

11 Critical Ocean Issues

With Action Items for Concerned Citizens



2006

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I. INTRODUCTION

The International SeaKeepers Society is a non-profit, non-partisan organization whose diverse international membership of leading entrepreneurs and concerned citizens cares about the world's oceans and recognizes their critical importance to the life of our planet and its population. As a group and as individuals The International SeaKeepers Society is deeply committed to finding solutions to the problems now plaguing our seas.

Decades of overuse and exploitation have presented us with complex, costly, and global ocean troubles. It is extremely difficult to prioritize or single out any one issue over another, as all have significant and varying impacts on humans, marine life and the environment. The 2004 U.S. Commission on Ocean Policy report, *An Ocean Blueprint for the 21st Century*, provides an excellent overview of the issues as well as recommendations for a more positive ocean future.¹ The Pew Oceans Commission, a privately sponsored effort, came to similar conclusions in its 2003 report titled, *America's Living Oceans: Charting a Course for Sea Change*.² Given these two landmark efforts, it is indeed unfortunate that most citizens have not yet embraced their findings as a personal call to action.

With this document, The International SeaKeepers Society addresses this situation by presenting critical ocean issues in an action-oriented guide for our members and for society at large. From the larger universe of ocean and coastal woes, this agenda chooses 11 issues that warrant action now. SeaKeepers sees this as a starting point only and expects this document to evolve through our collective experience and the feedback we receive. Through *11 Critical Ocean Issues*, we seek and encourage a dialogue among all who share our concerns, so that, coupled with the actions we advocate, we can all more effectively contribute to the revitalization of our oceans.

SeaKeepers recognizes the need to identify marine issues and develop action plans with an international perspective. In this first edition, however, we selectively target American audiences and their political processes, drawing upon the credibility and force of the two U.S. commission reports. Nonetheless, we describe ocean challenges around the world. Indeed, neither the problems nor the solutions are inherently American, and many of the messages here can be applied to political systems and leaders worldwide. We strongly encourage a global perspective, as the oceans know no bounds.

As with any highly complex problem, there is no single solution, and no solitary "right answer." Here is what we think does work: identifying a discrete set of initiatives, getting input and agreement from others working on the same issue, and then working from a common agenda. We offer our "*Oceans II*" as a useful agenda and guide and welcome your comments.

SeaKeepers encourages its members and the public to create and seize opportunities with the media, with leaders of industry, politicians, and others to discuss the plight of the ocean, its importance, and the need for action now.

John Englander
Chief Executive Officer

II: WHY ACTION NOW?

The stability and prosperity of national economies, the health of human beings around the globe, substantial sources of energy, and the quality of life we have come to enjoy and expect are all tied to the sea. The ocean, with all its beauty and wonder, also makes the planet livable. Yet frankly, the ocean as we know it and the invaluable resources it provides are at great risk. The U.S. Commission on Ocean Policy and the Pew Oceans Commission call the situation “a crisis,” and they have urged action as a national priority.

The U.S. Commission on Ocean Policy and the Pew Oceans Commission called the situation a crisis.

Whereas the ocean’s economic worth is immense, estimated to be in the trillions of dollars, its intrinsic value is incalculable—impacting the quality of lives, jobs and cultures worldwide.¹ Oceans are the essential conduit of international trade, supporting ships that carry billions of dollars of goods each year and a maritime industry that accounts for millions of jobs.³ In 2002, trade in fish and fishery products globally was valued at over \$58 billion and provided income for an estimated 38 million people.⁴ Throughout the world, ocean-related tourism and recreation are huge economic drivers that sustain cultures as well as communities. Coral reefs alone are estimated to provide \$375 billion per year in goods and services and a livelihood for an estimated 500 million people.⁵ The cruise industry and its passengers account for over \$12 billion per year in spending.⁶ And in just the U.S., annual expenditures on recreational boating are on the order of \$30 billion.⁷ Clearly, the ocean is big business on a global scale.

The seabed also provides extremely valuable resources—oil, gas, important minerals and construction materials. Within the U.S., 30 percent of oil supplies and 25 percent of natural gas supplies are produced from offshore areas.⁸

The ocean’s biological wealth provides riches of its own. More than three billion people worldwide obtain a significant portion of their animal protein from the sea, and in some parts of the world the ocean supplies the only source of protein.⁴ Population growth and the desire to eat seafood as part of a heart-healthy diet continue to drive the demand for fish even higher. The ocean is also yielding new and important pharmaceuticals. It is a growing industry that has already produced powerful marine-derived antiviral and anti-cancer drugs, anti-tumor compounds, toxin detectors, and disease-fighting supplements.

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Some of the ocean’s benefits, however, defy market analysis. How do we put a price on the sea’s vast populations of small drifting plants, the phytoplankton, that produce much of the oxygen we breathe? What is the value of ocean currents that help to balance the distribution of heat across the globe, or of the sea as a gigantic repository for carbon dioxide, which helps maintain an atmosphere and climate suitable for human life?

To these invaluable contributions we must also add the historical and aesthetic importance of the ocean. The sea, through its trove of submerged riches, provides a unique window through which to view past civilizations and is an abundant source of recreation, adventure and contemplation.

These manifest benefits of the oceans are at risk. Some say we are loving our oceans to death. They are no longer a vast expanse of clean water, bountiful with natural resources. Chronic pollution coming from urban and agricultural runoff, atmospheric sources, and traditional point-sources such as sewage treatment plants and factories, impact every region of the globe. This escalating assault has resulted in declines in fish and marine mammal populations, the loss and degradation of valuable natural habitat, as well as impacts on human health associated with exposure to contaminants, pathogens, and harmful algal blooms.

Over the centuries we have become ever more efficient at using the ocean for our own needs, extracting resources and dumping our wastes. Our short-term gains now threaten the long-term sustainability of the ocean and our use of its resources.

We risk losing much of what we have come to rely on and appreciate about the sea. Over the centuries we have become ever more efficient at using the ocean for our own needs, extracting resources and dumping our wastes. Our short-term gains now threaten the long-term sustainability of the ocean and our use of its resources. If the declining trends in ocean health—so visible now—continue, we can expect the ramifications to reach far and wide, impacting the global economy, human health, and the every-day life of billions of people. We need to act now to reverse these trends.

We are inspired by the wisdom of two exceptional people:

It is a curious situation that the sea, from which life first arose, should now be threatened by the activities of one form of that life. But the sea, though changed in a sinister way, will continue to exist; the threat is rather to life itself.

Rachael Carson's "The Sea Around Us"



Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.

Margaret Mead

III. 11 CRITICAL ISSUES WITH ACTION ITEMS FOR CONCERNED CITIZENS

Please note that the following issues and actions are all considered important for the purposes of this document and the health and future welfare of the ocean. The presentation order is not meant to imply prioritization. References to ocean and coast also include the Great Lakes where appropriate. Though specific action items are suggested, they are merely some of the myriad of actions you might take—depending on what is happening in the parts of the ocean you love, how those ocean challenges affect you, and how you are most comfortable reaching out. You can use the background information we provide to support your own action agenda—to inform, energize and activate the media, your neighbors, the governor, state and federal legislators, as well as your family, friends, and colleagues. Talk up the issues you care about, whether they affect your livelihood or your neighborhood. The level of public discourse on oceans is dismal, especially considering what’s at stake. So, find your issue and pick your forum. It is fair to say that your concerns, openly expressed, represent an important contribution to a much-needed shift in our attitudes, postures, and policies toward our oceans.

1. POLLUTION

In 2004, there were nearly 20,000 beach closings and health advisory days in th U.S. due mainly to improperly treated sewage and bacteria-contaminated stormwater runoff.

When the algae die, decomposition processes at the seafloor deplete oxygen in the water, suffocating marine life that can’t swim or crawl out of danger.

Around the globe, pollution from land-based activities threatens marine life, puts human health at risk, and is costing us billions.

