollution from sewage, runoff, and industrial discharges makes the shellfish unsafe to eat.⁷⁷

Florida restaurants, once renowned for fresh local seafood, are coming up short on popular local dishes as species decline and reliance on foreign imports grows. Higher prices at local seafood markets are forcing consumers to turn to farm-raised imported seafood. Both commercial fishermen and recreational anglers are frustrated at having catch limits reduced on many species.

Once-abundant species in the South Atlantic and Gulf of Mexico, including red snapper and a variety of groupers, red drum, greater amberjack, and black sea bass, are now classified by the government as "overfished," i.e., severely depleted.⁷⁸ Overfishing is still being allowed to occur by the South Atlantic and Gulf of Mexico Regional Fishery Management Councils on several of these already depleted species: red and

vermillion snapper, as well as amberjack in the Gulf, black sea bass, red drum, and several varieties of grouper in the South Atlantic.⁷⁹ Of 57 species managed by the Gulf of Mexico Fisheries Management Council, the status is not known for 38 of them—or 66 percent. Eleven species of Gulf fishes, from sharks to groupers, are now candidates for listing as endangered or threatened, along with manatees and sea turtles.⁸⁰ Available evidence suggests that almost all prominent reef fish and pelagic stocks are “growth-overfished,” which means that most fish are captured before they can reach maximum age and size. Therefore, the average size of catches, as well as species abundance, can decline noticeably through time. This also means those populations may not reproduce at sustainable levels through time and average sizes will continue to decrease.⁸¹

Many important ecosystems in Florida’s state waters, including coral reefs, seagrasses, hardbottom reefs, and mangroves, are considered Essential Fish Habitat (EFH), a federal designation under the Sustainable Fisheries Act that recognizes habitats of importance to fishery production. Florida’s Essential Fish Habitats are threatened by numerous human activities, including overfishing, cumulative loss of seagrasses and mangroves by coastal development, burial or removal by dredge operations for “beach renourishment” projects, and agricultural runoff.

Florida’s waters are also threatened by marine invasive species, such as Asian green mussels and lionfish, a poisonous Pacific species that can displace native species.⁸² While much attention has been given to the problem of invasive exotic species on land, problems associated with marine invasive species have been largely overlooked.

As far back as the 1960’s, leading state scientists raised concerns over the loss of Florida’s coastal habitats.⁸³ Yet these same problems remain unresolved—and in many cases ignored—by present-day coastal policy and management. Because marine ecosystems are extremely complex, and the health of the whole is directly related to the health of each component, Florida should manage these resources with meaningful input from scientists, academics, and conservation experts. The principal objective of marine fishery policy should be to protect marine ecosystems, rather than simply regulate on a species-by-species basis once populations have begun to decline.

Recommended Actions for Protecting Marine Ecosystems and Ensuring Robust Fisheries

- **Focus on managing special places and ecosystems** (e.g., state aquatic preserves, national parks, and coral reefs) rather than just individual species. To that end, integrate the Florida Fish and Wildlife Conservation Commission’s marine fisheries management with the Department of Environmental Protection’s management of submerged sovereign lands, coastal ecosystems, and environmental quality. Florida’s complex coastal systems require place-based, multi-species management, not simply the outdated single-species methods that ignore many biological connections among management decisions.
- **Redefine the principal objective of marine fishery policy to be the protection of marine ecosystems.** The health of marine systems must be the overarching goal; without healthy ecosystems, there can be no healthy fish populations. Additionally, fishing can profoundly affect habitats and the integrity, productivity, and stability of marine ecosystems. State agencies should work more closely with federal agencies to protect Essential Fish Habitat and clean water, cornerstones of fisheries management.
- **Achieve an integrated and adaptive ecosystem management framework that includes marine fisheries.** This will require an evolution toward ecosystem-based fisheries management integrating fish, invertebrates, physical processes, habitats, and humans, including a better understanding of the impacts of harvests of one species on other species in the food web, as well as harvest impacts on essential habitats.
- **Establish partnerships** between the Florida Fish and Wildlife Conservation Commission (FWCC) and federal ecosystem-based fishery management efforts through the South Atlantic Fishery Management Council. These partnerships should include a regional Fishery Ecosystem Plan and several potential deep-water Marine Protected Area plans for the east Florida coast.

