

THE NATIONAL OCEAN SERVICE

2007 ANNUAL REPORT

*America's Oceans and Coasts:
Safe, Healthy, and Productive*

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MESSAGE FROM THE ASSISTANT ADMINISTRATOR

America's Oceans and Coasts: Safe, Healthy, and Productive...

This is what all of us in the National Ocean Service (NOS) strive toward as we carry out important programs to serve the NOAA mission. In 2007, NOAA and NOS were able to execute many dramatic and vital activities to carry us forward and set a strong direction for the future.

We laid a strong foundation for considering the future of coastal management in America through our partnership with the Coastal States Organization to envision the Nation's values in the coming decades. We worked with states, other federal agencies, and a wide array of stakeholders to identify and prioritize coastal issues as well as to develop innovative solutions to address existing and future coastal challenges. More than 400 people took part in this visioning process. We look forward to finalizing an Administration proposal that reflects the most salient and promising ideas that have been mined from this process. The American public deserves a coastline that is managed to the highest possible standard in a way that promotes hazard-resilient communities. We will only be successful in this attempt if we leverage the power and strength of our partners to get the job done.

We took significant steps in 2007 to develop an Integrated Ocean Observing System (IOOS) Program. Housed within NOS, the NOAA IOOS Program enhances our capabilities for

monitoring, detection, and warnings that can protect lives and property. NOS's efforts to improve the execution of IOOS are longstanding, and we recognize that partnering is essential to building a successful, coordinated network of people and technology working together to generate and disseminate data on our coastal waters, Great Lakes, and oceans.

In 2007, we pursued new governance partnership opportunities by strongly supporting state efforts at regional collaboration to manage coastal areas. The Gulf of Mexico Alliance continued its cooperative efforts to address five major challenges for the Gulf Coast states and added a component to its program to address coastal hazard resilience. We supported growing regional ocean governance efforts among the West Coast and New England states and provided support for consideration of a similar effort along the South Atlantic Coast.

Also during the year, we renewed our commitment to technology in support of sound coastal management by continuing to develop integrated solutions to address evolving economic, environmental, and social pressures on our oceans and coasts. Emerging technology allowed us to complete a lengthy process to readjust the National Spatial Reference System, which significantly improves the Nation's positioning infrastructure. Global Positioning System technology also allowed for the publication of hundreds of new elevation benchmarks and



was used to improve weather forecasts. Additionally, through scientific advancements, we developed harmful algal bloom (HAB) detection methods that have now been adopted by seven different countries worldwide to detect toxins produced by HAB-related events.

We also took the opportunity this year to celebrate 200 years of science, service, and stewardship as we recognized the founding of the Coast Survey by President Thomas Jefferson in 1807. The Coast Survey was the Nation's first federally funded scientific agency and today carries on its proud traditions as part of NOS and NOAA. As we closed our year-long celebration, we reflected on our heritage and accomplishments – how far we have come in safeguarding America's oceans and coasts – and considered the opportunities for serving the people of our country and the world in the coming years.

America continues to face a number of challenges. The coasts and oceans, as we know them, are changing around us. We need to consider our role in responding to climate change and determine how we can best prepare the Nation's coastal and ocean managers for the future. Our Great Lakes and river tributaries are the water gateways to our oceans. We must help the country by acting as a steward for our Nation's water quality, focusing on mitigating and providing solutions to ecosystem degradation and pollution. We will continue to lead other

federal agencies in better preparing our citizens for extreme and natural hazard events. And finally, America's marine transportation system must be able to evolve to meet the needs of the new century, contributing to safety and economic security.

Our heritage is strong and our future inspiring. We envision a nation with safe, healthy, and productive oceans and coasts. By protecting these special places and the communities that enjoy them, we will continue to change the world for the next generation.

*John H. Dunnigan
Assistant Administrator
National Ocean Service*



America's Oceans and Coasts...

...stretch along 95,000 miles of shoreline...

...include waters that cover 3.5 million square miles...

...welcome over 60 million beach visitors each year...

...are home to a vast array of marine life...

*...encompass a transportation system that
contributes more than \$740 billion to the
U.S. gross domestic product...*

...and more.



*The mission of the National Ocean Service is to keep ocean and coastal areas **SAFE, HEALTHY, and PRODUCTIVE**. In this annual report, we offer a glimpse of our accomplishments over the last year.*

*You will see how the National Ocean Service serves America by conserving **MARINE and COASTAL PLACES** for present and future generations, ensuring safe and efficient **MARITIME TRANSPORTATION**, and promoting innovative **SCIENCE and TECHNOLOGY** solutions to coastal challenges.*



STEWARDSHIP

Protecting Coastal and Marine Places

The coastal zone contains some of our Nation's most economically valuable, ecologically diverse, and sensitive natural resources. Although this area covers less than 20 percent of the U.S. land mass, almost half of the U.S. population lives along the coast and 60 million visitors flock to America's beaches each year. Amidst pressures of increasing population, recreation, and development, the challenge for the National Ocean Service (NOS) and its partners is to protect,

enhance, and restore these special areas to ensure their use and enjoyment for present and future generations.

From developing tools to enhance the resiliency of coastal communities to natural disasters, to conceiving new ways to manage the coastal zone and marine ecosystems, sustain ocean life, restore coastal areas, and remove marine debris, NOS remained on the front lines during 2007 to protect our Nation's coastal and marine places.



2007 HIGHLIGHTS

- After more than 30 years under the Coastal Zone Management Act, NOS is working with partners to **envision the future of coastal management**. In 2007, NOS engaged coastal managers and stakeholders to identify priority issues and innovative ideas to enhance our ability to manage and protect coastal areas.
- Throughout the year, NOS worked with partners to protect some of our Nation's most valuable national treasures—from marine sanctuaries and marine protected areas to ocean life such as whales and coral reefs. In June 2007, the **Papahānaumokuākea Marine National Monument celebrated its one-year anniversary**. Established by President George W. Bush in the Northwestern Hawaiian Islands, the Monument is the world's largest fully protected marine conservation area. NOS continues to work with the U.S. Fish and Wildlife Service and the State of Hawaii to manage this national treasure.
- Pollution of coastal waters degrades water quality, damages marine ecosystems, and limits people's enjoyment of these areas. Identifying the sources of such pollution is a first step toward mitigating pollution-related impacts. In 2007, NOS released a **comprehensive assessment of estuarine eutrophication**, or nutrient pollution. The report clearly indicates links between upstream activities and coastal ecosystem health, and shows that many U.S. estuaries are highly influenced by human activities.
- In protecting marine and coastal resources, NOS does not go it alone: From collaborating internationally to working with local communities, partnerships are fundamental to NOS's work. Throughout the past year, NOS provided **federal leadership for the increasingly successful Gulf of Mexico Alliance**, supporting it in addressing a range of coastal issues. NOS also worked with the states of Florida, Georgia, South Carolina, and North Carolina to establish a **South Atlantic Alliance** to address priority coastal issues.



Protecting Coastal Communities

Enhancing Community Resilience

Some of the biggest challenges facing coastal communities involve coastal hazards such as hurricanes, tsunamis, erosion, and harmful algal blooms. During 2007, NOS continued a series of Community Resilience Salons designed to encourage thoughtful discussion among experts from the private sector; federal, state, and local agencies; academia; and nongovernmental organizations. The salons focused on factors that contribute to community resilience to natural hazards and reduce the negative environmental, social, and economic impacts that these hazards can have on coastal communities. The first salon was co-hosted by the American Meteorological Society and held in cooperation with the Business Civic Leadership Center at the U.S. Chamber of Commerce in Washington, DC. The second salon was conducted in Providence, Rhode Island, to define hazard resilience issues

in the northeast United States. Co-hosted by the Association of State Floodplain Managers and the Rhode Island Emergency Management Agency, the event included representatives from local governments, coastal zone and emergency management agencies, planning commissions, insurance commissions, and neighborhood associations. The salons generated a wealth of ideas about factors that contribute to or impede resilience for communities and provided insight into how resilience might be measured. The ideas generated at the two events will guide future efforts to understand, assess, and enhance resilience and to build partnerships that capitalize on the strengths of each sector.

Mobile Bay Resilience Pilot Project Supports Sustainable Development

Recognizing that private-sector involvement is a key to community resilience, NOS is participating in a pilot project in the Mobile Bay, Alabama, region that brings together the public and private sectors. To support the project, NOS staff members assisted the Mobile Area Chamber of Commerce during an initial planning process and stakeholder meeting. The Chamber, together with more than 50 regional business and community leaders, is interested in including resilience as part of its long-term planning efforts.

The project will serve as a model for other regions looking to incorporate resilience into their long-term plans. The approach involves extensive data collection, including hazard, environmental, economic, and quality-of-life factors that are merged with remote-sensing databases and software analyses to understand the impacts of future growth scenarios. Several NOAA offices are participating in the ongoing project, including the Gulf of Mexico Regional Team, Mobile Weather Forecasting Office, NOAA navigation interests, Weeks Bay National Estuarine Research Reserve, the proposed Shelby Response Center, and others.

Accurate Heights Enhance Coastal Applications in Louisiana

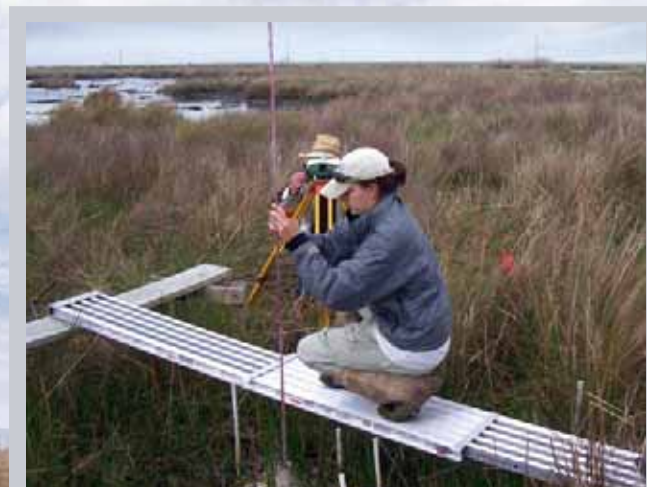
NOS, in cooperation with the University of New Orleans and the U.S. Geological Survey, measured coastal wetland elevations in southeastern Louisiana in March 2007. The project promoted the integration of ecosystem observations through Height

Modernization techniques that increase the accuracy of elevation measurements. The project also provided baseline data to help researchers differentiate between the many potential causes of relative sea-level change in coastal areas, including land subsidence (sinking), land accretion (growth) due to water-borne sediment deposits, erosion, and local sea-level rise. Height Modernization is a program within NOS that provides accurate height information by integrating Global Positioning System technology with existing survey techniques.