In undeveloped regions and small island nations, untreated sewage is regularly discharged directly into the sea. Even in developed nations, sewage discharge is a problem. America’s coastal waters receive more than 30,000 million liters of municipal sewage each day.⁹ In North Vancouver, British Columbia, one single wastewater plant discharges some 92 million liters of sewage daily into coastal waters.¹⁰ Although treatment removes some of the potentially harmful substances, concern exists over the continued release of nutrients, organic material, human pathogens, pharmaceuticals, and toxic substances such as metals, household and industrial chemicals, and chlorinated hydrocarbons, which go untreated. And in many areas, when rain overwhelms municipal facilities, treated and untreated sewage are combined and released. Treatment facilities have been unable to keep up with demand; infrastructure is aging; and too little is invested in improving sewage/wastewater treatment technologies and facilities.

In 2004, there were nearly 20,000 beach closings and health advisory days in the U.S. due mainly to improperly treated sewage and bacteria-contaminated stormwater runoff.¹¹ One study estimates that land-based marine pollution may result in 250 million clinical cases of illness globally, caused simply by bathing in contaminated seawater.¹² The related total cost of illnesses resulting from bathing in contaminated seawater or ingesting toxic seafood is estimated at \$13 billion annually.¹²

Sewage, along with runoff from agricultural areas, animal farms, lawns and golf courses, and deposition from the atmosphere, pose another serious threat—excess nutrients. A surplus of nutrients, such as nitrogen and phosphorous, promotes the growth of algae in coastal waters. The resulting algal blooms cloud seawater and prevent sunlight from reaching submerged vegetation, such as seagrass. When the algae die, decomposition processes at the seafloor deplete oxygen in the water, suffocating marine life that can’t swim or crawl out of danger. This situation is becoming more common, and worldwide, there are now some

Throughout the world, the occurrence and frequency of harmful algal blooms—involving algae that produce toxins detrimental to sea life, and in some cases human health—are on the rise.

On average, the annual economic impact of harmful algal blooms in the U.S. is estimated at \$49 million, and when extrapolated to the more than 50 countries now experiencing them, the global economic impact is large and growing.

At least 267 species of marine life are known to ingest or become entangled in this debris, including sea turtles, seabirds and nearly half of all marine mammal species.

146 dead zones—areas of water that are too low in dissolved oxygen to sustain life.^{13,14} In the U.S., over 80 bays and estuaries show signs of serious or moderate nutrient overenrichment.¹⁵ And each summer, off the mouth of the Mississippi River, the infamous Gulf of Mexico dead zone grows larger than the State of New Jersey.

Throughout the world, the occurrence and frequency of harmful algal blooms—involving algae that produce toxins detrimental to sea life, and in some cases human health—are on the rise. Though their cause is not yet fully understood, their impact is all too clear, particularly when toxins are involved. These toxins adversely affect more than 90,000 people annually, and are responsible for an estimated 62 percent of all seafood-related illnesses.¹⁶ Harmful algal blooms (HAB's) such as red tide also kill fish, shellfish and marine mammals. From the end of February to mid-April of 2003, red tide along Florida's southwest coast was implicated in the deaths of thousands of fish, over 100 endangered manatees and at least 46 sea turtles.¹⁷ Along with the risks to marine life and human health, these events have closed important fisheries, hurt tourism and recreation, and necessitated significant investments in health care and monitoring. On average, the annual economic impact of harmful algal blooms in the U.S. is estimated at \$49 million, and when extrapolated to the more than 50 countries now experiencing them, the global economic impact is large and growing.^{12,18}

Oil, pesticides, marine debris, other chemicals and potential pathogens (bacteria and viruses) also find their way into the sea. Each year, over 28 million gallons of oil enter North American waters from human-related sources, nearly three-quarters of which comes from land runoff and two-stroke outboard boat engines.¹⁹ In contrast to popular belief, most of the oil entering the ocean does not come from major spills. Incidences such as the *Exxon Valdez* spill, which dumped 11 million gallons of oil into Prince William Sound, Alaska in 1989, are thankfully, relatively uncommon. Yet even in the most remote regions of the ocean, tons of plastics, derelict fishing gear, and other marine debris wash ashore, foul coral reefs and sensitive marine habitats, and endanger marine wildlife. Nearly eight million pounds of debris, most of it plastic items washed into the oceans from land-based sources, were collected in 2004 as part of a global beach cleanup effort.²⁰ At least 267 species of marine life are known to ingest or become entangled in this debris, including sea turtles, seabirds and nearly half of all marine mammal species.²¹ Coastal communities are forced to spend much time and money to clear this debris from their beaches.

Research reveals that a surprising amount of pollution is deposited into coastal and ocean water via the atmosphere. The impacts of airborne mercury, excess nutrients, pathogens, and other harmful substances are significant. Mercury accumulation in the ocean's top predators and popular human foods, such as tuna, sharks, and swordfish, has elicited human health warnings.

ACTIONS

Does your local wastewater treatment facility have proper biological nutrient removal technology?

Learn more about your watershed and how activities can affect the health of oceans and coastal waters.

Contact your state and congressional representatives regarding funding on ocean pollution issues

Reduce fertilizer use

Initiate a clean marina program

- Find out whether your local wastewater treatment facility has installed advanced technology, such as biological nutrient removal, to reduce nitrogen from your community's wastewater. This is particularly important if you live in a watershed where discharges from these facilities contribute substantially to impaired water quality. Find out more about facilities discharging wastewater in your neighborhood, and lots of other information about what's going on in your environment, at the Envirofacts Data Warehouse, www.epa.gov/enviro.
- Learn more about your watershed and how activities near you—wherever you live—can affect the health of oceans and coastal waters. Consider becoming involved in local efforts to reduce nutrient and other pollution flowing into your streams, rivers, lakes, and ultimately, your oceans. (Find your watershed and other helpful information at www.epa.gov/adopt/network.html and check out the Watershed Information Network at www.ctic.purdue.edu/KYW/KYW.html)
- Visit, write, call or e-mail your state and congressional representatives* to fight for increased funding for improvements to local and regional wastewater treatment and combined sewer overflow systems (CSO's). CSO's are systems that allow stormwater runoff from streets to bypass treatment facilities, and are a major pollution source in many areas.
- Reduce nutrient levels in stormwater runoff by using less fertilizer on your lawn, and encourage your community—family, friends, and neighbors—to do the same on their lawns (and save money at the same time). Talk with managers of local golf courses (or at least your own course) about the problems caused by nitrogen runoff, and encourage them to implement best practices to minimize fertilizer use. Suggest that they can reduce green fees with the money they save. (For more golf course information see <http://www.usga.org/turf>, then click *Environmental Programs*, then *Articles and Resources*.)
- Initiate a clean marina program employing pollution-reduction measures at your local marina to minimize fuel spills, discharges from marine sanitary devices, and intentional and accidental dumping of toxic substances into the water. Write, call or e-mail your state and local elected representatives to encourage them to support and fund a robust clean marina program in your state and community. For more information on what you can say and do, see the National Oceanic and Atmospheric Administration's Clean Marina Initiative at <http://cleanmarinas.noaa.gov>.

* To find the names and addresses of your congressional representatives go to www.house.gov or www.senate.gov. Appendix D provides a template for a letter to your political representatives to urge their action on the oceans. We encourage you to use this letter as you see fit and modify it to suit your own interests and concerns regarding the sea.

Participate and support local coastal clean-up programs

Minimize runoff from farming operations

- Participate in and otherwise support (e.g. sponsor) local coastal clean-up events to remove marine debris from beaches and waterways (www.coastalcleanup.org). Lobby local officials for education programs to help your community adopt best practices to ensure proper disposal of solid wastes—particularly plastics, which represent about 80 percent of marine debris—to reduce the flow of potential marine debris into coastal waters.
- Visit, write, call or e-mail your congressional representatives to encourage them to direct more funding to agricultural conservation programs that minimize runoff from farming operations.