-
- **Use innovative management tools, including marine protected areas and no-take/no-fishing marine reserves.** These limited-use areas provide vital tools to help conserve biodiversity, understand ecosystem functioning and dynamics, and increase non-consumptive recreational opportunities such as scuba diving, snorkeling, and observing marine wildlife.
 - **End overfishing** in the several fisheries in the South Atlantic and Gulf of Mexico where that destructive practice is now occurring and rapidly rebuild depleted fish populations to healthy and abundant levels.
 - **Develop more information on the ecological effects of fishing,** assuring greater protection for coastal habitats (wetlands, estuaries, seagrass, nearshore reefs, offshore reefs) and addressing the impacts of coastal construction activities. The Florida Fish and Wildlife Conservation Commission (FWCC) should play a central role in protecting marine fisheries habitat.
 - **Hold an annual open forum on fisheries** with all relevant parties (managers, scientific community, commissioners, non-government organizations, etc.) to critically review state management objectives and decisions and provide guidance on future strategies. This forum should not reinvent, but rather work to implement, the consensus Research and Monitoring recommendations of the 2004-2005 Florida Fish and Wildlife Conservation Commission's Florida Fisheries Summit process.
 - **Develop a systematic monitoring process** so that fisheries managers can track and evaluate ecosystem responses following major fishery management actions to determine if the desired objectives are met.
 - **Rebuild and maintain healthy fisheries by replacing destructive open-access fishing regulations** with market-based, limited-access privilege programs (LAPPs) and ecosystem-based marine protection zones. LAPPs include individual and community fishing quotas, territorial use rights, and others. Marine protection zones can help preserve spawning aggregations and important habitats, avoid bycatch, and protect diverse ecological systems.
 - **Extend monitoring of fish harvests beyond the commercial fishing sector, with substantial increases in the accuracy of recreational effort and catch data.** A redefined approach to Florida recreational fishing monitoring should include the spatial distribution and fishing power of the fleets, as well as increased sample sizes to improve public confidence.
 - **Florida's incoming governor should recommend academic and conservation experts for appointment as voting members from Florida** on the Gulf of Mexico and South Atlantic Fishery Management Councils.
 - **Assure strong and perceptive law enforcement for fisheries.** Protection is absolutely necessary, yet at present not sufficient. Without enforcement, traditional management practices and prospective Marine Protected Areas will be ineffectual.
 - **Work with fishers to identify fishery spawning aggregation sites around the state, physically validate these areas, and ensure their long-term protection.**
 - **Ensure a healthy shellfishing industry by identifying the pollution sources that are causing shellfish beds to be closed.** The state should provide funding to both prevent pollution—especially at aging sewage plants—and restore damaged shellfish beds.
 - **Establish and improve programs to address threats to marine health caused by introduction of non-indigenous species.** Programs should include monitoring and tracking information, mitigating effects, and reducing opportunities for non-indigenous species introduction.

Florida Must Protect Sea Turtles and Manatees

Sea Turtles Threatened by Coastal Development

Florida's beaches and nearshore reefs are used by large numbers of nesting and foraging sea turtles. These habitats play a critical role in the long-term survival and recovery of these species. Florida hosts 90 percent of all sea turtle nesting in the continental United States, and the three species that nest in Florida are either

endangered or threatened. Florida's mid and south Atlantic beaches host some of the largest aggregations of nesting loggerheads in the world. Protection of these beaches is critical to the sea turtles' long-term survival.

Juvenile sea turtles migrate from the many distant beaches where they were born to forage, develop, and seek refuge in a myriad of inshore and offshore habitats along the Florida coast, including seagrass beds and Florida's extensive coral and "worm rock" reefs. What Florida does on its beaches and in its nearshore marine environments impacts international protection and recovery of sea turtle populations. Sea turtles are protected under the Federal Endangered Species Act of 1973 and Florida's Marine Turtle Protection Act.

The fate of Florida's sea turtles depends largely on the state's coastal management policies. The state allows high-density development right up to, and on, the frontal dunes of critically eroding beaches. This unwise development increases the demand for beach nourishment and sea wall construction. An increasing number of renourishment projects are taking place during sea turtle nesting season. That means large numbers of sea turtle nests have to be relocated, and that increases hatchling mortality. There is increasing concern that turbidity caused by constant beach renourishment is harming near shore reefs used by sea turtles. Frontal dune development also makes the beach and dune system less resilient, affecting its ability to recover after major storm events. Coastal armoring and sea wall construction after storms prevents female turtles from accessing suitable nesting habitat.