Managing the Coastal Zone

Future of Coastal Zone Management Envisioned

In 2007, NOS teamed up with the Coastal States Organization to envision the future of coastal management as part of the Coastal Zone Management Act reauthorization process. The partners gathered input from stakeholders about what is and is not working in coastal management and what



Surveyors use Global Positioning System technology to collect data in Louisiana's Big Branch National Wildlife Refuge.



improvements are needed. In May and June 2007, stakeholder meetings were held in Boston, Atlanta, Chicago, Honolulu, and San Francisco, followed by meetings with federal partners and Congressional staff. More than 400 people participated in the meetings, including representatives from federal and state partners, nongovernmental organizations, industry, academia, and the general public. Overall, participant responses were positive and enthusiastic, expressing interest in everything from public access to the federal consistency process and pollution to urban development.

Measuring Coastal Zone Management Performance

NOS, in cooperation with state Coastal Zone Management (CZM) programs, completed the first year of analyzing data collected for the Coastal Zone Management Act Performance Measurement System. The System tracks national indicators of the effectiveness of Coastal Management Programs and National Estuarine Research Reserves in achieving CZM and strategic objectives. The System is a suite of indicators that provide information on environmental and socioeconomic factors influencing program actions and performance measures to assess how well states are achieving objectives.

In 2007, NOS made improvements in data consistency, data collection methods, and efficient reporting. With a year of experience under its belt, NOS is poised to use the System to set future priorities, evaluate progress, and communicate successful strategies related to CZM.

A new *CZM Program Strategic Plan* linking performance measures with strategic and measurable goals was released in 2007. Strategic planning also provides focus for streamlining the Performance Measurement System to a core set of measures that relate to national program goals.

Funding Coastal and Estuarine Land Conservation Projects

NOS held its first competitive funding cycle for the Coastal and Estuarine Land Conservation Program (CELCP) in 2007, with funding awarded to 17 projects. The projects were selected from NOAA's competitively ranked list of projects considered ready and eligible for funding in fiscal year 2007. CELCP was created in 2002 to protect coastal and estuarine lands considered important for their conservation, recreation, ecologic, historic, or aesthetic values. The program provides state and local governments with matching funds to purchase significant coastal and estuarine lands or conservation easements on such lands from willing sellers. Lands and conservation easements acquired with CELCP funds are protected in perpetuity so the lands may be enjoyed by future generations.



NOS Assistant Administrator John H. Dunnigan, United Nations Development Programme Assistant Resident Representative (China) Kishan Khoday, and Chinese State Oceanic Administration Assistant Administrator Chen Lianzeng launch the establishment of the Marine Biodiversity and Ecosystems Management Training and Education Center in Xiamen, China. The Center will be a focal point for U.S.-China cooperation in biodiversity conservation and coastal and marine ecosystem science exchange.

New Training Center Opens in China

In October 2006, NOS, China's State Oceanographic Administration, and the United Nations Development Programme (UNDP) established a new Marine Biodiversity and Ecosystems Management Training and Education Center in Xiamen, China. Through this new Center, NOAA provides technical assistance to China by developing training curricula in marine protected area management, helping design marine monitoring programs, and assisting with the application of best practices in reducing land-based sources of pollution to the marine environment. The Xiamen Center is a key element in a recently launched UNDP-co-sponsored eight-year project on "Biodiversity Management in the Coastal Area of China's South Sea," and also supports an emerging initiative in watershed management for the Xiamen Bay-Jiulong River Basin. In May 2007, a NOAA team provided training at the Center to 60 Chinese scientists.

Furthering Regional Ocean Governance in the South Atlantic

Florida, Georgia, South Carolina, and North Carolina share a rich array of ocean and coastal resources that provide economic, environmental, and social benefits to each state. However, these resources face significant and growing stress. Recognizing the similarity of issues and habitats in coastal areas and the fact that resources are not confined by state boundaries, the states approached NOS to provide guidance and assistance for the possible development of a South Atlantic Alliance (Alliance) to address coastal management issues.

Throughout 2007, NOS provided leadership and advice to the nascent Alliance, from initial discussions and development under the umbrella of an existing U.S. Department of Defense-State partnership organization called the Southeast Regional Partnership for Planning and Sustainability (SERPPAS) through concept approval and endorsement by SERPPAS. The SERPPAS principals include director-level state officials and senior Department of Defense leadership. NOAA was invited to become a member of SERPPAS in early 2007.

NOS is continuing its efforts to assist the states in defining a structure for the Alliance and identifying region-wide priorities. Currently, four initial regional priorities have been proposed by the states. These priorities include working waterfronts, healthy ecosystems, clean coastal and ocean waters, and disaster-resilient communities. The states have drafted a framework document to address these topics. During 2008, public workshops will help to further define priorities, identify actions, and develop an Action Plan. Continued NOAA advice, assistance, and leadership will be crucial to helping maintain momentum in implementing the Alliance.

Strengthening the Gulf of Mexico Alliance

Throughout 2007, NOS provided federal leadership for the Gulf of Mexico (GOMEX) Alliance. Alabama, Florida, Louisiana, Mississippi, and Texas initiated the GOMEX Alliance in 2004 with a goal of increasing regional collaboration to enhance the environmental and economic health of the Gulf of Mexico. In 2006, the Alliance released the *Governors' Action Plan for Healthy and Resilient Coasts*, a statement of action endorsed and signed by all five Gulf State Governors and the Chairman of the U.S. Council on Environmental Quality. NOAA played a key

role in developing the *Plan*, which identified five priority issues for the region that can be effectively addressed through increased collaboration at the local, state, and federal levels. These issues include water quality for healthy beaches and shellfish beds, wetland and coastal conservation and restoration, environmental education, identification and characterization of Gulf habitats, and reduction of nutrient inputs to coastal ecosystems. The Alliance also coordinates closely with the Gulf of Mexico States Accord to facilitate eventual collaboration with the six Mexican Gulf of Mexico states. NOAA co-chairs the Gulf of Mexico Regional Partnership Federal Workgroup together with the U.S. Environmental Protection Agency; 11 other federal agencies participate in the Workgroup.

Managing Marine Ecosystems

Scientists Evaluate Hawaiian Marine Protected Areas

An NOS report entitled *Fish Habitat Utilization Patterns and Evaluation of the Efficacy of Marine Protected Areas (MPAs) in Hawaii* is the first comprehensive evaluation of the state's MPAs. To prepare the report, scientists examined 11 Marine Life Conservation Districts established by the State of Hawaii over the last 40 years. Three key findings presented in the report are: (1) areas with full protection from fishing had higher fish biomass, larger overall fish size, and higher biodiversity than adjacent areas of similar habitat quality; (2) habitat complexity, protected area size, and habitat diversity were the major factors in determining the effectiveness of an MPA; and (3) all districts were too small to provide any measurable positive influence on adjacent areas where fishing occurred. The methods and results



On March 2, 2007 in Honolulu, First Lady Laura Bush announced Papahānaumokuākea Marine National Monument as the new name of the world's largest fully protected marine conservation area in the Northwestern Hawaiian Islands. The name comes from a Hawaiian tradition concerning the genealogy and formation of the Hawaiian Islands.

of the study, which NOS conducted with funding from NOAA's Coral Reef Conservation Program and in partnership with a number of agencies and organizations, can be applied to other regions that are designing, managing, and evaluating MPAs.

West Coast Pilot Project on Marine Protected Areas

The Marine Protected Areas (MPA) Center, together with other federal agencies and tribes, launched a pilot project with California, Oregon, and Washington to design and manage a regional system of MPAs on the West Coast. Last year, the partners met to share their understanding of place-based management in the region and began to identify activities to enhance MPA planning and management. During 2007, the MPA Center worked with other NOS offices to conduct an ecological characterization of the region. Additional analyses of human uses, ocean governance, and cultural resources are under way.

Marine Reserves Established in Channel Islands National Marine Sanctuary

In 2007, NOS established the federal portion of the marine reserves and conservation area network within the Channel Islands National Marine Sanctuary. As the largest network of marine reserves in federal waters in the continental United States, it will help maintain natural biological communities, habitats, and ecological processes.

Papahānaumokuākea Marine National Monument Celebrates First Anniversary

In 2006, President George W. Bush created the world's largest fully protected marine conservation area in the Northwestern Hawaiian Islands to protect the area's pristine islands, coral reefs, unique native species, and cultural and historic resources. In the year since the designation of the Papahānaumokuākea Marine National Monument, significant steps have been taken to implement the President's action, including interagency cooperative agreements, education and outreach efforts, and research. In August 2006, the co-trustee agencies, including NOAA, the U.S. Department of the Interior's Fish and Wildlife Service (FWS), and the State of Hawaii, published joint regulations to implement the President's proclamation and ensure resource protection. In April 2007, the United States submitted proposals to the International Maritime Organization that, if implemented, will help reduce threats to the Monument posed by international shipping.

In addition, the State of Hawaii, with the support of NOAA and the FWS, submitted an application nominating the Monument

to be considered for the U.S. World Heritage Tentative List. The World Heritage List is an international list of globally significant properties recognized as outstanding examples of cultural and natural heritage important to the history of humankind maintained by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). The National Park Service, which oversees the U.S. World Heritage Program in cooperation with the U.S. Department of State, accepted the nomination of the Papahānaumokuākea Marine National Monument for the List. Later, the U.S. National Commission for UNESCO recommended not only that the Monument be included on the List, but also ranked the Monument as one of two sites to be put forward to the UNESCO World Heritage Committee for inclusion at the first eligible opportunity.

Addressing Marine Ecosystem Issues in the Seas of East Asia

In December 2006, NOS Assistant Administrator John H. Dunnigan and Dr. Chua Thia Eng, Regional Programme Director of the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), signed a letter of cooperation to promote and facilitate sustainable development of marine and coastal resources and governance of the large marine ecosystems of the Seas of East Asia. The partnership between PEMSEA and NOAA is a cross-NOAA initiative, with participation from NOAA International Affairs, NOS, the National Marine Fisheries Service, the Office of Oceanic and Atmospheric Research, and the Office of General Counsel. Under the agreement, NOAA and PEMSEA will work with countries in the region to develop National Programs of Action to address land-based sources of marine pollution; develop integrated watershed and coastal management programs linking fresh water to oceans; develop a regional Sea Grant network; develop ecosystem approaches to management relative to the effects of climate change on living marine resources; and share scientific, technical, and programmatic information on regional activities.

Sanctuary Status Reports Highlight Complex Conditions

Sanctuary Condition Reports, which examine the status of everything from water quality to endangered whale populations, were released by NOS in 2007. The reports provide a wealth of information about the complex marine resources and archaeological treasures found in sanctuary waters. The reports will help set the stage for management plan reviews at each sanctuary site, and help sanctuary staff identify monitoring and research priorities for day-to-day management needs and potential threats. Sanctuaries reporting in 2007 were Stellwagen Bank in Massachusetts and Fagatele Bay on the island of Tutuila, American Samoa.