All the recommended action items contained in this report are available in a consolidated list, in a worksheet format. This is to facilitate choosing those of interest to you and allowing you to easily keep track of related follow up items. This can be downloaded from our website, www.seakeepers.org.

2. FISHERIES

A recent study showed that once modern fishing fleets target a particular pelagic fish species, they can eliminate about 80 percent of the population within 15 years.

The ocean is so large it *seems* impervious to human activities and limitless in its resources. We know now that this is hardly the case. Our capacity to catch fish, for example, has overwhelmed the ocean's ability to replace them. A recent study showed that once modern fishing fleets target a particular pelagic fish species, they can eliminate about 80 percent of the population within 15 years.²² In fact, research suggests that 90 percent of the sea's most majestic, commercially and recreationally important creatures, such as tuna, marlin and swordfish, are now gone.^{22,23} Around the globe, the diversity of fish may have diminished as well, by as much as 50 percent.²⁴ We are now not only catching smaller fish, but are also developing fisheries focused on species once thought of as worthless.²⁵ The implications for fish and fishermen are obvious. What is becoming clearer is that this so-called "fishing down the food web" is altering and in some cases destroying a variety of ecosystems, including coral reefs, kelp forests and amazingly productive seamounts.^{23, 25}

About 25 percent of the total global catch is simply discarded—that's 60 billion pounds of – non-targeted and accidentally caught marine life thrown back into the sea dead or dying.

Fishing practices often affect much more than the targeted fish. For example, bottom trawling, which involves dragging large, heavy nets across the ocean floor, is plowing under the very habitat upon which marine life depends. Such trawling and other destructive fishing techniques, such as the use of longlines—miles-long fishing lines with thousands of hooks—catch indiscriminately. About 25 percent of the total global catch is simply discarded—that's 60 billion pounds of – non-targeted and accidentally caught marine life thrown back into the sea dead or dying.²⁶ Worldwide, for the fish populations that have been assessed, 75 percent are categorized as fully exploited, already depleted or overexploited.⁴ And research suggests that such fishing pressure is altering the growth and reproductive cycles within fish populations.^{26,27}

ACTIONS

*Eat only sustainable seafood;
encourage friends and
restaurants to join you.*

*Encourage and support efforts to
establish marine reserves and
other protected areas.*

*Support enlightened
fishing policies.*

Overcapacity—the ability to catch fish faster than the sea can replace them—as well as subsidies, harmful fishing technology, and ineffective management have all contributed to significant declines in fish populations. If these trends continue, the future for the world’s fish and the billions of people who rely on them for jobs, sustenance, recreation, or cultural tradition is bleak.

- Join the many thousands of people who are choosing to eat only sustainable seafood (healthful fish that are neither overfished nor caught with destructive gear). Check out a reliable list of good seafood choices, such as www.thefishlist.org, www.montereybayaquarium.org, and www.blueoceaninstitute.org, and bring your family, friends, and colleagues along so you can magnify your market power to relieve pressure on dwindling fish species and increase pressure on fishermen who target these species or use harmful fishing practices. And, while you are purchasing your sustainable fish, tell the owners and managers of your local markets and restaurants to check out these sites, and encourage them to join a substantial and growing number of their colleagues around the world who offer only sustainable seafood for sale. Despite increasing awareness, highly depleted and vulnerable species like orange roughy, Chilean sea bass, and Atlantic cod still appear on some menus and in display cases at the market.
- Visit, write, call or e-mail your elected representatives at all levels and ask them to support efforts to establish marine reserves and other marine protected areas that include and preserve critical habitats, ecosystems and spawning areas that produce and nurture fish. Find out if there are efforts to create such reserves in your area and, if so, support them. For more on marine reserves and other types of marine protected areas, check out <http://mpa.gov>.
- Visit, write, call or e-mail your congressional representatives to urge their support to:
 - Promote science- and ecosystem-based fisheries management (such management would take into account the interactions among fish, their environment, and humans);
 - Prohibit the use of damaging bottom gear in critical fish habitat areas, such as deepwater coral habitats and seamounts; .
 - Mandate plans to reduce bycatch of non-targeted fish, marine mammals, seabirds, and sea turtles to levels approaching zero, including funding to develop improved technology to reduce bycatch; and
 - Reduce fishing capacity while providing support for affected fishermen.

For more information, including what is going on in Congress and fisheries management agencies, check out the Marine Fish Conservation Network site at www.conservefish.org

3. LEGAL FRAMEWORK FOR GOVERNANCE

Because the ocean and its resources are viewed as a public good and subject to overexploitation and other abuse by anyone with the capacity to do so (the so-called “tragedy of the commons”), there is a clear, inherent need to create an effective framework for using AND protecting the seas. Nations have created zones, through domestic and international laws, defining rights and responsibilities affecting the use and management of ocean resources. For example, in the U.S., most states have jurisdiction to manage resources from the shore to three nautical miles offshore, with the exception of Texas, Florida’s west coast, and Puerto Rico, where jurisdictions extend outward nine nautical miles. The federal government retains power to regulate commerce, navigation, power generation, national defense, and international affairs within state waters.¹

According to international law, every coastal nation has sovereignty over its territorial sea, which for the U.S. extends 12 nautical miles seaward. International law, as defined by the U.N. Convention on the Law of the Sea (UNCLOS), also recognizes various levels of national jurisdiction over waters extending as far as 200 miles, and in some circumstances even further when a nation’s continental margin (shelf) extends beyond that distance.¹ Along the Atlantic Coast, within the Gulf of Mexico, and in the Bering Sea and the Arctic Ocean, the U.S. continental shelf is wider than 200 miles. However, the U.S. cannot assert its claim on these areas internationally because, unlike 145 other nations, it is not a party to UNCLOS. This treaty also clearly spells out national rights to navigation, research and resources, and for the first time assesses global responsibilities for protecting ocean waters and their inhabitants in the 60 percent of the world’s ocean that is unclaimed by any sovereign state. As global warming opens new waterways and land areas in the Arctic, the role of UNCLOS in defining ocean rights and responsibilities and for providing a forum for resolving disputes among nations becomes critical as countries vie for rights to newly accessible minerals, energy supplies, and navigation routes.

The UN Convention on Law of the Sea (UNCLOS) is a good base for international marine policy. Although 95 US Senators are in favor, five opponents keep the treaty from being voted upon.

The U.S. has debated ratification of UNCLOS for more than 20 years, with a growing consensus among resource users, conservationists, the military, the petroleum industry, and a host of other groups that ratification of UNCLOS is essential to protect U.S. economic, national security, and ocean conservation interests. As of the fall of 2005, some 95 of 100 U.S. senators were prepared to vote for UNCLOS ratification. Unfortunately, a lack of Senate and White House leadership in the face of concerns expressed by a handful of conservatives prevented action on this widely supported and necessary legislation.

The ability of the U.S. to engage constructively in international management of ocean resources is compromised by its haphazard approach to its own ocean waters. Both U.S. ocean commissions decried a plethora of often conflicting laws, responsibilities and agencies.^{1,2} Given the dismal health of U.S. coastal and offshore waters, the commissions advocate a substantial revamp of governance processes and institutions, along with fundamental reform of federal policies. This need to adopt and implement a new oceans ethic is amplified by

emerging uses in offshore waters, such as aquaculture, renewable energy, and bio-prospecting, whose impacts and potential conflicts with other activities are either poorly or not at all addressed by existing laws and institutions. Rather than heed the commissions' recommendations for integrated and comprehensive approaches, the White House and Congress continue to propose and adopt piecemeal tactics for such issues as wind power and offshore aquaculture, thus compromising our nation's ability to address conflicts among uses and manage cumulative impacts.