And the sea turtles face many more threats in Florida. Human disturbances on nesting beaches can impact a female's attempt to dig a nest and lay eggs. Nesting beaches are often degraded by rows of lawn chairs, sand fencing, and other structures. Bright lights on the beach can discourage nesting and annually lure thousands of hatchlings to their deaths. Turtles of all sizes and ages may be killed by beach dredging equipment, speed boats, and gill nets. Pollution and runoff from land-based sources can degrade important marine and estuarine turtle habitats and impact both sea turtles and the food they eat. New research suggests that a disease now killing many sea turtles (fibropapillomas) may be linked to pollution in the oceans and in near shore waters. Red tide events have killed large numbers of sea turtles in recent years.

There are signs of some recovery and positive action in Florida. The number of green turtle and leatherback turtle nests appear to be increasing slowly. Many coastal construction and beach renourishment permits incorporate sea turtle protection measures. Dedicated state biologists and a network of sea turtle groups monitor nesting beaches throughout the state. But much more needs to be done. Loggerhead turtle nesting numbers at some "core index nesting beaches" in Florida have been declining for years and are just above all-time lows since record keeping began in 1989.⁸⁴

Manatees in Peril from Human Interference

The Florida manatee, a subspecies of the West Indian manatee, lives in the intracoastal lagoon waters on Florida's east and west coasts, as well as freshwater rivers and springs. The exact number of manatees in the wild is unknown, but the most recent surveys put the minimum manatee population around at least 3,000 individuals.⁸⁵ Florida manatees are listed as endangered under the federal Endangered Species Act and are listed as threatened under Florida law.

Manatees face several major threats as they navigate the waters around Florida. They get killed or injured when stuck by boats, and their habitat is degrading from runoff pollution and boat activity, which turns waters turbid and leaves long-lasting propeller scars in seagrass beds. In recent years, there have been episodes of high annual mortality from the effects of red tide. Manatees are a tropical/sub-tropical species, so in Florida they are at the northern limit of their range. Historically, they would migrate to the most southerly waters in cold months when water temperatures drop below about 70° F. Currently, however, nearly 80 percent of the state's manatee population relies largely on water warmed by discharges of electric-generating power plants, located on both coasts, for their warm water needs.

Since power plants were built in the 1950s and 1960s, manatees have used power plant canals (located further north than the historic winter range), venturing out to feed during warmer spells. This learned behavior has associated risks. Most of these aging power plants will go offline in the near future. Whether these manatees will quickly learn to use other sources of warm water or suffer catastrophic die-offs is unknown, but researchers consider this the ultimate threat to long-term manatee survival.

The other 20-plus percent of the Florida manatee population relies on natural warm water springs (72-74° F) during winter months. As the power plants go offline, these springs become more important for much larger numbers of over-wintering manatees. But all over the state, spring volume is threatened by increased groundwater withdrawals for new development.

Recommended Actions for Protecting Our Sea Turtles and Manatees

- **Renew the state’s commitment to protecting the beach and dune system from overdevelopment.** The fate of Florida’s rare sea turtles is at stake. The state allows high-density development right up to, and on top of, the frontal dunes of critically eroding beaches. To protect sea turtle nesting beaches, Florida must develop new coastal management policies that lessen developmental pressures on critically eroding shorelines and reduce the need for renourishment and sea walls.
- **Discourage beach renourishment during sea turtle nesting season.** The “one-size-fits-all” (large, square and flat) approach to beach nourishment should be modified. Environment-friendly beach building designs should be researched and employed to protect nearshore reefs and critical turtle nesting beaches.
- **Make greater public awareness and support for sea turtle conservation a priority.** By learning more about sea turtles, the public is more likely to avoid disrupting nesting turtles and to support policies that aid sea turtle conservation.
- **Encourage local governments to pass ordinances to eliminate or control artificial beachfront lighting.** Existing lighting ordinances need to be better enforced, and public education must continually promote compliance.
- **Establish a “frontal dune setback” line to protect frontal dunes, encourage the landward siting of new construction, and better protect the beach and dune system.**
- **Repeal the state’s “gap closure law,” which allows the armoring of undeveloped shorelines.** The law allows the armoring of critical “pocket beaches,” often the last remaining turtle nesting area on a heavily armored beach.
- **Better enforce state regulations to protect seagrass beds that provide habitat for valuable fishes, sea turtles, and manatees.** Fund a substantial increase in the number of law enforcement officers in the Florida Fish and Wildlife Conservation Commission, as well as regulatory personnel in the Department of Environmental Protection. Penalties for violating regulations that protect manatees and their habitats should be increased.
- **Protect natural spring flows and enhance access to springs for manatees.** Currently, Florida’s water management districts are setting “minimum flow” levels for Florida’s springs, with the human demand for water serving as the driving force. These “minimum flow” rules should be revised to take manatees and other wildlife into account.
- **Expedite contingency plans for protecting manatees in the event of power plant closures.** Currently, the Warm Water Task Force of the Florida Manatee Recovery Team is looking into alternatives to industrial warm water outfalls. While this group has the best of intentions and is working to identify and implement alternatives, they have yet to implement concrete, site-specific solutions to this inevitable crisis.