Protecting Ocean Life

New Regulations for Gray's Reef National Marine Sanctuary Protect Marine Life

Several new regulations for the Gray's Reef National Marine Sanctuary were established in 2007 to provide greater protection for the Sanctuary's valuable marine resources and live-bottom reef habitat. The regulatory changes prohibit anchoring in the Sanctuary and allow fishing only by rod-and-reel, hand line, and spearfishing gear without powerheads. NOS developed these management strategies through the sound application of science to marine policy and worked with partners at the regional and local levels to promote conservation principles. The regulations were developed in collaboration with the South Atlantic Fishery Management Council, the National Marine Fisheries Service, and the State of Georgia.

Entangled Humpback Whale Rescued in Hawaiian Waters

In February 2007, federal and state officials teamed up with local volunteers to free a humpback whale located off the north side of the island of Lanai, Hawaii, from a life-threatening entanglement. Staff from the National Marine Fisheries Service, the Hawaiian Islands Humpback Whale National Marine Sanctuary, the Hawaii Department of Land and Natural Resources, and the community-based Whale Disentanglement Network freed the whale by unraveling lines that were dragging 25 feet from its mouth. This was the first successful whale disentanglement that used a small VHF radio-tracking buoy. The buoy was attached to the whale, allowing rescuers to track it until it was safe to attempt the rescue effort. This effort continues a string of successful disentanglements conducted in Hawaii in the past few years.



A team of "whale rescuers" attempts to disentangle a humpback whale that has become ensnared by fishing nets and other marine debris. National Marine Sanctuary Program personnel conduct operations like this in Stellwagen Bank and Hawaiian Islands Humpback Whale national marine sanctuaries.

Dolphin SMART Program Recognizes First Participant

The Florida Keys National Marine Sanctuary and its partners welcomed the first charter operator under a new program designed to protect wild dolphins. Key West's Dolphin Safari Charters officially joined the Dolphin SMART Program in April 2007 after meeting standards that promote responsible viewing of wild dolphins. The acronym "SMART" is a reminder of the basic principles of dolphin-viewing: *Stay* at least 50 yards away from dolphins; *Move* away slowly if they show signs of disturbance; *Always* put your vessel engine in neutral when dolphins are nearby; *Refrain* from feeding, touching, or swimming with wild dolphins; and *Teach* others to be Dolphin SMART. Staff from NOS worked with the National Marine Fisheries Service, the Whale and Dolphin Conservation Society, and the Dolphin Ecology Project to establish the program, which is funded by NOAA Fisheries and the "Protect Wild Dolphins" Florida license-plate program run by the Harbor Branch Oceanographic Institution.

Sea Grasses Declining at an Accelerated Rate

Sea grasses appear to be declining at an ever-accelerating rate, according to two-thirds of the studies done by NOS scientists and sea-grass experts from around the world. Sea grass is an important organism in the marine environment, providing a major source of oxygen in the water and serving as habitat for juvenile fishes. Ongoing research will further examine regional trends to evaluate the correlation between sea-grass changes and environmental and human stressors. The project will use the largest data set ever compiled on the global distribution and abundance of sea grasses, providing information to resource managers and the public.

Conserving and Preserving Coral Reefs

Report on Coral Reef Marine Protected Areas

In March 2007, NOS and the NOAA Coral Reef Conservation Program released the *Report on the Status of Marine Protected Areas (MPAs) in Coral Ecosystems of the United States, Volume 1: MPAs Managed by U.S. States, Territories, and Commonwealths*. The report examines the management status of 207 MPAs located across seven jurisdictions, identifies major challenges to effective MPA management, and makes recommendations to improve MPA success.

NOAA Releases First Agency-wide Coral Reef Ecosystem Research Plan

In 2007, NOAA's Coral Reef Conservation Program released the first agency-wide coral reef ecosystem research plan. The document, entitled *NOAA's Coral Reef Ecosystem Research Plan for Fiscal Years 2007 to 2011*, is designed to help NOAA and its partners set research priorities through fiscal year 2011. The *Plan* provides an up-to-date scientific assessment of the threats facing coral reefs, summarizes management and other issues that will drive research at the regional level, and identifies specific research needed to advance management action. The *Plan* covers all coral reef ecosystems under the jurisdiction of the United States and the Pacific Freely Associated States.

Administration Proposes Reauthorization of Coral Reef Conservation Act

In May 2007, the U.S. Department of Commerce transmitted to Congress an Administration proposal, the *Coral Reef Ecosystem Conservation Amendments Act of 2007*, which would strengthen the protection and restoration of U.S. coral reefs by providing expanded authorities to the U.S. Secretary of Commerce and the U.S. Secretary of the Interior. The proposed legislation, which would reauthorize the Coral Reef Conservation Act of 2000, directed NOAA's Coral Reef Conservation Program to address emerging issues such as coral bleaching, disease, and climate change. The proposal also provided the authority to seek compensation from those responsible for physical damage to coral reefs from such causes as vessel groundings, anchors, towlines, and lost cargo. The proposal mandated that recovered damages would be used to fund coral reef restoration. Both chambers of the 110th Congress introduced legislation to reauthorize the Coral Reef Conservation Act; reauthorization bills were pending in both the House and Senate as fiscal year 2007 ended.

'Secrets of the Gulf' Expedition Explores Unknown Reefs

In March 2007, NOS and partners undertook a ground-breaking expedition in the Flower Garden Banks National Marine Sanctuary, located in the Gulf of Mexico about 100 miles off the coast of Galveston, Texas. The U.S. Navy's nuclear-powered research submarine, NR-1, and its surface support vessel, the SSV *Carolyn Chouest*, carried Sanctuary researchers to explore the deep-water, low-relief ridges and scarps connecting the various banks along the continental shelf in the northwestern Gulf of Mexico, including two of the three banks comprising the Sanctuary. The objective of the expedition was to observe and document plants and animals using the "hidden highways" between the banks to determine how the Sanctuary may be

affected by events occurring outside its boundaries. In the shallower waters of the Sanctuary, researchers investigated connections on the coral reef cap, including manta ray movements, conch populations, and parrot fish predation of corals. A private organization called Immersion Presents aired portions of the mission in classrooms and informal settings, bringing the secrets of the marine environment to approximately 33,000 students in grades K-12.



Coral reefs are unique and complex systems. From mapping and monitoring to managing reef resources and removing harmful debris, NOAA's Coral Reef Conservation Program supports effective management and sound science to preserve, sustain, and restore these valuable ecosystems.

Detecting and Mitigating Pollution

Report Released on Nutrient Pollution Levels in U.S. Estuaries

On July 31, 2007, NOS released the report, *The Effects of Nutrient Enrichment in the Nation's Estuaries: A Decade of Change, National Estuarine Eutrophication Assessment Update*. The report contains the Nation's most comprehensive assessment of nutrient pollution (eutrophication) in U.S. estuaries to date. The report, which updated the 1999 *National Estuarine Eutrophication Assessment*, shows that two-thirds of the 99 U.S. estuaries assessed were moderately to highly impacted by eutrophication, thus linking upstream activities and the health of coastal ecosystems. NOAA scientists and their partners at the University of Maryland Center for Environmental Science found that overall, eutrophic conditions did not show significant differences between the early 1990s and early 2000s. Eutrophication is caused by excess nutrients in the water, which can result in increased blooms of algae, decreased dissolved oxygen, and loss of sea grasses. The end result of eutrophication is often loss of critical marine life habitat.

Scientists Predict Largest Gulf of Mexico

'Dead Zone' on Record

In July 2007, a team of scientists from NOAA, the Louisiana Universities Marine Consortium, and Louisiana State University released their forecast of the "Dead Zone" off the Louisiana and Texas coasts. Based on data from the U.S. Geological Survey and models developed by NOAA and its partners, the summer 2007 Dead Zone was predicted to encompass 8,500 square miles, an area about the size of New Jersey. This was significantly larger than the average area since 1990, and the largest area since measurements began in 1985. The forecast is based on nitrate loads provided by the U.S. Geological Survey from the Mississippi and Atchafalaya Rivers in May and incorporates the previous year's conditions. The model is an example of an innovative environmental service, officially referred to as "ecological forecasting," which NOAA scientists believe will become an important tool in coming years for both decision makers and the public. Actual observations at the end of July showed that the Dead Zone was the third largest on record since annual measurements began in 1985. The observed area, 7,900 square miles, was seven percent lower than the 8,500 square miles predicted by the forecast model.

In the Dead Zone, seasonal oxygen levels drop too low to support most life in bottom and near-bottom waters. The low-oxygen phenomenon is caused by increased nutrients, such as nitrogen and phosphorus, which flow into the Gulf of Mexico from the Mississippi and Atchafalaya Rivers and stimulate excessive algal growth. The excess algae consume oxygen faster than it can be replenished. The actual size of the Dead Zone is affected by factors such as the number and intensity of hurricanes and tropical storms.

Coastal Nonpoint Pollution Control Programs Approved for New York and Guam

NOS, in partnership with the U.S. Environmental Protection Agency, approved Coastal Nonpoint Pollution Control Programs for New York and Guam in 2007. Congress established the Program in 1990 to improve coordination between state coastal zone managers and water-quality experts to reduce polluted runoff in the coastal zone. Coastal states must develop programs, backed by enforceable authorities, to implement a suite of management measures that will control runoff from six main sources, including forestry, wetlands and riparian areas, agriculture, urban areas, marinas, and hydromodification (alterations to shorelines and stream channels). Nineteen of 34 coastal states and territories now have fully approved Coastal Nonpoint Pollution Control Programs.



During the 2007 NOAA Restoration Day event, NOAA employees conducted a range of activities to help restore the Jug Bay Component of the Chesapeake Bay National Estuarine Research Reserve in Maryland. For example, along the Mt. Calvert shore of Jug Bay, volunteers identified 12 species of fish during seining, which involves using a net to encircle fish.

Restoring Coastal Areas

NOAA Restoration Day Helps Save the Chesapeake Bay

In 2002, a small but enthusiastic group of NOS staff began to grow underwater bay grasses in a tank provided by the Chesapeake Bay Foundation. Bay grass provides important food and habitat for fish, shellfish, and waterfowl and helps keep the water clean. This tiny 2002 planting effort eventually grew into NOAA Restoration Day, one of the largest voluntary employee-sponsored events in the Chesapeake Bay watershed. On June 12, 2007, hundreds of NOAA employees and partners participated in the fourth annual event, held in Maryland at the Jug Bay component of the Chesapeake Bay National Estuarine Research Reserve and in Virginia at the Virginia Commonwealth University Rice Center in Charles City. Volunteers planted underwater grasses grown in 22 tanks in NOAA offices, transplanted wild rice, performed fish seining and sampling, mapped and removed invasive plants, and completed digital elevation mapping.