ACTIONS

Add your voice to the ratification of the U.N. Convention on the Law of the Sea

Support extension of use and protection of resources out to 200 miles

- Visit, write, call or e-mail your U.S. senators to urge their leaders to schedule a vote soon on the ratification of the U.N. Convention on the Law of the Sea—and send a copy of your message to the White House asking President Bush to push for a vote in the Senate.
- Visit, write, call or e-mail your congressional representatives and urge them to support legislation to establish a comprehensive and integrated regime for the use and protection of resources under federal jurisdiction—out to 200 miles—that specifically deals with proposed new activities.

4. INSUFFICIENT INVESTMENT

The total US Federal budget for ocean science and technology is just \$630 million. For comparison, each NASA shuttle mission costs \$1.5 billion.

Despite the clear value of oceans to the U.S. economy, quality of life, and human health, as well as evidence of the degradation to marine ecosystems along and off our shores, the nation's investment in ocean science and technology over the last 25 years has dropped from seven percent of the federal research budget to just three and a half percent today—or about \$630 million per year.¹ By comparison, just one NASA shuttle mission costs about \$1.5 billion dollars. Congressional appropriations for ocean and coastal management—including enforcement—as well as for education, marine technology, research facilities and ocean monitoring are also woefully inadequate.

Both U.S. ocean commissions recommended that Congress double the federal ocean and coastal science budget, and the U.S. Commission on Ocean Policy called for an Ocean Policy Trust Fund—relying on a portion of fees, not already designated for use, generated by oil, gas and other revenue-generating activities utilizing public offshore lands—to pump an additional \$3.9 billion into the host of ocean programs and activities outlined in its recommendations.¹

Though not small change, it is a pittance compared to the trillions of dollars of economic activity generated along the U.S. coasts each year, a substantial portion of which is jeopardized by lack of adequate government investment necessary to acquire scientific understanding and ensure effective management of ocean resources.¹ Furthermore, the recommended \$3.9 billion is but a fraction of the \$26 billion of so-called “pork” that Congress added to the U.S. surface transportation bill in the fall of 2005.

ACTIONS

- Visit, write, call or e-mail senior Administration officials* and your congressman and senators and encourage them to urge congressional appropriations committees to double the ocean science budget over the next five years as recommended by the two U.S. ocean commissions. Also let them know you strongly support the concept of long-term, sustained funding for ocean programs through an Ocean Policy Trust Fund, as recommended by the U.S. Commission on Ocean Policy. For updates on efforts to increase the ocean science budget, check out www.coreocean.org.

5. HABITAT LOSS

Since 1900, more than half of the world's wetlands have been lost due to drainage or filling for agriculture and urban development, pollution, subsidence, and sea-level rise, as well as due to the construction of infrastructure such as dams and levees that alter wetland-creating water flows and sediment deposition.

Ocean and coastal habitats, such as wetlands, seagrass beds and coral reefs, provide nurseries for commercially important fish species, protect shorelines from erosion and storm damage, and provide unparalleled recreational experiences. These habitats are priceless, yet human activities are responsible for their decline and in many places, their disappearance.

Since 1900, more than half of the world's wetlands have been lost due to drainage or filling for agriculture and urban development, pollution, subsidence, and sea-level rise, as well as due to the construction of infrastructure such as dams and levees that alter wetland-creating water flows and sediment deposition.²⁸ A similar percentage—or more than 100 million acres—have disappeared from the U.S. landscape (excluding Alaska) since the arrival of European settlers.²⁹ Louisiana, home to 40 percent of the coastal wetlands in the lower 48 states, is losing from 25 to 35 square miles of wetlands each year.³⁰ The loss of wetlands leaves shorelines more vulnerable to erosion, flooding, and saltwater intrusion into freshwater environments and aquifers. Wetlands' unique capacity to filter out pollutants is also eliminated, resulting in degraded water quality, destroyed wildlife habitats, and lost recreational opportunities.

Approximately 20 percent of the world's coral reefs have been destroyed and show little prospect for recovery.

Other important habitats are under siege as well. Approximately 20 percent of the world's coral reefs have been destroyed and show little prospect for recovery, and about half of those remaining are at risk from climate change, overfishing, sediment and nutrient pollution, disease, destructive fishing practices, and marine debris.³¹ As a result, coral reefs are more vulnerable to, and are less able to recover from, natural perturbations such as storms.

The world is also losing thousands of acres of seagrass, miles of mangroves, and vast stretches of kelp forests, eliminating key ecosystems and the variety of goods (including commercially and recreationally important fish species) and services (such as protection from storm surge and erosion) upon which coastal humanity has become dependent. Seagrass—an important source of food and shelter for marine life, as well as an excellent indicator of ecosystem

* President George W. Bush (www.whitehouse.gov/contact); The Honorable Joshua Bolten, Director of the Office of Management and Budget (www.whitehouse.gov/omb/contact.html); The Honorable Carlos Gutierrez, Secretary of the Department of Commerce (www.commerce.gov/Contact_Us.htm); The Honorable Conrad C. Lautenbacher, Administrator of the National Oceanic and Atmospheric Administration (NOAA) (PH:(202) 482-3436; FAX:(202) 408-9674; conrad.c.lautenbacher@noaa.gov; 14th Street & Constitution Avenue, NW Washington, DC 20230).

health—is declining precipitously in U.S. coastal waters.³² Along the shores of Sri Lanka and Sumatra, the loss of buffering mangroves and wave dampening coral reefs has been identified as one factor that enhanced the catastrophic impact of the Indian Ocean tsunami in December 2004. In Louisiana, the disappearance of Mississippi River delta wetlands is believed to have exacerbated the impact of hurricane Katrina.

ACTIONS

- Visit, write, call or e-mail your members of Congress and let them know you want them to support legislation facilitating the use of, and providing robust funding for, marine protected areas—including marine reserves, parks, sanctuaries, and refuges—to preserve critical habitat, such as coral reefs, wetlands, mangroves, and seagrass beds. Let local and state officials know you support efforts to do the same in your area. For more information, check out <http://mpa.gov>.
- Visit, write, call or e-mail your congressional delegation to urge they take the lead in Congress to provide a significant, dedicated and permanent source of funding for habitat protection.
- Participate in public meetings and, with members of your local planning boards, councils and regional land development agencies, insist that protecting coastal habitats must be part of both long- and short-term planning efforts.
- On cruises or dive trips, determine in advance that the operator observes best practices appropriate to coral reef areas, such as use of permanent moorings.

6. LEADERSHIP

We need to elect and support political leaders with the vision to realize the importance of the oceans.

The two U.S. ocean commissions described this nation’s ocean governance as a confusing mishmash of laws and institutions, with little evidence of the vision, coordination, and leadership necessary to solve our ocean and coastal challenges. The fate of our oceans rests in the hands of 11 federal departments, four independent federal agencies, dozens of congressional committees—not to mention state, territorial, tribal and local authorities—all operating within a complex web of 140+ federal laws and a plethora of state and other mandates. Given these circumstances, it is not surprising that both commissions called for a comprehensive and integrated national ocean policy and the designation of one lead federal entity whose mission would be to evaluate the array of federal and regional activities to ensure that our use of marine and coastal resources does not sacrifice their environmental integrity or sustainability. It would also enforce marine conservation and management statutes, coordinate the various decision-making entities, and advocate strongly for funding to undertake ocean and coastal research, conservation, education and management activities.

“The problem is that politicians cater to voters and fish don’t vote.”
Dr. Sylvia Earle

Few political leaders have seized upon the urgency and value of these recommendations, and in the current political climate filled with other distractions and priorities, they will need substantial incentives to pursue a meaningful ocean policy agenda. The U.S. Ocean Action Plan, the Administration’s response to the U.S. Commission on Ocean Policy report, is only a first step and does not reflect the immediacy permeating the commission’s recommendations.³³

“The problem is that politicians cater to voters and fish don’t vote,” says Dr. Sylvia Earle, former NOAA Chief Scientist and renowned ocean explorer. But, people can make a difference, for they, unlike fish, can vote and make their political choices heard. And, a new political action committee—Ocean Champions—is directing financial and other support to politicians who demonstrate much-needed leadership on behalf of the oceans.