V. Reduce Global Warming Pollution

Florida is on the front line of climate change, and we're already feeling the effects of global warming. Global warming is caused by burning fossil fuels like oil, natural gas, and coal. Science has shown a direct relationship between the amount of carbon dioxide and other heat-trapping gases released into the air by human activities and the increase in average surface temperatures around the world.

In less than one century, the Earth's temperature has risen about 1 degree Fahrenheit, and it is expected to rise by another 2.5 to 10 degrees by 2100 if global warming pollution remains unchecked. An increase in the rate of sea-level rise from melting glaciers and ice caps, along with the thermal expansion of the oceans, is one of the most direct consequences of global warming. Increased temperatures will affect reefs and marine nursery grounds, and glacier melt is predicted to inundate the state's low-lying shoreline, leaving much of the state underwater.

Florida must commit to halting the progress of global warming by reducing the pollution that causes it—pollution largely caused by carbon dioxide emissions released into the air when we drive our cars, cool our homes, and fill up the tanks in powerboats.

Global Warming Is Already Changing Florida

Over the past 70 years, average sea level in South Florida rose about nine inches, contributing to coastal erosion, inundation, and changes in wetlands and mangroves. Scientists project that sea level is likely to rise an additional 4 to 35 inches, on average, during this century.

And scientists are becoming increasingly concerned that the rate of sea-level rise in the future could be significantly greater than current projections. Several new studies have determined that the vast ice sheets of Antarctica and Greenland are melting much more rapidly than previously thought.⁸⁶ If the Greenland ice sheet alone were to melt completely, it would raise global sea levels by more than 20 feet, putting most of southern Florida underwater.⁸⁷



Healthy coral reef in the Key West, Florida, area. Coral reefs are one of the species that will be affected by global warming's impacts. Photograph by Craig Quirolo/Reef Relief.

The National Wildlife Federation and the Florida Wildlife Federation looked at nine areas along Florida's coast (including Pensacola Bay, Apalachicola Bay, Tampa Bay, Charlotte Harbor, Ten Thousand Islands, Florida Bay, Biscayne Bay, St. Lucie Estuary, and Indian River Lagoon) to see how a moderate scenario of a 5- to 27-inch rise in average sea level during this century is likely to affect coastal habitats.

How sea-level rise will affect habitats in each of the nine study sites individually varies considerably based on the different habitat types, geological and oceanographic features, and the extent of coastal development. Along the Gulf Coast and in South Florida, the most vulnerable habitats are salt marshes and tidal flats. Along the East Coast, the greatest problems are likely to be significant erosion of beaches and inundation of dry land.

Under the mean sea-level rise projection of 15 inches by 2100, the study found that nearly 50 percent of critical salt marsh and 84 percent of tidal flats statewide are likely to be lost. In specific areas, the percent losses of critical habitats are staggering. Florida Bay is likely to lose 98 percent of its tidal flats by 2050, and Charlotte Harbor is projected to lose 97 percent of its tidal flats and 89 percent of its salt marsh by 2100. In Apalachicola, 61 percent of its salt marsh is projected to be gone by 2100, severely altering the critical mixture of saltwater and freshwater that supports the abundance of this estuary.⁸⁸

The area of dry land is projected to decrease by 14 percent, and roughly 30 percent of ocean beaches and two-thirds of estuarine beaches will disappear. As sea level rises, the area of open-ocean and estuarine water is projected to increase by 64 percent and 18 percent, respectively. Mangroves are expected to expand in some areas, increasing by 36 percent. The area of brackish marsh is projected to increase more than forty-fold, mostly around Apalachicola, taking over much of the current hardwood swamp land.

The majority of Florida's marine fish and shellfish species depend on salt marshes, seagrass beds, and other habitats found in the state's bays and estuaries, so the projected changes to these habitats due to sea-level rise will likely have an enormous impact on Florida's commercial and recreational fisheries. Species that depend on salt marshes and seagrass beds for their egg, larval, and juvenile life stages are especially vulnerable, since problems that affect many of Florida's fish and shellfish in their early life stages are among the most important determinants of their population abundance down the road. Significant declines in beaches and tidal flats in some areas will also reduce habitat for species that rely on those areas to feed.