Settlement Agreement Approved for Wetland Restoration in Delaware

In 2007, a major milestone for wetland restoration in Delaware was reached when the consent decree for the Dupont Newport Superfund Site Natural Resource Damages was approved and became effective. NOAA's Damage Assessment, Remediation, and Restoration Program (DARRP) and co-trustees reached a cooperative agreement with chemical companies DuPont and Ciba to resolve natural resource claims following the release of hazardous substances from the DuPont Newport Superfund Site, which contaminated wetlands in and around the Christina River ecosystem. The settlement, valued at \$1.6 million, will provide for an environmental easement, restoration projects by the trustees, and the trustees' damage assessment costs. In addition, an environmental covenant sets aside 56 acres of private land located in the Delaware Estuary for restoration projects identified in the trustees' Damage Assessment and Restoration Plan. DARRP is a NOAA program comprised of offices from NOS, the National Marine Fisheries Service, and NOAA's Office of General Counsel for Natural Resources.

NOAA Responds to Louisiana Oil Well Blowout

In January 2007, NOS supported the U.S. Coast Guard's response to an oil spill in the Bayou Perot, Lake Salvador area of southern Louisiana, approximately 20 miles south-southwest of New Orleans. The NOAA Scientific Support Coordinator conducted aerial overflights and identified oil and gas jetting 40 to 60 feet into the air. First responders determined that the source was a wellhead that had been hit by a passing vessel. Based on the extent of the slick and duration of the release, an estimated 68,000 gallons of crude oil co-produced with natural gas spilled into the brackish bayou. NOAA's Scientific Support Team identified gross shoreline oiling and coordinated spill cleanup and assessment (SCAT) surveys. SCAT surveys were concentrated on Lake Salvador and northwest Bayou Perot, where the most significant oiling was observed. The NOAA team also dispatched Natural Resource Damage Assessment experts to document potential impacts to wildlife and aquatic biota. NOAA is working with federal and state trustees to decide whether a natural resource restoration plan will be developed under the Federal Oil Pollution Act and state laws.

Tackling Marine Debris

Reporting to Congress on Marine Debris

In 2007, the Interagency Marine Debris Coordinating Committee provided Congress with a report identifying the sources of marine debris; discussing the ecological and economic impact of



Marine debris is an ongoing problem worldwide. With the increased use of synthetic materials like plastic, marine ecosystems have suffered from the impacts of marine debris. The NOAA Marine Debris Program supports a national effort to prevent, identify, remove, and reduce marine debris and to protect and conserve our Nation's natural resources and coastal waterways from the impacts of marine debris.

marine debris; describing alternatives for reducing, mitigating, preventing, and controlling the harmful effects of marine debris; and offering recommendations to reduce marine debris both domestically and internationally. NOAA serves as co-chair of the Committee, an interagency group responsible for developing and recommending comprehensive, multidisciplinary approaches to reduce the sources and impacts of marine debris on the marine environment, natural resources, public safety, and the economy. The Committee also established three *ad-hoc* working groups to define marine debris, examine international issues, and develop educational messages.

Hawaii's Mokupapapa Discovery Center Highlights Marine Debris

The Mokupapapa Discovery Center in Hilo, Hawaii, which provides information about the remote Northwestern Hawaiian Islands chain and its coral reef ecosystem, added marine debris to one of its exhibits in 2007. The exhibit, funded by the NOAA Marine Debris Program, explains where marine debris comes from, why it is a problem, and how people can help reduce it. A poignant part of the display reveals the contents of an albatross's stomach—nearly a pound of plastic material. It is estimated that more than one million birds and 100,000 marine mammals die each year by ingesting and/or becoming entangled in marine debris.

Gulf of Mexico Marine Debris Team Establishes Outreach Partnership

The 2005 hurricane season inflicted severe damage on the Gulf of Mexico coastal region and deposited huge amounts of debris over large areas of the Gulf Coast. Submerged marine debris poses a hazard to vessel traffic and can adversely affect viable commercial fishing grounds. In 2007, the Gulf of Mexico Marine Debris Project team partnered with Louisiana Sea Grant and the Mississippi-Alabama Sea Grant Consortium to develop and employ outreach materials and strategies to share with constituents in Louisiana, Mississippi, and Alabama. The goal of the project is to increase coastal citizens' awareness of the information generated from post-hurricane marine debris survey work in the Gulf. Highlights of the collaboration include a public service announcement, posters and brochures to promote debris maps available on the project Web site, and foreign-language translations to reach non-English-speaking members of local fishing and shrimping communities.



The NOAA Marine Debris Program provided expertise to the State Kahoolawe Island Reserve Commission in removing marine debris from Kanapou Beach on the uninhabited island of Kahoolawe, Hawaii. Kanapou Beach is an area in the main Hawaiian Islands where plastics and other debris accumulate.

Expanding Ocean Literacy

NOAA Opens Visitor Centers in Florida and Virginia

In January 2007, NOS and partners opened the Florida Keys Eco-Discovery Center in Key West, Florida. The Center offers both visitors and residents the opportunity to learn about South Florida's natural and historic resources and how these resources can be enjoyed and protected. Located in NOAA's Dr. Nancy Foster Florida Keys Environmental Complex, the Center's interactive exhibits illustrate the resources and management efforts of the Florida Keys National Marine Sanctuary, two national parks, and four national wildlife refuges.

In March 2007, NOAA and The Mariners' Museum opened the USS *Monitor* Center in Newport News, Virginia. Visitors to the Center learn about the USS *Monitor*, a revolutionary ironclad battleship, which fought one of the most important naval battles of the Civil War off the Virginia coast. The Center is the fruition of a successful 30-year public-private partnership between NOAA, The Mariners' Museum, the U.S. Navy, the Northrop Grumman Newport News shipyard, and others.

Partnering with Walt Disney to Keep Oceans Clean

NOAA and The Walt Disney Company, together with the Ad Council, the National Marine Sanctuary Foundation, and the advocacy group Environmental Defense, entered into a partnership to "Promote Marine Debris Awareness and Young Stewards of the Ocean" through the re-release of *The Little Mermaid*. The partnership includes radio and TV public service announcements, a Web site, and a video game. The video game is a fun educational tool for children and adults focusing on marine debris. The Web site discusses how citizens can help keep the oceans clean, provides links to online ocean awareness games, and offers parents and teachers access to other educational resources. ■



PARTNERING FOR SUCCESS

The National Ocean Service (NOS) recognizes the critical value of partnerships to NOAA's success as an agency and works closely with non-profit organizations, state and local governments, academic institutions, and industry and trade organizations to achieve agency goals. A few of these partnerships are highlighted below.

Regional Partners

NOS partners with regional groups such as the Gulf of Mexico Alliance and the Coastal States Organization (CSO) to address coastal management issues. NOAA and the U.S. Environmental Protection Agency lead a group of 13 federal agencies committed to supporting the five states of the Gulf of Mexico Alliance and coordinating an integrated federal response to the environmental and economic health needs of the Gulf. NOS and CSO, which represents the interests of governors from 35 coastal states and territories, worked together to gather stakeholder input about the future of the Coastal Zone Management Act.

Partners for Enhanced Ocean Literacy

Non-profit partnerships, such as that between NOS and the National Marine Sanctuary Foundation, often promote public understanding of ocean literacy and coastal issues. In 2007, the Foundation provided key fundraising support, raising \$1.9 million for the new Florida Keys Eco-Discovery Center, located at NOAA's Dr. Nancy Foster Florida Keys Environmental Complex in Key West. The Foundation also hosted the seventh annual Capitol Hill Ocean Week, an event that brings together prominent ocean advocates, constituents, and policy makers to discuss ocean issues.

To ensure the most comprehensive reach of information related to marine debris, NOS has partnered with the private and public sectors. NOAA worked with The Walt Disney Company, the Ad Council, the National Marine Sanctuary Foundation, and Environmental Defense to promote marine debris awareness through the 2007 re-release of *The Little Mermaid*. On the issue of marine debris, NOAA also partners with the Ocean Conservancy and serves on the advisory group for the American Chemistry Council Plastics Division Marine Debris Workshop.

NOS works closely with the National Science Teachers Association to provide science educators with high-quality professional development experiences and cutting-edge science. This partnership enhances classroom-based science, technology, and engineering education through the application of NOAA science and data in curricula and teacher professional development.

Technology Partners

NOS leverages private-sector expertise through partnerships to develop innovative new technologies. For example, in 2007, NOS partnered with Shark Marine Technologies to develop and test an underwater camera system to improve mapping and monitoring objectives.

To ensure the availability of accurate, consistent, and timely spatial referencing data, NOS works with a wide range of partners at the international, regional, state, and local levels. NOS also works with more than 200 partners to support a network of Continuously Operating Reference Stations and supports state and local efforts to provide accurate height information and training to help protect coastal communities.

Throughout this report, you will see several examples where NOS and partners worked together to ensure the health, safety, and productivity of our Nation's oceans and coasts. ■



TACKLING COASTAL ISSUES THROUGH A REGIONAL APPROACH

Our Nation's coastal resources and ecosystems stretch along 95,000 miles of shoreline and cover 3.5 million square miles of coastal ocean. From the icy waters off the coast of Alaska to the wetlands of coastal Louisiana, these areas are diverse, unique places that transcend state and provincial boundaries.

The National Ocean Service (NOS) works to build and improve the scientific and technological foundation needed to protect and manage our Nation's coastal and marine places. However, because these places are geographically unique, to fully address problems facing these areas also requires approaches tailored to specific regions. A regional approach to ocean and coastal resource management requires thinking and acting across an area defined by natural features rather than jurisdictional boundaries, and thus requires strong partnerships at the federal, state, and local levels.

Regional collaboration allows NOS to tackle regional issues and address distinct priorities using a broader range of experience, knowledge, and skills than the organization could deliver alone. Together, NOS and partners can blend national and regional capabilities, improve services, increase the value and productivity of partnerships, and improve the value and effectiveness of NOAA's products and services.

Across the country, regional activities are underway, providing opportunities for local, state, and federal agencies to coordinate ocean and coastal management. NOS actively supports all of these regional partnerships.

Chesapeake Bay Program

The Chesapeake Bay Program, created by the Chesapeake Bay Agreement of 1983, includes members of federal, state, local, and academic organizations working to restore the Bay's living resources through river-specific plans to reduce the nutrients and sediment that flow into the Chesapeake Bay.

Gulf of Maine Council

The Gulf of Maine Council on the Marine Environment is a partnership of government and non-governmental organizations from the United States and Canada. In 2007, the Council released a plan of action to maintain and enhance environmental quality in the Gulf of Maine and allow sustainable resource use by existing and future generations.