ACTIONS

- Support political candidates who are interested and active in marine issues. For information on which candidates meet these criteria, check out Ocean Champions at www.oceanchampions.org.
- Visit, write, call or e-mail your political representatives and let them know that the oceans are vital to our economic, natural, and national security and are collapsing under the weight of our misuse. Let them know that it is inconceivable that they would not make their protection, maintenance, and restoration a high priority.
- Ask your U.S. representative to join the House Ocean Caucus (an unofficial, bipartisan group of House members interested in ocean issues) and become an active, leading member. Ask your senators to take the lead in establishing an equivalent caucus in the Senate.

7. INTEGRATED MANAGEMENT

...in the sea the flow of life, pollution and currents is without regard to political boundaries.

Human actions impact and are affected by the sea, regardless of where one lives, works, or travels. The flow of water and air over the land and through our communities connects us to the ocean. We are more intimately tied to the sea than we often realize. Within the ocean, its creatures are also linked through an intricate and complex web of life that is supported and directed by the physical, geologic, and chemical environment. Furthermore, in the sea the flow of life, pollution and currents is without regard to political boundaries.

By moving toward ecosystem-based approaches, we can improve integration and address interconnectivity.

Management of ocean uses must, therefore, be done within a context that takes into account marine ecosystems and their interconnectivity, the artificiality of political boundaries, and the links between the oceans and human society. By moving toward ecosystem-based approaches, we can improve integration and address interconnectivity.

ACTIONS

Let your voice be heard by contacting local, state and federal agency representatives and challenging them to raise ocean conservation issues to the forefront of the national agenda.

- Write, email or call your political allies and representatives, urging them to strengthen integrated management components outlined in the U.S. Ocean Action Plan (www.ocean.ceq.gov) to better reflect the comprehensive and coordinated governance described by the two commissions. Recent actions supported by the Administration and Congress which would vest federal responsibility for offshore wind farms in the Department of the Interior and offshore aquaculture in the Department of Commerce, are at odds with the recommendations for an integrated offshore governance and management regime offered by the U.S. Commission on Ocean Policy.
- Visit, write, call or e-mail your governor and your state and congressional representatives to let them know that you support an integrated regional effort to develop comprehensive plans to protect, maintain, and restore the health of marine ecosystems. These plans should address all problems affecting marine ecosystems and coordinate the efforts of relevant federal, state and tribal agencies. Tentative efforts are already underway in New England, the Gulf of Mexico (www.dep.state.fl.us/gulf/default.htm), and in the Pacific Northwest.
- Visit, write, call or e-mail senior Administration officials and request that they provide an integrated ocean budget as part of the President's fiscal year 2007 submission to Congress. That budget should provide Congress and stakeholders with a clear understanding of ocean-related program funding and the degree to which the programs are integrated.
- Visit, write, call or e-mail members of your congressional delegation and ask them to seek oversight hearings to examine how the 140-plus federal ocean-related laws can be better integrated and coordinated.
- Visit, write, call or e-mail senior Administration officials voicing support for a strong Ocean Research Priorities Plan and Implementation Strategy (ORPPIS) and calling for funding in the President's fiscal year 2007 budget to support greater integration of ocean science priorities. A multi-agency subcommittee is developing the ORPPIS, as required by the U.S. Ocean Action Plan.

8. DECISIONS BASED ON SCIENCE

"We know more about the backside of the moon than we do about the bottom of the ocean."

Wise decision-making and effective strategic planning require the best information available—and for the oceans this means unbiased, credible, and up-to-date data and analysis. This need is heightened by the complexity of ocean ecosystems, the urgency to base management decisions in the context of ecosystem health and function, and our surprising lack of information. There is a favorite slogan among the maritime community: "We know more about the backside of the moon than we do about the bottom of the ocean." In fact, 95 percent of the ocean remains unexplored, and our capacity to observe what is going on there and the geographic reach of existing observation efforts are far too limited.

Improved forecasts derived from ocean observations would significantly benefit industries such as fisheries, agriculture, insurance, energy, tourism and recreation, as well as public safety and disaster management.

Chronic under-funding by the U.S. has rendered much of the nation's ocean-related research infrastructure—including an aging research fleet—obsolete.

With improved ocean observations we would have the basis for understanding ocean dynamics and the functioning of marine ecosystems. With this knowledge, we could provide more timely and accurate hurricane forecasts, improve the safety and efficiency of marine operations, monitor and understand harmful algal blooms, and more effectively predict seasonal climate patterns. We would, in short, have vastly enhanced tools to manage and protect our ocean resources and ourselves. Improved forecasts derived from ocean observations would significantly benefit industries such as fisheries, agriculture, insurance, energy, tourism and recreation, as well as public safety and disaster management.

In February of 2005, 61 countries recognized the need for, and importance of, a Global Earth Observing System of Systems (GEOSS) by agreeing to a ten-year implementation plan.³⁴ Ocean observing is a crucial part of the envisioned GEOSS. Within the U.S., a subset of GEOSS—the Integrated Ocean Observing System (IOOS)—is beginning to take shape. However, a lack of funding, coordination, and leadership hinders progress.

The International SeaKeepers Society recognizes the need for, and importance of, building scientific capacity and enhancing ocean observations. The Society has developed a cost-effective, automated system for near-surface, high-quality ocean observations, which is being considered as part of a large regional observing system. The SeaKeeper 1000™ system is described in Appendix C.

Chronic under-funding by the U.S. has rendered much of the nation's ocean-related research infrastructure—including an aging research fleet—obsolete. This lack of capacity deprives the nation's scientists and decision-makers of data on critical parameters such as fish populations, ocean currents, climate change, coastal erosion and algal blooms.

Another point worth mentioning is that the best monitoring, research, and knowledge are useless if not used. Scientific information must be translated, made suitable for the needs of managers, and integrated into the decision-making process. For example, even in the most scientifically advanced nation in the world, we have seen the crash of species of economically and ecologically crucial fish—like cod and West Coast rockfish—both of which are struggling to recover under ineffective management measures. The strongest and most sustainable fishery management decisions are and must be based on science and embody a sufficient amount of caution to account for scientific gaps. Resource management decisions in general, should be made based on science with precaution, but kept separate from issues of politics or commerce.

ACTIONS

- Visit, write, call or e-mail your congressional representatives to push for a doubling of the investment (\$150 million in the fiscal year 2007 budget, increasing to levels approaching \$650 million over the next five years) in a U.S. integrated ocean-observing system (IOOS). For more on ocean observing, and IOOS in particular, go to www.ocean.us, and click “Links” then “IOOS.”

- Visit, write, call or e-mail senior Administration officials and your congressional representatives and tell them to urge appropriations committees to double the ocean science budget over the next five years as recommended by the two U.S. oceans commissions. For more information and updates, check www.coreocean.org.
- Visit, write, call or e-mail your congressional representatives, urging them to support legislation amending the Magnuson-Stevens Fisheries Conservation and Management Act (the nation's primary fisheries law) to require federal regional fisheries councils to adhere to the scientific advice they receive and to maintain strict separation between conservation and allocation decisions. Keep up with this and other fisheries issues at www.conservefish.org.
- Visit, write, call or e-mail your congressional representatives and ask them to support specific investment in, and implementation of, a research fleet renewal plan and a national strategy to strengthen marine research infrastructure and technology. For background and updates on research vessels and facilities, go to www.unols.org.

9. EDUCATION & OUTREACH

. . . just 32 percent of the nation's adults grasp basic environmental concepts. Even fewer understand more complex issues such as ecosystem decline, loss of biodiversity, non-point source pollution, and watershed degradation.