Our unique coral reefs, which attract millions of visitors annually, are also at serious risk if temperatures continue to rise. Increasing surface temperatures are considered one of the main causes of coral bleaching.⁸⁹ And the warmer ocean temperatures caused by global warming will alter fish spawning and migration patterns, and will exacerbate red tides, hypoxia events, and marine diseases.

Recommended Actions

- **Reduce the pollution that causes global warming.** The most important measure Florida can implement is a mandatory “cap-and-trade” program for greenhouse gas emissions. Solutions also must involve smart business strategies that recognize the value of the natural environment and that emphasize creative cooperation between the business and environmental communities.
- **Develop and implement more rigorous fishery and coastal resource management strategies** that fully incorporate the likely and devastating impacts of global warming on key habitats, such as reefs and coastal wetlands.
- **Dramatically increase federal funding to state fish and wildlife agencies** to help them incorporate activities to address global warming into long-term conservation efforts.
- **Engage in the national debate advocating for mandatory limits on the nation’s global warming pollution, and re-engage in international cooperation on global warming.** As a state very vulnerable to the impacts of global warming, Florida must become involved in the larger discussion.
- **Address climate change issues, such as sea level rise and increased storm frequency and intensity, in Florida coastal management policies.** To ignore these issues subjects Florida to greater threats to human safety and a future of increasingly armored shorelines.

How Florida Can Help Combat Global Warming Pollution

Florida must act now to reduce the emissions that cause global warming. Fortunately, there are a number of things we can do to make a difference. For example:

- Strengthen local, state, and federal policies to cut dependence on fossil fuels such as coal and oil by promoting energy efficiency and cleaner transportation options.
- Develop renewable energy, particularly the solar energy that is so abundant in the Sunshine State.
- Encourage protection and restoration of natural habitats (wetlands, grasslands, forests) that have a net use of carbon dioxide (often called carbon sequestration).

VI. Strengthen Ocean Governance

The state of Florida currently lacks the focus needed to address marine and coastal challenges. Fractured government programs on ocean and coastal policy create a confusing array of regulations that can prove frustrating to citizens and businesses and undermine support for marine protection.

Florida has coastal and marine programs housed in various scattered programs within the Departments of Environmental Protection, Agriculture, and Community Affairs; the Florida Fish and Wildlife Conservation Commission; five water management districts; regional planning councils; two federal fisheries management councils; and dozens of municipal and county governments. Several private research institutions and universities also collect information critical to ocean and coastal policy makers.

Policy makers often have no idea what another program is doing, even within their own agency, and local governments complain that their communication with the state is poor. Despite a myriad of laws and plans, our marine resources continue to decline. A coordinated office dedicated to ocean and coastal policy would make for better information gathering and better decision making.

In the wake of the U.S. Commission on Ocean Policy report, the Florida Legislature appropriated \$1 million in 2004 and \$1 million in 2005 for the Florida Oceans Initiative to focus on several areas of coastal protection. In 2005, the legislature created the Florida Oceans and Coastal Resources Council.⁹⁰ Charged with developing priorities for ocean and coastal research in Florida, the 18-member council was supposed to establish a statewide ocean research plan and make management recommendations to the legislature on coastal and ocean policies.

The council submitted prioritized research projects for a first year of funding to the 2006 Florida Legislature. The legislature appropriated \$3 million to begin implementing the council's recommendations. Despite wide public support and involvement, Governor Jeb Bush vetoed the ocean council's budget appropriation. The veto not only eliminated the proposed research, but also the council's 2006 operating budget. This money must be restored so ocean research can catch up with the dramatic decline of Florida's marine resources.

In addition to the problem of funding, the state must address public perception of environmental issues. There are broad gaps between the public's perception of key environmental issues and current science.

Reaching the public with accurate information about the importance of coastal and ocean resources is key to creating a stewardship. Many people move to Florida from somewhere else and are unaware how simple actions—such as spreading pesticides or fertilizers on lawns—can devastate nearby waters. Public information efforts need to be ongoing as new residents pour into the state.