Gulf of Mexico Alliance

Formed in 2004, the Gulf of Mexico Alliance, a partnership led by the Governors of Alabama, Florida, Louisiana, Mississippi, and Texas, is applying a regional approach to address issues such as water quality, conservation and restoration, environmental education, Gulf habitat identification and characterization, and nutrient input reduction to coastal ecosystems. The Alliance has had considerable success implementing their regional *Governors' Action Plan*.

Northeast Regional Ocean Council

The Northeast Regional Ocean Council (NROC), established by the New England Governors and Eastern Canadian Premiers, is linking regional ocean management and science institutions and programs for the Gulf of Maine, Long Island Sound, and southeastern New England. NROC is addressing topics such as ocean energy resource planning and management, ocean and coastal ecosystem health, maritime security, and coastal hazard response and resiliency.

South Atlantic Alliance

Florida, Georgia, South Carolina, and North Carolina share an extraordinarily rich array of ocean and coastal resources that provide enormous economic, environmental, and social benefits to each state. To address growing stress on these resources, the states approached NOS to provide guidance and assistance for the development of a South Atlantic Alliance. The Alliance would address priorities including working waterfronts, healthy ecosystems, clean coastal and ocean waters, and disaster-resilient communities. The current timeline calls for the Alliance to be implemented by November 2008.

West Coast Governor's Agreement on Ocean Health

In September 2006, the Governors of Washington, Oregon, and California announced the West Coast Governor's Agreement on Ocean Health to address ecosystem-level ocean and coastal protection and management issues. These issues include water quality; ocean and coastal habitats; offshore development; ocean literacy; ocean and coastal science, research, and monitoring; and sustainable economic development in coastal communities.

Throughout this report, you will see several examples where NOS and partners worked together to meet the geographically specific needs of coastal communities. ■





MARITIME TRANSPORTATION

As a nation, we have always depended heavily on our waterways to transport goods, services, and people. Since 1807, when President Thomas Jefferson ordered a survey of our young Nation's coast, NOAA and its predecessor agencies have supported the Nation's commerce with information for safe, efficient, and environmentally sound marine transportation.

Today, the U.S. marine transportation system conveys 95 percent of U.S. foreign trade by volume, moves two billion tons of freight, transports more than 130 million ferry passengers and five million cruise passengers, contributes over \$700 billion to the U.S. gross domestic product, and provides more than 13



million jobs. Marine transportation affects virtually everyone and works on the national, regional, and local levels.

In 2007, the National Ocean Service (NOS) continued to support the Nation's commerce with information for marine transportation. NOS delivered accurate and up-to-date

nautical charts, tide and current observations, and other coastal and ocean information to make sea travel safer and more efficient. The organization's products and services helped to reduce the risk of marine accidents and oil spills, enhance search-and-rescue operations, and provide other capabilities to protect the Nation's coasts.

2007 HIGHLIGHTS

- Throughout the year, NOS provided ocean observations, such as data on water levels and currents, to help mariners time their approaches to and exits from ports; to develop tidal predictions, monitor sea-level trends, and conduct oceanographic and climate research; and to play a role in bridge, breakwater, and deep-water channel construction. NOS installed a Physical Oceanographic Real-Time System (PORTS®) in Mobile, Alabama. A component of the Mobile Bay PORTS® was the 200th station within the National Water Level Observation Network (NWLON). Also in 2007, NWLON technology was upgraded around the country to provide real-time information.
- Navigation needs to be safe for both mariners and the life they encounter while at sea. NOS worked with the U.S. Coast Guard and International Maritime Organization to shift ship traffic lanes in Boston Harbor to reduce the risk of collisions between large ships and whales. As of July 1, 2007, ships transiting in and out of Boston Harbor travel a different path through the Stellwagen Bank National Marine Sanctuary to avoid waters where whales concentrate.
- From broad-scale projects to activities focused on specific geographic regions, NOS continued to deliver nautical charts, accurate maps of the shoreline, and other information required for safe and efficient maritime commerce in and out of the Nation's ports. In 2007, NOS completed analyses to update nautical charts around the coast of Alaska, charted waters around the Columbia Glacier ice sheet off the Alaskan coast, and equipped 45 sites in Prince William Sound with Doppler current profilers to help update tidal current predictions.
- During 2007, NOS and other NOAA offices participated in field activities to restore coral reefs in Hawaii and Puerto Rico severely injured by two vessel groundings. At the two sites, NOS reattached over 12,000 corals and coral fragments to reefs. In Hawaii, NOAA and partners also removed or re-cemented an estimated 45,000 tons of dislodged coral rock.



Charting Our Way

Updating Alaska's Nautical Charts

In 2007, NOS completed an analysis of the charted features off the coast of Alaska, leading to an official baseline in accordance with international law. The baseline marks the definitive position and limits of the U.S. territorial sea off the Alaskan coast. These data are of extreme importance for the application of fishing and maritime laws. As a result of this four-year project, NOS will update the newly established maritime zones on approximately 200 nautical charts of Alaska.

Waters of Receding Glacier Charted

In May 2007, NOS completed the northward extension of Alaska Chart 16713, *Naked Island to Columbia Bay*, to show new major revisions to the Columbia Glacier ice field. The glacier has been receding at a rapid rate, leaving miles of uncharted waters in its wake. These new chart revisions benefit the cruise-ship industry, which transports tourists to view the glacier. Cruise-ship tourism is the fastest-growing sector in the tourism industry.

Playing a Key Role in Unusual Channel Dredging Project

In April 2007, NOS verified that deeper depths dredged in a channel leading to an oil transfer terminal in South Portland, Maine, were correctly surveyed and charted, to allow deeper-draft tankers safe transit into port. To accommodate deeper-



NOAA Ship Rainier conducting hydrographic surveys in Alaska. The collected data are used to update nautical charts.

draft tanker vessels to its facility, the Portland Pipe Line Corporation (PPLC) acquired a U.S. Army Corps of Engineers (USACE) permit to dredge the existing 45-foot-deep federally authorized channel leading to its terminal by an additional three feet. Because it is unusual for a private corporation to dredge a federally maintained channel, coordination between PPLC, NOAA, USACE, and the U.S. Coast Guard (USCG) was essential to ensure that chart and survey standards were met and that questions regarding liability and future maintenance were addressed to the satisfaction of the USCG Captain of the Port. NOAA examined and combined three separate hydrographic surveys into one cohesive product and applied the data to the applicable nautical chart (Chart 13292) for immediate publication. The greater depths reflected in NOS's revised chart allowed the Captain of the Port to authorize harbor traffic to operate at the deeper depth.

Observing Our Oceans

National Water Level Observation Network Upgraded to Real-time Status

NOS completed a three-year effort to upgrade the technology of its National Water Level Observation Network (NWLON). NWLON stations provide mariners, first responders, and the public with real-time tide and water-level information. A major benefit of the upgrade is that network stations normally equipped to transmit water-level and other environmental data at hourly increments via NOAA Geostationary Operational Environmental Satellites now transmit data every six minutes, enabling users to access data much faster. Real-time data from the NWLON are critical for supporting safe and efficient navigation, tsunami and storm-surge warnings, and hazmat emergency response efforts.

In addition, the data support marine boundaries, habitat restoration, long-term sea-level trends, and other important applications.

Two-hundredth National Water Level Observation Network Station Installed in Alabama

As part of NOAA's 200th anniversary celebration in 2007, NOAA representatives joined other federal, state, and local officials in Mobile, Alabama, to mark the installation of the agency's 200th National Water Level Observation Network (NWLON) station at the Port of Alabama State Docks. Operated by NOS, the NWLON station provides mariners, first responders, and



During a ribbon-cutting ceremony, NOAA representatives and state and local officials celebrated the installation of the 200th National Water Level Observation Network station on Pier A at the Port of Alabama State Docks. The State Docks station is a component of the Mobile Bay NOAA Physical Oceanographic Real-Time System (PORTS®), which was also installed during 2007.

the public with real-time tide and water-level information. The State Docks station is a key component of NOAA's Mobile Bay Physical Oceanographic Real-Time System (PORTS®), also installed in 2007. The Mobile PORTS® consists of three water-level stations, two current meters, three meteorological packages, and a salinity sensor. PORTS® provides pilots, shippers, and agents with real-time information to facilitate vessel safety, reduce transit delays, and optimize cargo carriage.

The Port of Mobile is ranked as the 11th largest in the Nation based on the tonnage that moves through the port. Ships entering the port have a long transit up a very narrow channel, and the Gulf Intracoastal Canal crosses the shipping channel at a right angle. PORTS® will thus be a valuable tool for the region's maritime community.

PORTS® Provides Economic Benefits to Houston-Galveston

An economic benefits study prepared by the Houston Galveston Navigation Safety Advisory Committee estimated that the Physical Oceanographic Real-Time System (PORTS®) brought \$14 million in direct annual benefits to the Houston-Galveston area economy and helped to achieve a 50-percent reduction in vessel groundings. Knowledge of currents, water levels, winds, and water density provided by PORTS® allows mariners to use every inch of dredged channel depth, increasing the amount of cargo that can safely move through a port and harbor. U.S. Secretary of Commerce Carlos M. Gutierrez announced the study at the 25th World



This "air gap" sensor installed at the Desmond Bridge in California, measures the clearance between the water surface and the lowest part of the bridge, thus assisting large ships in determining bridge clearance.

Ports Conference in Houston in May 2007, stating, "Trade is a key part of America's economy, boosting jobs, expanding consumer choices, and helping keep inflation in check, and the Port of Houston is a major gateway for U.S. trade. The Federal Government can facilitate that trade by providing the key mapping information that our seaborne trade needs to navigate our ports."

Tidal Current Surveys Conducted in Alaska and New Hampshire

NOS conducted three major tidal current surveys in 2007. The collected data will help update tidal current predictions and other applications that are published each year in the *U.S. Tidal Current Tables*.