Data suggests that one-quarter of Americans—or at least 70 million citizens—incorrectly believe that the sun shining through the ozone hole causes global warming.

Great nations and Fortune 500 companies alike are built on an educated and engaged workforce and passionate leadership. The ocean needs both—strong, effective leadership and people with knowledge, understanding, skills, and sufficient desire to act. With the exception of coastal residents whose lives are most directly engaged with the sea, most of the public does not understand the significance of the ocean to their everyday lives, its value to society, or the seriousness of the problems we face.

Ocean illiteracy is part of a wider and more substantial problem. A *Report Card on Knowledge, Attitudes, and Behaviors on the Environment* indicates that just 32 percent of the nation's adults grasp basic environmental concepts and that even fewer understand more complex issues such as ecosystem decline, loss of biodiversity, non-point source pollution, and watershed degradation.³⁵ Data suggests that one-quarter of Americans—or at least 70 million citizens—incorrectly believe that the sun shining through the ozone hole causes global warming. Few recognize that land runoff contains pollutants that threaten the health of our coastal waters or that mercury, which accumulates in the fish we eat, comes from human activities via the atmosphere. These pervasive misunderstandings and lack of knowledge about the oceans leave citizens unaware of the growing problems, disconnected from the issues, and unmotivated to demand needed change.

The U.S. and other nations face educational deficiencies that are rendering the world populace scientifically illiterate, unprepared in the workforce, and/or to be poor ocean stewards. We have to address the challenge that much of humanity

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We need to tap the ocean's allure to energize students of all ages about science, the natural world, and the importance of stewardship.

remains ignorant of the oceans' precarious condition and its importance. Having enough schools with sufficiently trained teachers and adequate resources for students is a global problem. Even in the U.S., there are not enough well-trained K-12 science teachers, and many of them simply do not have the resources they need to adequately engage and educate their students. At the undergraduate and graduate levels, too few students—particularly minorities—are pursuing careers in ocean science, technology, and policy. Funding for scholarships and fellowships is inadequate to attract and develop the ocean-related workforce and leaders we need.

We need to tap the ocean's allure to energize students of all ages about science, the natural world, and the importance of stewardship. Decades ago, Jacques-Yves Cousteau excited a generation and created a worldwide passion for the oceans through exploration, discovery, and an infectious fascination for the world beneath the waves. Today, Dr. Bob Ballard, with the discovery of the Titanic and his deep-sea archeological finds, is stimulating interest in this realm. Sadly, despite the natural fascination people have for the sea and its wondrous creatures, and the ability of technology to bring ocean excitement and exploration to one's computer and living room, we have failed to capture enough of the world's attention to inspire a widespread sense of connection to or stewardship for the sea. *We need to change this!*

ACTIONS

- Make sure your local schools include oceans in their science curriculum (for guidance on ocean education see www.vims.edu/Bridge).
- Create an award for marine-related articles, books or documentaries or support other innovative education and outreach efforts. (This could be done by an individual, an organization, or by endowing an existing institution to establish an award or program.)
- Support existing National Science Foundation (NSF) Centers for Ocean Sciences Education Excellence (COSEE) or assist in the establishment of new COSEEs (see: www.cosee.net).
- Establish a scholarship or fellowship program for students to study ocean science, marine technology, policy, or education.
- Sponsor the National Ocean Sciences Bowl (www.coreocean.org) and encourage participation of local high schools.
- Let the media know the ocean is important and you want to see more stories and information in print, online, and in broadcasts on issues you care about. Visit with your newspaper's editorial board, and visit, write, email or call your local radio and television stations, as well as national networks and papers.

10. INVASIVE SPECIES

Thanks to global trade and travel, non-native species of animals and plants are showing up in places they had not historically been, out-competing native species and causing harm to fisheries, fouling infrastructure, altering ecosystems, and costing us billions of dollars. In San Francisco Bay alone, there are now more than 175 non-native species, and the incidence of invasive species around the world is on the rise.³⁶

From 1989 to 2000, the economic impact of zebra mussels in the U.S. is estimated to have been between \$750 million and \$1 billion.³⁷ The release of water from ships' ballast and holding tanks is the prime suspect for most introductions of non-native marine animals and plants, and at least 7,000 different species of marine life may be transported around the world each day in ballast water.^{38,39} Other contributors to the spread of introduced species include the dumping of aquarium fish and plants into non-native waters, moving fisheries-related gear with attached invasives to new environments, moving boats and trailers—with hitchhikers—from place to place, and relocating navigational buoys or drilling platforms with their communities of attached organisms.

ACTIONS

- Prevent the introduction of non-native species into coastal waters by disposing of aquariums and aquarium organisms properly, and rinsing off small boats, trailers, fishing gear, and other equipment before going to another locale. Share this information with your community. Not sure what to do with your aquarium plants and critters? Here is a helpful Web site (www.habitattitude.net). Check out this information from the Minnesota Department of Natural Resources on how to manage your boat and gear (www.dnr.state.mn.us/invasives/preventspread.html).
- Visit, write, call or e-mail your congressional representatives encouraging them to support legislation and regulations to minimize the introduction and spread of invasive species from all sources, and to support the use of technologies that eliminate invasive organisms from ballast water. For more information on invasive species and efforts to control them, go to www.invasivespeciesinfo.gov.

11. CLIMATE CHANGE

Independent of the details, such as the exact rate of warming, the specific nature of the impacts, or how much humans are to blame, the impacts of global warming can no longer be ignored.

Climate change, both natural and human-induced, is a reality on planet Earth. The Intergovernmental Panel on Climate Change reports that the average near-surface temperature of the earth has increased by about 1 degree Fahrenheit (0.6°C) since 1861 and that by 2100 it will rise another 2.5 to 10.4°F (1.4 to 5.8°C) from 1990 levels.⁴⁰ Independent of the details, such as the exact rate of warming, the specific nature of the impacts, or how much humans are to blame, the impacts of global warming can no longer be ignored. Increasing ocean temperatures, sea-level rise, altered patterns and intensities of drought and flooding, changing disease frequencies and incidence, and intensified storm activity are occurring and are increasingly being documented as a consequence of climate change.

The average thickness of sea ice in the Arctic has decreased nearly three meters over the last 30 to 40 years.

As the oceans warm, the spread and incidence of human disease, such as cholera and malaria, may increase throughout the world.

During the 20th century, the globally averaged sea level has increased between four and eight inches (10 to 20 cm), and may rise another four to 35 inches (9 to 88 cm) by 2100.⁴⁰ Though the exact amount of sea-level rise and the rate at which it will occur are uncertain, the fact that the ocean will continue to expand is not. Low-lying coastal regions and island territories are particularly vulnerable to flooding and storm damage.

Polar regions are already exhibiting dramatic signs of change, with thinning ice caps and melting glaciers. The average thickness of sea ice in the Arctic has decreased nearly three meters over the last 30 to 40 years.⁴¹ In the tropics, coral disease and bleaching are much more common, and there is evidence that the ability of corals to calcify and grow may be declining due to an increasing amount of carbon dioxide dissolved in the sea.⁴²

As the oceans warm, the spread and incidence of human disease, such as cholera and malaria, may increase throughout the world. Already, we are seeing ecological impacts associated with the sensitivity of some marine organisms to small temperature changes. Those, such as corals, that cannot shift their geographic position or depth to avoid adverse temperature-induced effects may perish. There are also recent reports suggesting that while the number of hurricanes has not appreciably increased, their intensity has, and it may be due to global warming.⁴³

While immediate actions to reduce greenhouse gas emissions, such as cutting back on fossil fuel use through energy efficiency, conservation, and application of new technologies will not stop global warming today, they will reduce impacts on future generations.