Recommended Actions

- **Hold a Governor’s Ocean and Coastal Symposium in the first six months of the new incoming governor’s administration to develop a plan of action for better oceans and coastal protection.** This plan’s implementation should be a top priority for Florida’s new government leaders and will be an opportunity to reach out to Florida’s coastal constituency.
- **Create an Ocean and Coastal Policy office** in the executive office of Florida’s governor to coordinate scattered programs and provide unified leadership for coastal and ocean management.
- **Restore the operating budget of the Florida Oceans and Coastal Resources Council**, and encourage the Florida Legislature and next governor to support and fund the council’s work and the ocean research priorities it identifies.
- **Create a Coastal Commission/Council to reinvigorate the Coastal Zone Management Act Consistency review process.** The consistency review was originally established to coordinate development reviews among scattered state and federal agencies. The new commission/council would work with local governments and public agencies to develop strategies to protect public beach access, wetlands, wildlife on land and in the sea, water quality, scenic vistas, and coastal tourism.
- **Develop increased coordination** among the South Atlantic Fisheries Management Council, the Gulf of Mexico Fishery Management Council, the National Park Service, the U.S. Coral Reef Task Force, the U.S. Army Corps of Engineers, the National Marine Fisheries Service Habitat Division, and the U.S. Fish and Wildlife Service. This coordination should involve collaboration among resource managers and scientists, including the Florida Fish and Wildlife Conservation Commission, non-government organizations, and Florida universities. This will leverage the state’s intellectual capital and help to bring federal research dollars to bear on the management and research infrastructure.
- **Make Florida an innovative leader in the informal regional group, the Gulf of Mexico Alliance.** The Alliance is made up of leaders in the five Gulf rim states—Texas, Louisiana, Mississippi, Alabama, and Florida.
- **Develop science-based regional ocean and coastal governance plans to protect, maintain, and restore ecosystems.** These plans should address management of living marine resources, protection of habitat; protection of water quality; and management of development affecting marine ecosystem health.
- **Make the public more aware of Florida’s marine fisheries and coastal habitat issues and needs.** This will require coordinated outreach programs, including those of the Florida Fish and Wildlife Conservation Commission and Florida Sea Grant Extension Program (representing all public and private universities and not-for-profit research institutions), that are jointly planned, implemented, and evaluated for effectiveness.
- **Provide permanent funding for environmental education and stewardship projects**, similar to the former Florida Advisory Council on Environmental Education program. This would include a regular series of public lectures held around the state to inform the public of marine fisheries management requirements, opportunities, challenges, and milestones. Education partnerships should be formed with private industry for marine-related classes and field trips.
- **Provide more support for volunteer research and conservation programs** involving tourists, residents, teachers, decision-makers, students, and the media.