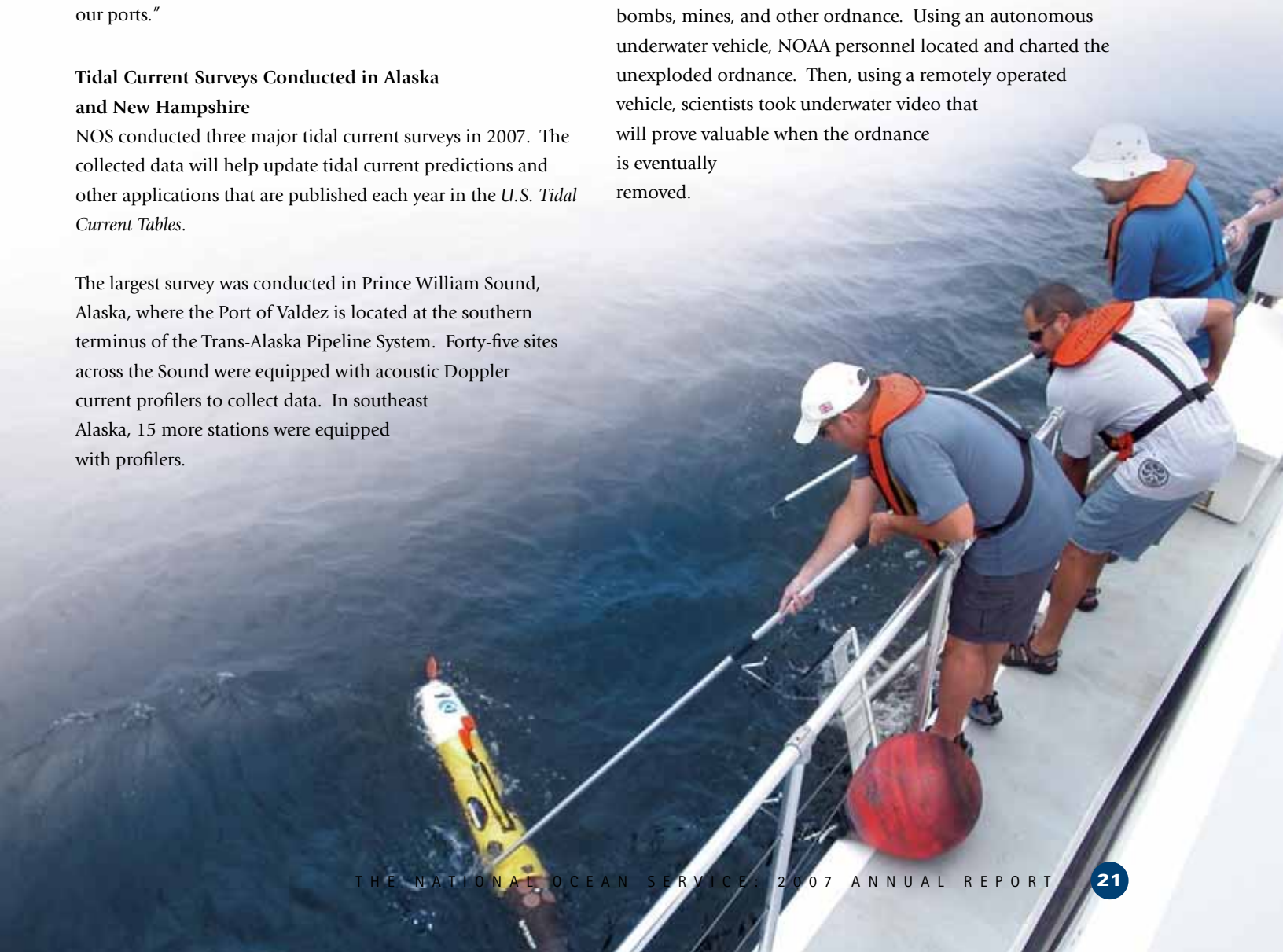
The largest survey was conducted in Prince William Sound, Alaska, where the Port of Valdez is located at the southern terminus of the Trans-Alaska Pipeline System. Forty-five sites across the Sound were equipped with acoustic Doppler current profilers to collect data. In southeast Alaska, 15 more stations were equipped with profilers.

In New Hampshire, surveys were conducted at 11 stations, extending from the mouth of the Piscataqua River to Furber Strait, which is the entrance to Great Bay and the site of a NOAA National Estuarine Research Reserve. The survey, conducted in partnership with the University of New Hampshire, gave students hands-on training in current measurement technology. The busy region is home to numerous commercial facilities, the oldest active Navy shipyard, U.S. Coast Guard cutters, and commercial fishing. It will also be the home port for NOAA's new SWATH (coastal mapping) vessel, to be launched in the summer of 2008.

Protecting Mariners... and the Environment

New Technology Identifies Ordnance Around Vieques Island, Puerto Rico

NOS participated in a project to map and detect underwater objects to help locate and clean up unexploded ordnance in Puerto Rico's Vieques National Fish and Wildlife Refuge. The U.S. military used the area for target training for more than 60 years and left behind an unknown number of unexploded bombs, mines, and other ordnance. Using an autonomous underwater vehicle, NOAA personnel located and charted the unexploded ordnance. Then, using a remotely operated vehicle, scientists took underwater video that will prove valuable when the ordnance is eventually removed.





The resulting data were imported into a geographic information system that will be used to guide planning and technology choices for future underwater surveys. This ongoing activity supports the cleanup and restoration of more than 14,000 acres of wildlife habitat and identifies objects that pose potential hazards to navigation, which is important since the area and surrounding bays are frequented by pleasure boaters.

As part of cleanup and restoration efforts, in 2007, staff from NOS also conducted a comprehensive sampling effort around Vieques Island. With the support of personnel from the U.S. Navy, U.S. Environmental Protection Agency, and U.S. Fish and Wildlife Service, NOAA staff collected sediment, coral tissues, and water quality data, as well as information on the health of the coral reefs and biological communities associated with them. The information provides a baseline assessment of the overall condition of the coral reef ecosystem, which will be useful in the Navy's ongoing contaminant and munitions cleanup efforts and for the future protection and restoration of NOAA trust resources on and around the island.

Enhancing Navigation Safety in the Gulf of Honduras

NOS supported several international partners who, under the auspices of the MesoAmerican Caribbean Sea Hydrographic Commission, cooperated in 2007 to address some of the major environmental problems and issues that are leading to the degradation of marine and coastal ecosystems in the Gulf of Honduras, home to the second-largest barrier reef system on Earth. NOS designed a project to enhance maritime navigation safety in the region's key ports and primary navigation lanes, with the goal of reducing marine environmental pollution and enhancing public safety through improved navigational products (e.g., updated nautical charts) and services (e.g., development of regional capacity to conduct hydrographic surveys). NOS and the Commission are establishing a coastal/oceanographic geographic information system database for oil and chemical spill prevention and contingency planning in the Gulf. The system may help prevent damage associated with both operational and accidental discharges at sea, and may improve area authorities' abilities to respond to accidental spills.

Boston Shipping Lanes Shifted to Reduce Collisions between Ships and Whales

Years of effort by NOAA and the U.S. Coast Guard paid off when, for the first time in the United States, ship traffic lanes were shifted to reduce the risk of collisions between large ships and whales. As of July 1, 2007, ships transiting in and out of Boston Harbor traveled a different path through the Stellwagen Bank National Marine Sanctuary to avoid waters where whales—in particular, the highly endangered North Atlantic right whale—tend to concentrate. NOAA scientists did an extensive study of ship traffic and whale behavior to devise this measure, which provides a much safer environment for both the ships and the whales while being the least disruptive to the economy. The International Maritime Organization, a specialized agency of the United Nations that addresses issues pertaining to international shipping traffic, approved the proposed lane revision in December 2006. Approximately 3,500 ships transit within the Sanctuary every year.

Sustaining Healthy Waterways

Emergency Coral Restoration Conducted in Puerto Rico and Hawaii

During 2007, NOS and other NOAA offices participated in field activities to restore coral reefs that were severely injured by two vessel groundings in 2006. In one incident, the oil tanker M/T *Margara* grounded along the south coast of Puerto Rico. The Responsible Party performed emergency restoration work under the oversight of NOAA and the Commonwealth of Puerto Rico's Department of Natural and Environmental Resources. The work included the reattachment of 9,500 soft corals, hard corals, and coral fragments, about ten percent of which were fragments of Staghorn coral (*Acropora cervicornis*), which is listed as threatened under the Endangered Species Act.

The second grounding incident involved the bulk carrier M/V *Cape Flattery*, which grounded in coral reef habitat off Barbers Point (Kalaeloa), Oahu. Efforts to free the ship and prevent an oil spill caused widespread injury to the reef and its inhabitants, resulting in the largest natural resource damage assessment case

conducted in Hawaii to date. The Responsible Parties, NOAA, and other natural resource trustees finished two phases of emergency restoration in 2007, during which 2,800 corals and coral fragments were reattached to the reef. NOAA and partners also removed or re-cemented an estimated 45,000 tons of dislodged coral rock so it would neither wash away nor crush or bury the surviving reef organisms.

NOAA Trains Panama Canal Personnel in HazMat Spill Response

In January 2007, the Panama Canal Authority funded three emergency response specialists from NOS to travel to Panama and train personnel to respond to incidents involving spills of oil or other hazardous materials. Twelve participants received instruction in the Incident Command System, environmental countermeasures, shoreline cleanup assessment and response, cleanup endpoints, the Environmental Sensitivity Index, chemical tools, and oil spill tools. The trainees' final exercise was to complete a shoreline cleanup assessment on the beach, with no assistance. The NOAA team also led four helicopter flights, showing the trainees how to conduct ocean science; review the shoreline; and identify infrastructure, habitats, and living organisms from the air.

Online Tool for Hazardous Materials Responders Launched

In 2007, NOS released a new online tool for first responders to hazardous chemical accidents. The new Web site, called CAMEO Chemicals (<http://cameochemicals.noaa.gov/>), is the latest component of NOAA's popular CAMEO (Computer-Aided Management of Emergency Operations) software suite and is the first such tool available for online use. For 20 years, CAMEO has provided first responders with up-to-date, comprehensive

information on chemical plumes, toxicity risks, and the susceptibility of chemical mixtures to burn or explode.

Celebrating Our History

From Sea to Shining Sea Exhibit

On June 21, 2007, World Hydrography Day, NOS and the Smithsonian Institution launched the exhibit, "From Sea to Shining Sea: 200 Years of Charting America's Coasts." The exhibit included 20 posters celebrating the history, accomplishments, and scientific contributions of the Nation's first federally funded science agency, the Survey of the Coast, which was established by President Thomas Jefferson in 1807. Across the United States, 200 venues were selected to host the exhibit, including maritime heritage museums, ports, nature centers, schools, libraries, lighthouses, and NOAA facilities. The exhibit educated the public on the history and importance of hydrography—the scientific measurement and mapping of Earth's water bodies.



Two boys learn about the roots of U.S. federal science by viewing the "Sea to Shining Sea" poster exhibit. The posters highlighted the history of the U.S. Coast and Geodetic Survey in three parts, including people, expeditions, and science and technology.





The NOAA 200th Anniversary Web site commemorates the establishment of NOAA's first components in 1807. The site is organized around the past, present, and future time periods, with content that highlights the science, service, and stewardship activities of all facets of NOAA and its predecessor agencies.

Web Site Honors 200 Years of Science, Service, and Stewardship

The NOAA 200th Anniversary Web site (<http://celebrating200years.noaa.gov>), developed by NOS with contributions from all NOAA offices, captured the depth and breadth of NOAA's science, service, and stewardship. The site features articles written for a non-technical audience, covering all of NOAA's missions. The "Top Tens" section showcases individuals, events, and projects that preceded the modern agency, while online collections allow visitors to experience NOAA's ongoing evolution. Other features, including a "For Fun" section, an interactive timeline, and educational materials help increase understanding and appreciation of NOAA's contributions to the Nation.