ACTIONS

- Discover and choose ways to become more energy efficient in your life, for example by:
 - Buying fuel-efficient vehicles and appliances.
 - Asking your local power company for an energy audit of your home and workplace, and implementing suggestions for reducing energy use (many of which could pay for themselves in the very short term and save you money over the longer term).
 - Making other choices that could maximize your energy efficiency and reduce greenhouse gas emissions (for ideas on what you and others can do, check out <http://globalgreen.org/programs/climate.html>).
- Visit, write, call or e-mail your congressional representatives and encourage them to support policies, including caps on greenhouse gas emissions and appropriate incentives, that would promote energy efficiency, conservation, alternative energy development, and improved technology to minimize the use of fossil fuels and reduce emissions of carbon dioxide and other greenhouse gases.

In addition to the actions listed above, we remind our members and the public to create other opportunities with the media, leaders in industry, politics, and others to discuss the plight of the ocean, its importance, and the need for action now.

IV. A GLIMMER OF HOPE

Much of the news about the oceans is disturbing: we are mired in the mix of insufficient or unused science, inadequate investment, and political as well as public apathy. While it may be hard to feel hopeful, it may not be too late to turn the tide—the ocean does have tremendous powers of recuperation. And let us remember that it was recognition of the importance of the oceans and the problems that prompted the combined six-year efforts of the Pew Oceans Commission and the U.S. Commission on Ocean Policy. Their efforts illuminated the need for and produced a blueprint for action, an inherently hopeful consequence.

Meanwhile, politics in the U.S. is increasingly polarized, and the nation is fundamentally distracted by global terrorism, war in Iraq, hurricane aftermath, and economic uncertainty. Because of these diverting priorities, our nation's leaders are largely inattentive to the messages of these ocean commissions, and currently lack the requisite motivation to convert them into a new national ocean policy.

The above notwithstanding, there is some activity. In response to the U.S. Commission on Ocean Policy's report, a cabinet-level Committee on Ocean Policy was established in late 2004 by Executive Order along with the release of a U.S. Ocean Action Plan.³³ Hampered by White House requirements that it represent a consensus among dozens of turf-conscious federal agencies and not contain new expenditures, the Plan lacks the bold, comprehensive, integrated vision so strongly promoted by the report that prompted it. It is not a national ocean policy, but more a list of discrete actions that perpetuate—rather than repudiate—the haphazard, ad hoc approach to oceans that is largely responsible for the state they are in today. Nonetheless, federal agencies are devoting more collective and coordinated attention to ocean issues, and it is likely the Ocean Action Plan will foster progress on a number of specific ocean and coastal issues. In addition, members of Congress have introduced several legislative proposals, a few focused on establishing a comprehensive national ocean policy and the rest addressing particular issues, some of which could strengthen management and protection and help the nation demonstrate international leadership on ocean issues.

To learn more about legislative initiatives, check these Web sites:

www.coreocean.org

www.noaa.gov

www.nsf.gov

www.jointoceancommission.org

<http://resourcescommittee.house.gov/>

www.house.gov/science/welcome.htm

www.commerce.senate.gov

www.oceanconservancy.org

www.nrdc.org (and click on Earth Action Center)

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Learn more about legislative initiatives -- check out these websites.

More hope comes from research and advances in technology. Scientists have shown that marine reserves are an effective tool for protecting critical habitats, increasing fish populations, and protecting and restoring marine ecosystems.⁴⁴ Aquaculture technologies are being improved to minimize environmental impacts, in the hopes of providing sustainable seafood. Commercial and recreational fishing communities are working with others to develop less harmful catch technologies. The cruise industry is improving wastewater treatment. The ocean science community is reaching consensus on research and ocean observation needs. Based on an international meeting in 2003, a broad coalition of major conservation organizations collaborated on an agenda to address the global oceans' decline.⁴⁵ And in the ocean education arena, while inadequate funding is still an overarching issue, U.S. educators are focusing significant attention on coordinating resources, disseminating information, and finding innovative means to engage students through the Internet, distance learning, and more.

Necessary, substantial, and still-prospective shifts in priorities and policies are required, and the world's leaders in politics, industry, philanthropy, conservation, science, and the media must make a commitment to change.

These are but glimmers. In the context of the grave situation delineated by scientists and confirmed by the U.S. ocean commissions, they are small steps. Necessary, substantial, and still-prospective shifts in priorities and policies are required, and the world's leaders in politics, industry, philanthropy, conservation, science, and the media must make a commitment to change.

We are at a critical time in the human relationship with the oceans, one that will determine the future of both the sea and humankind. The International SeaKeepers Society believes that as informed individuals and as leaders within the global community we can each be an agent of change for our imperiled, life-sustaining oceans.

ACKNOWLEDGEMENTS

This document is the product of many contributors, and has gone through several iterations. The idea sprang from a Board member's suggestion that we develop and publish a short list of action items to help us and others restore and protect our oceans.

Subsequently, our 2005 SeaKeeper Award recipient, Admiral James D. Watkins, USN (Ret.), spoke at the SeaKeepers' fundraising event in Monaco. Inspired by his call to action, some members asked for a specific agenda upon which they could act individually. From these inspirations, the project began to take shape.

We drew on the ideas of many people and institutions. In particular, we are indebted to Admiral Watkins, who chaired the just-completed U.S. Commission on Ocean Policy. The Consortium for Oceanographic Research and Education (CORE)—through the facilitation and input of its President, Admiral Richard West, USN (Ret.), his staff, and a few of CORE's member institutions—was most helpful.

This document's primary author was Dr. Ellen Prager, a noted oceanographer and writer, who also was a contractor for the U.S. Commission on Ocean Policy. Christophe A. G. Tulou, an ocean policy expert who served as executive director of the Pew Oceans Commission, provided significant revisions to enhance the scope, relevance, and potential impact of the recommendations. We are deeply grateful for their efforts and the broad knowledge they brought to this work.

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*John Englander
Ft. Lauderdale, Florida*

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THE SEAKEEPERS STORY

In 1998, a group of yacht owners and entrepreneurs sharing a genuine concern for the sea asked a simple yet revolutionary question: Could they create a fully automated ocean monitoring system to gather scientific-quality data from their yachts?

While oceanographic research ships have been collecting data for over 150 years, scientists are limited by the surprising scarcity of accurate, current data about ocean water quality. Oceans are critically important to the planet and its inhabitants due to the food, oxygen and economic livelihood they supply. The oceans are changing dramatically and these changes are having extraordinary impact on billions of people around the world.

Just as economists use models to predict global economic change, scientists are trying to model the oceans and atmosphere to better understand and predict the scope and consequences of changes in these realms. Research and faster computers offer the possibility of more accurate predictions, yet there is a lack of sufficient data to drive the models. With its powerful, flexible and cost-effective technology, SeaKeepers has already made a substantial contribution to the understanding of oceanographic and climatologic change.

Registered as a not-for-profit organization in the U.S. and in Monaco, The International SeaKeepers Society has more than 75 Founding Members, each of whom has contributed at least \$50,000 to finance the research and development of the SeaKeeper 1000™ (SK1000) monitoring system. Now patented, the system is in full production and has been deployed on approximately 50 platforms, including:

- Private yachts
- Cruise ships
- Transpacific freighters
- NOAA sea buoys
- Private submarines
- Remotely Operated Vehicles (ROVs)
- Coastal piers
- Lighthouses
- U.S. Coast Guard icebreaker
- Passenger /Car ferry in the Mediterranean

These diverse installations prove the utility and flexibility of this system. It is suitable for a private yacht, for a scientific facility, or for a pier-based coastal monitoring network. The heart of the SeaKeeper 1000 is a cabinet with slots for various suites of sensors. Seawater is continuously pumped through the sensors with samples typically taken every minute. The scientifically precise data is recorded on computer memory, and every three hours data is sent via satellite to the SeaKeepers Data Servers.