ENDNOTES

1. *Naples Daily News*, "Deep Trouble: The Gulf in Peril," Sept. 30, 2003.
2. Visit Florida, The Official Tourism Marketing Agency of the State of Florida, personal communication, May, 2006.
3. *Florida's Ocean Strategies*, Florida Governor's Ocean Committee, Final Report to the Governor, June 1999.
4. http://www.visitflorida.com/cms/d/surf_contests_in_florida.php.
5. Florida Wildlife Research Institute, <http://research.myfwc.com/features>.
6. *Miami Herald*, "Saltwater Fish Face Uncertain Future," Oct. 16, 2005.
7. NOAA Fisheries Service news release, Southeast regional office, May 5, 2006.
8. *St. Petersburg Times*, "Red Tide Choking Life From Gulf," Aug. 17, 2005.
9. "America's Living Oceans: Charting A Course For Sea Change," Pew Oceans Commission, May 2003; United States Commission on Ocean Policy, "An Ocean Blueprint for the 21st Century," September 2004.
10. Visit Florida: Florida at a Glance, <http://media.visitflorida.org/travel/facts/?ID=12>.
11. Florida Department of Environmental Protection.
12. www.StateOfFlorida.com.
13. "Florida's Draft Assessment and Strategies for FY 2006-FY 2010," prepared in accordance with Section 309 of the Coastal Zone Management Act.
14. "Florida's Ocean Strategies," Final Report to the Governor, Florida Governor's Ocean Committee, June 1999.
15. Florida Department of Environmental Protection, Beach Erosion and Control Program, 2006.
16. "Focus on Florida: Population, Resources, and Quality of Life," Leon Bouvier and Sharon McCloe Stein http://www.npg.org/specialreports/FL/fl_report.html.
17. http://www.flsuspop.org/docs/florida_population_facts.htm.
18. "Florida's Population Growth: Past, Present and Future," Stanley Smith, Bureau of Economic and Business Research, University of Florida.
19. "Florida's Ocean Strategies," Final Report to the Governor, Florida Governor's Ocean Committee, June 1999.
20. Florida Department of Environmental Protection, Bureau of Beaches and Coastal Systems, Beach Erosion Control Program, 2006.
21. Florida Department of Environmental Protection, Bureau of Beaches and Coastal Systems, unpublished data presented to the High Hazard Study Committee, 2005.
22. Surfrider Foundation.
23. Caribbean Conservation Corporation, Gainesville, Florida, unpublished data.
24. Florida Department of Environmental Protection, "Performance Evaluation of Armoring Structures in Florida During the 2004 Hurricane Season," 2005.
25. *Pensacola News Journal*, March 26, 2006.
26. D. M. Bush, W. J. Neal, N.J. Longo, K.C. Lindeman, D.F. Pilkey, L.S. Esteves, J.D. Congleton, and O.H. Pilkey, *Living With Florida's Atlantic Beaches: Coastal Hazards from Amelia Island to Key West*, Duke University Press, 2004.
27. Florida Department of Environmental Protection, "Homeowner's Guide to the Coastal Construction Control Line Program," 2006.
28. Ibid.
29. *St. Petersburg Times*, "Satellite Photographs Show Losses," May 22, 2005.
30. Ibid.
31. Ibid.
32. Ibid.
33. Final Judgment, Second Judicial Circuit, Leon County, Fla., Judge L. Ralph Smith, Case # 2001-CA-001266.
34. "Compensating for Wetlands Losses Under the Clean Water Act," National Research Council, 2001.
35. "Water Policy for Protecting Nature, Not Promoting Growth," Florida Water Coalition, Jan. 2003.
36. Ibid.
37. Florida Keys National Marine Sanctuary website, http://www.fknms.nos.noaa.gov/sanctuary_resources/welcome.html
38. Ibid.
39. Ibid.
40. Environmental Protection Agency, 1998 303 (d) List; Official Notice of the Florida Department of Environmental Protection authorized under Sec. 120.551, F.S., Group 3 & 4 Basins, May 12, 2006; Florida Department of Environmental Protection Adopted Verified List for Group 2 Basin; Office of General Counsel Case Numbers 02-1247, Aug. 30, 2002.
41. *Tampa Tribune*, "EPA Rejects Florida's Water Quality Standards," Oct. 8, 2005.
42. Natural Resources Defense Council, *Testing the Waters 2005: A Guide to Water Quality at Vacation Beaches*, Aug. 2005.
43. Report of the Special Grand Jury on Air and Water Quality, Escambia County, June 1999.
44. *Naples Daily News*, "Deep Trouble: The Gulf in Peril" Oct. 2, 2003.
45. *St. Petersburg Times*, "Factory Owner Fined for '04 Spill," July 2, 2005; *Tampa Tribune*, "Wastewater Dump Seen as 'Lesser of Two Evils,'" Feb. 21, 2005.
46. "Florida's Draft Assessment and Strategies for FY 2006-FY 2010," prepared in accordance with Section 309 of the Coastal Zone Management Act.
47. <http://www.surfriderpbc.org/images/InjectionWellNOI-11040-1.pdf>
48. Florida Department of Health, "Eat Healthy, Eat Smart: The 2005 Florida Fish Advisories Brochure."
49. *Pensacola News Journal*, Dec. 27, 2005.
50. Dec. 5, 2003, letter from Susan Ann Bland, biological scientist, Florida Department of Health to Ralf Brookes, Esq.; Jan. 14, 2004, letter from Carol Baschon, Office of Water Legal Support, U.S. Environmental Protection Agency, to Terry Cole, Esq.
51. Pew Oceans Commission, America's Living Oceans, *Charting a Course for Sea Change*, May 2003.
52. *Naples Daily News*, "Deep Trouble: The Gulf in Peril," Sept. 28, 2003.
53. Pew Oceans Commission report, May 2003.
54. *St. Petersburg Times*, "Red Tide Choking Life From Gulf," Aug. 17, 2005.
55. Lora E. Fleming, et al., "Initial Evaluation of the Effects of Aerosolized Florida Red Tide Toxins (Brevetoxins) in Persons With Asthma," *Environmental Health Perspectives*, Vol. 113, No. 5, May 2005.
56. Ibid.
57. *Tampa Tribune*, "Environmental Fines Decline With Interest," March 22, 2006; *Report of the Special Grand Jury on Air and Water Quality, Escambia County*, June, 1999; *St. Petersburg Times*, "Has State Environmental Watchdog Lost Its Bite?" April 13, 1997; *St. Petersburg Times*, "They Won't Say No: Vanishing Wetlands: A Two-Part Special Report," May 22, 2005; *St. Petersburg Times*, "Judge: Corps Failed Glades," March 24, 2006.
58. Florida Department of Agriculture and Consumer Services, personal communication, May 2006.