Educating Future Mariners

Online Sea-floor Mapping Tool Reaches Young Environmental Stewards

In August 2007, NOS launched an animated, interactive online tool that invites elementary-age children to explore sea-floor mapping and learn how NOAA charts millions of nautical miles around the U.S. coasts. With a "sea-floor detective" on call, kids embark on an online voyage that begins with the first U.S. sea-floor mapping survey in 1834 and advances to today's modern sonar survey tools. Multibeam and side-scan sonar are shown measuring the depth of the sea floor and creating images with maps and 3-D models. A lesson on hydrographic surveys puts NOAA ships on display. Children can also generate and map their own sea floor and study sunken treasure. The offering can be accessed through the NOS Web site (<http://oceanservice.noaa.gov/>).

New Ocean Currents Tutorial Launched Online

NOS launched a new online tutorial called "Currents," which includes a list of online data resources and lesson plans on ocean currents. The tutorial identifies the major factors that cause coastal and open ocean currents. Two lesson plans ("Motion in the Ocean" and "Ready, Set, Drift!") focus on the physical features of ocean currents and on navigation. The tutorial can be accessed through the NOS Web site (<http://oceanservice.noaa.gov/>). ■



A CELEBRATION 200 YEARS IN THE MAKING

In 2007, the National Ocean Service (NOS) was at the center of NOAA's year-long celebration of 200 years of science, service, and stewardship to the Nation. Programs at the core of NOS's mission are historically tied to the foundations of our Nation and the beginnings of science within the Federal Government.

In 1807, President Thomas Jefferson founded the Survey of the Coast to provide nautical charts to the maritime community for safe passage into American ports and along our extensive coastline. In 1870, the U.S. Weather Bureau was established and one year later, the U.S. Commission of Fish and Fisheries was founded. Individually, these organizations were America's first physical science agency, America's first agency dedicated to the atmospheric sciences, and America's first conservation agency. In 1970, these agencies were brought together with the establishment of NOAA.

The cultures of scientific accuracy and precision, service to protect life and property, and environmental stewardship of these original organizations prevail in the NOAA of today.

Reaching Out with Our Story

In honor of this heritage and the evolving and important work of all NOS and NOAA offices, throughout the year, NOS led many efforts to celebrate our innovative and dedicated people, programs, and services. To commemorate this bicentennial milestone, NOAA developed informational materials including pamphlets, brochures, and posters focusing on the theme of "200 Years of Science, Service, and Stewardship to the Nation;" built a Web site exploring the past, present, and future of NOAA; created informational exhibits; hosted educational events to reach out to teachers and students; and held events to honor the 200-year legacy of NOAA, its predecessor agencies, and partnerships with organizations across the country.

Over the year, the NOAA 200th Celebration outreach effort directly touched more than 300,000 Americans and the 200th Celebration Web site received over 11 million hits—honoring our heritage, looking to the future, and educating Americans about the important work conducted by NOAA.

Linking to History...Touching Lives Today

NOAA is proud of our ties to America's scientific and historical foundations. The men and women who went before us helped create the first federal scientific agency in the United States and built a powerhouse of new technology and innovation to help engineer the growth of the Nation. We are equally proud of the mission being fulfilled today by NOS and NOAA. The work we do touches the lives of Americans every day, helps stimulate our economy, protects people and property, and provides sound science to help our Nation's leaders make key policy decisions.

We are proud of our connection to our Nation's history and the vital role we play in America today as we carry on the legacy set in motion by Thomas Jefferson in 1807.

To learn more about the 200-year history of NOAA and its predecessor agencies, visit <http://celebrating200years.noaa.gov/>. ■



AN INTEGRATED APPROACH TO MONITORING THE COASTAL OCEAN ENVIRONMENT

Changes in the ocean can have significant impacts on our society, from sea-level rise and coastal flooding to harmful algal blooms and dead zones. NOAA relies on a variety of observations from tide gauges, ocean buoys, satellites, and shipboard and other observing systems to monitor environmental changes and describe the condition of our oceans, coasts, and Great Lakes.

Because many observing systems were developed independently to serve a singular purpose, potential incompatibilities can arise when attempting to use data from multiple systems together to address ocean and coastal management problems. A coordinated effort is required to ensure data are available at the formats, rates, and scales required by a broad range of users to support research and inform decision making. The vision for this effort is the Integrated Ocean Observing System, or "IOOS."

IOOS Components

Two interdependent components constitute IOOS: (1) global ocean component and (2) national coastal component. IOOS is the U.S. contribution to the Global Ocean Observing System, or "GOOS." GOOS is a global system for ocean observations designed to improve weather forecasts and climate predictions. The national coastal component of IOOS includes U.S. observations, products, and services provided by 17 federal agencies to monitor and manage the Great Lakes and entire U.S. coastal ocean environment. The IOOS coastal component also includes a network of 11 non-federal Regional Associations of Regional Coastal Ocean Observing Systems that expand observing coverage to provide data of particular interest to local communities.

NOAA IOOS Program

NOAA has participated in the development of the U.S. IOOS since its beginnings in the late 1990s. In February 2007, Conrad C. Lautenbacher, Vice Admiral, U.S. Navy (Ret.), Under Secretary of Commerce for Oceans and Atmosphere and Administrator of NOAA, established a new program within the National Ocean Service to serve as the overall coordinator of NOAA's IOOS activities and to provide a consistent management function. The Program's mission is to "lead the integration of ocean, coastal, and Great Lakes observing capabilities, in collaboration with federal and non-federal partners, to maximize access to data and generation of information products; inform decision making; and promote economic, environmental, and social benefits to our Nation and the world."



In 2007...

In support of its mission, the NOAA IOOS Program initiated development of a Data Integration Framework (DIF) to improve management and delivery of an initial subset of ocean observations. The DIF will establish the technical infrastructure, standards, and protocols needed to improve delivery of five of 20 "IOOS core oceanographic variables" defined in the *First U.S. IOOS Development Plan*, including temperature, salinity, sea level, surface currents, and ocean color. Integration efforts will focus on using these variables to improve NOAA's efforts to model and forecast harmful algal blooms, coastal flooding and hurricane intensity and to develop integrated ecosystem assessments. Ultimately, the intent is to extend this capability to include other data, products, and services.

NOAA also worked closely with interagency partners to develop a variety of plans, agreements, and processes designed to advance the U.S. IOOS. NOAA collaborated with the National Office for Integrated and Sustained Ocean Observations (Ocean.US) to implement the national Data Management and Communications (DMAC) Standards process. DMAC is the process by which submitted IOOS-related data standards are evaluated and recommended for use across multiple agencies and organizations. NOAA also coordinated with the U.S. Army Corps of Engineers to publish a plan that documents national requirements for the measurement of near-shore ocean waves.

The NOAA IOOS Program published the first version of the *National High Frequency Radar Plan* and funded development of a national data server to deliver valuable high frequency radar data collected by regional partners to users around the country. High Frequency radar systems collect near real-time surface current data needed to support a range of applications including search and rescue, oil spill response, and assessments of beach water quality.

Learn more about IOOS at <http://ioos.noaa.gov/>. ■



SCIENCE AND TECHNOLOGY

The development and application of scientific tools, understanding, and technology allows the National Ocean Service (NOS) to keep our oceans and coasts safe, healthy, and productive.

Ecological research, monitoring, and assessments help NOS scientists to better understand and apply knowledge of the causes and consequences of environmental change. NOS research and applications in geodesy, the science of measuring and monitoring the size and shape of the Earth and the location of points on its surface,



form the basis of the national geodetic data system used for navigation, communication systems, and mapping and charting. Hydrographic surveys measure the depth and bottom configuration of water bodies, to produce the Nation's nautical charts and ensure safe navigation along the U.S.

coastline. Social science research allows NOS to better understand the "human dimension" of coastal management. Science and technology form the cornerstone of everything NOS does.

Throughout 2007, NOS continued to seek and apply innovative ways to understand, protect, and manage ocean and coastal environments.

2007 HIGHLIGHTS

- Harmful algal blooms (HABs) occur when algae produce toxic or harmful effects on people, fish, shellfish, marine mammals, and birds. HAB outbreaks can be ecologically, socially, and economically detrimental. To combat these events, in 2007, NOS confirmed the presence of HABs or their toxins in the tissues of stranded marine mammals and developed an accurate and inexpensive kit to detect and measure HAB toxins. Also during the year, seven countries adopted methods developed by NOS to detect toxins produced by HABs.
- The Global Positioning System (GPS) has revolutionized surveying, providing latitude, longitude, and height information in a way which is less expensive and more accurate than traditional surveying methods. In 2007, NOS used GPS technology to complete a two-year project to readjust the National Spatial Reference System, significantly improving the Nation's fundamental positioning infrastructure; to publish new elevations for more than 340 benchmarks in areas of southern Louisiana; and even to improve weather forecasts. NOS was also ranked number one in GPS data accuracy among International Global Navigation Satellite System Service agencies.
- In January 2007, NOS installed the 1,001st Continuously Operating Reference Station (CORS). The station ushers in a new generation of CORS by becoming the first to provide precise global positioning data in real time from both the U.S.-based Global Positioning System and the Russian-based Global Navigation Satellite System.
- To improve storm planning, prediction, and recovery in the Pacific Northwest, NOS developed a suite of products in 2007, including an online decision-support tool, ecological assessments, an atmospheric profiler, a digital elevation model, and a precipitation atlas for Oregon and Washington coastal communities. Together, these tools will benefit communities and emergency managers by equipping them to better prepare for and mitigate the effects of coastal hazards.



Delivering Online Tools

Online Watershed Databases Updated

During the year, NOS released significant updates to several online watershed databases, including ones for Hudson River, New York, and Portland Harbor, Maine. The Hudson River database includes sediment chemistry, fish-tissue chemistry, and the results of toxicity tests from multiple years of monitoring the river, which is heavily contaminated with polychlorinated biphenyls (PCBs). The database contains more than one million sediment chemistry records and more than 600,000 records of tissue chemistry. NOS also posted a major update of the Portland Harbor/Willamette River watershed database. The update includes more than 100 new sediment samples and almost 200 new tissue samples; the database now contains more than half a million sediment chemistry records. The data are an integral part of Watershed Database and Mapping Projects for both rivers. The two databases, and more than 15 others, support ongoing efforts to assess risk and injury to NOAA trust resources.