One of the system's most important attributes is that depending on the monitoring needs in a particular environment, new sensors can be added as technology becomes available. More than a half-dozen sensor manufacturers in various countries are designing and adapting ocean measurement devices to fit the SeaKeeper architecture. Standardization and modularity offers huge benefits in terms of diversity of data and cost efficiency compared to previous scientific instrumentation. The initial deployments are taking the following measurements:

Oceanography

- Salinity
- Dissolved oxygen
- Reduction-oxidation Potential
- pH
- Sea surface temperature
- Sample Depth

Meteorology

- Wind speed
- Wind direction
- Air temperature
- Relative humidity
- Barometric pressure

Date / Time / Location

The systems' weather measurements are immediately checked for integrity and entered into the U.S. and global weather-reporting network. Given that the vessels' and other platforms' locations are often the only weather-reporting stations in their vicinities, the weather data are quite valuable in forecasting. The technology has already provided significant information on specific hurricanes and other weather phenomena. The ocean database is now online and available to the scientific community.

The cost of each SK1000 is substantial. However, given that it performs seawater and weather analysis every minute of every day completely unattended, the cost per datum record is quite inexpensive. The systems require only minor maintenance and calibration a few times a year, and SK1000 systems have been working continuously now for six years without a failure.

Additional sensors under development include:

- Ocean color (CDOM)
- Water clarity (turbidity)
- Phytoplankton (chlorophyll)
- Blue-green algae
- Select metals (Cu, Cd, Fe, Mn, Pb, Zn)
- Arsenic and mercury
- Harmful algal blooms (HABs) – “red tide” plus others
- Carbon dioxide
- Nutrients
- Bacteria
- Radiation

SeaKeepers members are proud that the SeaKeeper 1000 is endorsed and used by organizations such as the National Oceanic and Atmospheric Administration (NOAA), the World Meteorological Organization (WMO), and the United Nations System's Intergovernmental Oceanographic Commission. The Society is considering working closely with various oceanographic institutions, governments, and entities such as the Global Ocean Observing System (GOOS) and the various Coastal Ocean Observing Systems to expand the deployment of its system and to ensure that the information gathered is used effectively.

The Society's members have contributed more than seven million dollars to fund this innovative ocean monitoring technology. With the success of the SeaKeeper 1000 firmly established, SeaKeepers is now addressing a broader ocean agenda—our goal is to ensure a healthy ocean for future generations. This publication, "11 Critical Ocean Issues," is an integral step toward that goal.

DRAFT LETTER TO POLITICAL LEADERS

The following letter is merely suggested language, and should be modified as appropriate for the political leader to whom it is sent. We encourage you to consider sending it to your senator, congressional representative, governors, and others. This document can be downloaded from the SeaKeepers website (www.seakeepers.org) in Word format to facilitate editing for your purposes. For those interested in doing so, separate letters on the individual critical issues would garner greater impact and results.

[Note: To find the name and address of your Congressional representatives go to www.house.gov or www.senate.gov]

Date

The Honorable _____

Dear

As a voting constituent and citizen, I am alarmed by the declining health of our oceans. In my lifetime there have been such drastic changes: more and more beaches are being closed due to pollution; fish are getting fewer in number and size; there are toxins in the seafood we eat; and coral reefs are dying. I keep reading in the press about red tide and other harmful algal blooms, marine debris entangling and killing sea life, and wetlands disappearing. It seems as if the ocean is deteriorating before our eyes.

The oceans must be recognized for the critical resource they are. The health of our seas must become a priority. As my political representative I urge you to act on this issue now, for the well-being of current and future generations.

I have read the recent report “11 Critical Ocean Issues: With Action Items for Concerned Citizens” published by the International SeaKeepers Society and strongly endorse its concerns and agenda (www.seakeepers.org).

I urge you to take a leadership role on the following issues: reduce coastal and ocean pollution, stop the decline of fisheries, strengthen our governance of and leadership for the seas, invest more in the oceans, prevent habitat loss, fight for better coordination of ocean and coastal management, use science to make smart decisions, enhance ocean education and outreach, reduce invasive species, and support polices to reduce global warming.

Sincerely,

THE INTERNATIONAL SEAKEEPERS SOCIETY

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Don & Rachelle Tomlin

Douglas & Linda Von Allmen

Jay & Janna Wade

Herb & Nicole Wertheim

John & Nancy Williams ^{ADM}

Frank Wlasek

Ambrous & Annie Young

^{ADM} Denotes Admirals' Club level of support.

We gratefully acknowledge the support of The Paul G. Allen Family Foundation.

REVIEWS

I have admired SeaKeepers early contribution of creating an automated ocean monitoring system and bringing private yachts aboard the marine environmental effort as gatherers of scientific data. With this new report, "11 Critical Ocean Issues with Action Items for Concerned Citizens", they have made another valuable contribution. This easy to read document fills the need for a broad perspective across many of the ocean crises, with specific things that one concerned person can pursue. This agenda will be valuable not only to their members, but to the public as well. Bravo!

Living up to their name, The International SeaKeepers Society provides here clear messages of concern and care, an action plan laced with hope for the future of the ocean — and for ourselves.

What we do in the next fifty years will determine whether we can live in harmony with our global environment. What we do in the next ten years will determine what is possible in the next fifty. I urge everyone to read this compelling summary of what we must do now to keep our oceans an abundant reservoir of life.

"11 Critical Ocean Issues With Action Items for Concerned Citizens", as its title exactly implies, is both a compendium of invaluable information about the perils facing our magnificent oceans, and an action-oriented manual with vital instructions explaining how each individual can make a significant difference toward securing the health of our treasured seas. It is the duty of all the world's citizens to protect the beauty and bounty of our oceans for the future. Safeguarding that legacy is our responsibility to prospective generations and this publication demonstrates exactly how that may be accomplished.

Two landmark national ocean commissions recently reported comprehensively on the threats to our oceans and made recommendations for action at all levels of government. But what can individual citizens do? This clear, concise booklet answers that question.

I commend the members of the International SeaKeepers Society for their continuing commitment to enhancing the understanding and conservation of the world's oceans, coasts and Great Lakes. Their guide for concerned citizens identifies numerous important actions that individuals can take to help move our nation toward a more comprehensive national ocean policy. The focus on cultivating informed and engaged citizens is essential to the development of a new stewardship ethic that more fully recognizes and appreciates the wealth of ecologic, economic and aesthetic benefits each of us derive from the oceans.

I applaud this report by SeaKeepers. Our ocean priorities are a very sad state of affairs. In particular, given the recent near total annihilation of federal funds for undersea research, I believe that it is imperative that the private sector step into the fray, both to move for a better national agenda, as well as in a more direct participatory role. Your call to action could not be more timely. While the situation is grave, you have presented a worthwhile plan that any concerned citizen can and should support.

The International SeaKeepers Society's "11 Critical Ocean Issues" highlights the importance of ocean science research and education to better understand the dynamics and functioning of our marine ecosystems. CORE supports this effort and looks forward to partnering with SeaKeepers to reverse the declining trends in ocean health and to secure greater investment in ocean research and education in order to protect our ocean legacy for future generations.

Jean-Michel Cousteau

President, Ocean Futures Society;
Environmentalist

Dr. Sylvia A. Earle

Marine Biologist;
Former NOAA chief scientist

Dr. Charles F. Kennel

Director,
Scripps Institution of Oceanography, UCSD

Honorable Leon E. Panetta

Chairman, Pew Oceans Commission;
Former U.S. Congressman &
White House Chief of Staff

Vice Admiral Roger T. Rufe, Jr., USCG (Ret.)

President and CEO,
The Ocean Conservancy

Admiral James D. Watkins, USN (Ret.)

Chairman, U.S. Commission on Ocean Policy;
President Emeritus, Consortium for
Oceanographic Research and Education

Honorable Lowell P. Weicker, Jr.

Former U.S. Senator and Governor of CT;
National Marine Sanctuary Foundation
Lifetime Achievement Award recipient

Rear Admiral Richard D. West, USN (Ret.)

President, Consortium for Oceanographic
Research and Education (CORE)