59. Florida Department of Agriculture and Consumer Services, Division of Aquaculture, Open/Close Status, Shellfish Harvesting Area Information.
60. National Research Council, "Compensating for Wetlands Losses Under the Clean Water Act," 2001.
61. Legal Environmental Assistance Foundation, <http://www.leaflaw.org/press/pdfs/FLORIDA%20COMMENTS%20DECEMBER%202005signon2.pdf>
62. Robert D. McCauley, et al., High Intensity Anthropogenic Sound Damages Fish Ears, 113 J. Acoust. Soc. Am, 638 (Jan. 2003); Robert D. McCauley, et al., *Marine Seismic Surveys: Analysis and Propagation of Air-Gun Signals; and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes and Squid*.
63. MMS, "Gulf of Mexico OCS Oil and Gas Lease Sale 181, Draft Environmental Impact Statement" (DEIS); MMS, Gulf of Mexico Comprehensive Synthetic Based Muds Monitoring Program, May 2002.
64. MMS, "Gulf of Mexico OCS Oil and Gas Lease Sale 181, Draft Environmental Impact Statement" (DEIS).
65. Donald F. Boesch and Gordan A. Robilliard, "Physical Alteration of Marine and Coastal Habitats," in D. F. Boesch and N. N. Rabalais, eds., 1987, *Long-term Effects of Offshore Oil and Gas Development*, Elsevier Applied Science, New York, p. 695.
66. "Oil Spill Soaks Pelican Refuge," *Alexander's Gas and Oil Connections*, Vol.10, Issue 13, July 06, 2005.
67. *Inside Energy*, Vol. 11, No. 21.
68. Union of Concerned Scientists, Vehicles Engineer Donald MacKenzie, presentation at the PowerShift energy alternatives event in Lawrence, Kansas, April 29, 2006.
69. Florida Wildlife Research Institute, <http://research.myfwc.com/features>
70. *Miami Herald*, "Saltwater Fish Face Uncertain Future," Oct. 16, 2005.
71. Marine Recreational Fisheries Statistics, National Marine Fisheries Service, 2004.
72. Florida Fish and Wildlife Conservation Commission, http://research.myfwc.com/features/view_article.asp?id=5913
73. Florida Governor's Ocean Committee, "Florida's Ocean Strategies," Final Report to the Governor, June 1999.
74. Florida Fish and Wildlife Conservation Commission, Division of Aquaculture.
75. Florida Wildlife Research Institute, 2006.
76. Pew Oceans Commission report, May 2003.
77. Florida Department of Agriculture and Consumer Services, Division of Aquaculture, Open/Close Status, Shellfish Harvesting Area Information.
78. NOAA Fisheries, 2006 Status of Stocks, First Quarter Update, March 31, 2006.
79. NOAA Fisheries, Status of U.S. Fisheries for 2005, June 30, 2006.
80. *Naples Daily News*, Sept. 30, 2003.
81. Dr. Ken Lindeman, senior scientist, Environmental Defense.
82. Florida Marine Research Institute.
83. Research articles by McNulty, 1961; Taylor and Saloman, 1968; Odum, 1970; Roessler, 1971; Lindall, 1973.
84. Florida Fish and Wildlife Institute.
85. Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute.
86. National Aeronautics and Space Administration, "NASA Mission Detects Significant Antarctic Ice Mass Loss," March 8, 2006.
87. National Aeronautics and Space Administration, "NASA Mission Detects Significant Antarctic Ice Mass Loss," March 8, 2006; E. Rignot and P. Kanagaratnam, "Changes in the Velocity Structure of the Greenland Ice Sheet," *Science*, Vol. 311, No. 5763, Feb. 17, 2006.
88. National Wildlife Federation, "Unfavorable Tide: Global Warming, Coastal Habitats, and Sportfishing in Florida," June 2006.
89. Donner S.D., W.J. Skirving, C.M. Little, C. Oppenheimer, and O. Hoegh-Gulberg, "Global Assessment of Coral Bleaching and Required Rates of Adaptation Under Climate Change," *Global Change Biology*, 2005, Vol. 11.
90. Florida House of Representatives Bill 1855, 2006 Legislature.