Delivering Real-time Data to Help Shellfish Growers

Shellfish growers in the Pacific Northwest can get near real-time water quality data from the System-wide Monitoring Program operating at National Estuarine Research Reserves in Alaska, Washington, and Oregon. Through a Web site jointly sponsored by NOS and the Northwest Association of Networked Ocean Observing Systems (NANOOS), growers can view up-to-date water temperature, salinity, oxygen, turbidity, pH, and chlorophyll data from reserves in Kachemak Bay, Alaska; South Slough, Oregon; and Padilla Bay, Washington. Data are also available from four buoys operated by the University of Washington in Hood Canal, a long arm of Puget Sound west of the main basin. The project received funding support from NOS, the National Estuarine Research Reserve Association, and NANOOS. The Pacific Coast Shellfish Growers Association and the Pacific Shellfish Institute provided technical assistance. Water quality and weather data are transmitted every 30 minutes via satellite from monitoring stations at all 27 National Estuarine Research Reserves, providing information to the growing Integrated Ocean Observing System (IOOS).

NANOOS is one of 11 Regional Coastal Ocean Observing Systems (RCOOSs) included within IOOS. IOOS, a coordinated network of people and technology working to generate and deliver continuous data on coastal waters, the Great Lakes, and oceans, includes both federal and regional contributions. RCOOSs contribute to and benefit from the Federal IOOS contributions of NOAA and 16 other participating agencies by providing ocean data and products to user groups within each of the respective regions.

Understanding and Detecting Harmful Algal Blooms

Monitoring Kits Provide Reliable Toxin Test

NOS worked with a private industry partner to develop an accurate and inexpensive monitoring kit to detect and measure toxic domoic acid from harmful algal blooms (HABs). The test kits use a method called ELISA, for “enzyme-linked immunosorbent assay,” which detects toxin levels in less than 1.5 hours in whole-water samples and in shellfish, providing managers with real-time data. The U.S. Department of Commerce assigned its co-right to Mercury Science, Inc. of Durham, North Carolina, which will perfect, manufacture, and market the kit. The University of California at Santa Cruz, California State Department of Health, Quinault Nation, and Quileute Tribe are already using the kit to monitor domoic acid along the U.S. West Coast. Domoic acid causes gastrointestinal and neurological illness in people, marine mammals, and birds; in some cases, it can be fatal. HABs can also cause severe economic losses to coastal communities.



An NOS scientist deploying an underwater optics package during a harmful algal bloom research cruise in the Gulf of Mexico.

Understanding the Impacts of Harmful Algal Blooms on Marine Species

NOS scientists confirmed the presence of harmful algal blooms (HABs) or their toxins in the tissues of stranded marine mammals or in seawater samples in many coastal states. Blooms in 2007 included several along the southeast coast of the United States from North Carolina to Florida, across the Gulf of Mexico from Florida to Texas, and on the West Coast in California. Affected species included dolphins, pygmy sperm whales, large whales and other cetaceans, sea lions, porpoises, birds, and fish. The collected data increase researchers’ understanding of how toxins that accumulate in a certain species can lead to an unusual mortality event (UME), how the toxins move through the food web, and when and where UMEs may occur. The two algae species associated with events in 2007 were *Karenia brevis*, a dinoflagellate, and *Pseudo-nitzschia*, a diatom.

Seven Nations Adopt NOS Methods to Detect Harmful Algal Bloom Toxins

Six countries in Africa and one in the Persian Gulf adopted methods developed by NOS to detect toxins produced by harmful algal blooms (HABs). Kenya, Tanzania, Tunisia, Angola, Namibia, and South Africa are using a receptor assay for paralytic shellfish poisoning to test shellfish as safe for domestic or export sale. In addition, Angola is using the sampling program in the Congo River delta to improve management response to significant and unexplained marine mammal mortality associated with blooms in the region. In the Persian Gulf, NOS and the Environmental Research and Wildlife Development Agency of the United Arab Emirates (UAE) initiated a program to sample phytoplankton (e.g., algae), which forms the beginning of the marine food web. UAE scientists take weekly samples at several estuarine, near-shore, and offshore sites where unexplained fish die-offs and HABs have occurred.

Bridging Coastal Science and Social Science

Bringing Social Science Skills to Coastal Resource Decision Making

The need to incorporate societal considerations into the decision-making process is the primary reason that NOS led a multi-organizational effort to bring social science information to coastal resource managers. The interagency Web portal, HumanDimensions.gov (<http://www.HD.gov>), guides users to social science resources that address specific needs. The site includes answers to management questions, social science case studies, access to publications, and more. To produce the portal,

NOS received content from federal and state agencies, tribal nations, nongovernmental organizations, academic institutions, private industry, and international agencies and organizations. These groups are also the primary audience for the site.

NOS Launches *Digital Coast: Legislative Atlas* Web Site Launched

NOS collaborated with national and local partners to develop the *Digital Coast: Legislative Atlas*, a Web-based mapping and database search tool that helps coastal resource managers visualize and analyze the regulatory framework of the U.S. marine environment. Following the regional approach recommended by the U.S. Commission on Ocean Policy in 2004, the site currently includes maps of federal regulations and agency jurisdictions, as well as state regulatory boundaries for the Gulf of Mexico.

The addition of state-level data for Hawaii, California, and the Gulf of Maine is planned for 2008. The *Atlas* supports ocean managers working on ecosystem-based approaches to regional ocean governance by allowing them to identify gaps and overlaps in marine policy. The *Atlas* can be viewed at <http://www.csc.noaa.gov/legislativeatlas/>.

NOS Contributes to National Ocean Economics Program

NOS produced a series of maps for a recent report, *Florida Oceans and Coastal Economies*, which illustrates demographic and economic trends in the state since 1990. This activity contributed to the objectives of the NOAA-funded National Ocean Economics Program. In addition, the article, "Hurricane Damage to the Ocean Economy in the U.S. Gulf Region in 2005," by two NOAA economists, won a Lawrence Klein award, which recognizes the best articles in the *Monthly Labor Review*, a respected journal published by the U.S. Department of Labor.

Protecting Fisheries

Scientists and Law Officers Team Up to Deter Seafood Smuggling

NOS scientists worked with special agents from the NOAA Office for Law Enforcement over a two-year period to help uncover a multi-year scheme that involved smuggling and distributing catfish labeled and sold as grouper to avoid tariffs imposed by the U.S. Department of Commerce. The scientists used molecular genetic techniques to analyze fish tissues and reveal



Horse-eye jacks (Caranx latus) swim by a NOAA diver in the Flower Garden Banks National Marine Sanctuary.

that the samples were in fact catfish and not grouper. As a result of this research, a Florida seafood importer received 51 months in federal prison terms in addition to probation, \$1.13 million in fines, and forfeiture of two Florida businesses. Successful enforcement initiatives such as this one help to ensure truth-in-labeling of seafood and may deter future efforts to mislead consumers.

Protecting Shark Populations in Coastal Ecosystems

In May 2007, NOS scientists and their partners at the U.S. Fish and Wildlife Service Wildlife Forensics Laboratory in Ashland, Oregon, began collaborative research efforts to identify shark species from dried fins. NOS developed the current identification method, which works for 35 of the 73 shark species that occur in U.S. waters. This collaboration will expand the capacity for shark identification, as it is anticipated that more shark species will soon be protected under national and international law. Cooperation between NOS and the U.S. Fish and Wildlife Service will provide greater efficiency in forensic analyses to protect the Nation's shrinking shark populations. Dried shark fins are commonly sold in Asian markets for use in shark-fin soup.

Detecting and Managing Disease in Aquaculture

NOS researchers collaborated with scientists at the North Carolina College of Veterinary Medicine to develop a sensitive and specific method to detect and help manage a parasite responsible for 20 percent of losses of cultivated warm-water fishes. The disease, Amyloodiniosis, is caused by a tiny marine

organism called a dinoflagellate. While previous microscopic methods could not detect the parasite until later stages of infestation, the new method can detect the parasite's DNA from a single cell, making disease management easier.

Monitoring Our Environment

Contaminants Measured in Hudson-Raritan

Estuary Post-9/11

Samples taken from New York's Hudson-Raritan Estuary before and after the September 11, 2001, attack on the World Trade Center indicated no significant changes in the concentrations of two classes of contaminants—polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). This information is useful to coastal management agencies and public health organizations monitoring the status of the estuary following the disaster, when PAHs, PCBs, and other contaminants were released into the environment after the collapse of the skyscrapers. Scientists from NOAA's Mussel Watch Project analyzed more than 20 years of monitoring data, plus samples collected in December 2001 and November 2003, to determine that no significant changes had occurred in PAH and PCB concentrations.

Navigation Technologies Improve Knowledge of Coastal Processes

Through a partnership with NOAA's Elkhorn Slough National Estuarine Research Reserve and the Elkhorn Slough Foundation, NOS installed two water-level stations at the California reserve in May 2007. Both stations will support ongoing environmental monitoring efforts at the reserve and provide data for hydrodynamic models to predict water movement in the estuary



Elkhorn Slough is one of the relatively few coastal wetlands remaining in California. The main channel of the slough, which winds inland nearly seven miles, is flanked by a broad salt marsh second in size in California only to San Francisco Bay.

and address increasing tidal range (greater distances between low and high tides). NOS is also providing Global Positioning System techniques, geodetic heights, and biological monitoring. Field personnel from the reserve and several NOS offices conducted surveys to establish a project baseline for long-term monitoring. Elkhorn Slough harbors the largest tract of tidal salt marsh in California outside of San Francisco Bay. Located at the center of the Monterey Bay coastline, the slough provides habitat for hundreds of species of plants and animals, including more than 340 species of birds.

Global Positioning Technology Advances Accurate Measurement of Coastal Elevations

In April 2007, NOAA organized a technology-transfer meeting at the Smithsonian Environmental Research Center in Edgewater, Maryland. The meeting was a major milestone in a multi-pronged strategy to partner with the U.S. Geological Survey (USGS) and other NOAA offices to acquire accurate elevations in the U.S. coastal zone. During the meeting, researchers from the USGS and the Smithsonian were briefed on a new Global Positioning System (GPS) instrument and techniques developed by NOS. The new instrument, called the "kendapter," is a level adapter used to fit a GPS antenna on top of surface elevation table (SET) benchmarks. SETs are portable measuring devices used to record millimeter-level changes in wetland and shallow-bottom surface elevations. The kendapter allows a SET benchmark to hold a GPS antenna, meaning that the benchmark can be surveyed by a static GPS receiver, a critical step in establishing known elevations in a wetland area. The kendapter's new techniques were developed at NOS's antenna-testing facility in Corbin, Virginia, and field tested in cooperation with the University of New Orleans in March 2007. With these improvements, SET technology is poised to provide standardized elevation data along the world's coastlines, improving environmental models and informing science and management decisions.

Cooperative Institute Awards \$3.65 Million for Coastal Research

In fiscal year 2007, the University of New Hampshire/NOAA Cooperative Institute for Coastal and Estuarine Environmental Technology awarded \$3.65 million to 15 technology development projects to address the challenges facing natural resource managers in coastal states. Researchers from academia, industry, and the public sector developed tools to monitor harmful algal blooms and coastal water quality, manage nutrient pollution, treat contaminated sediments, and restore habitats. Funded work took place at National Estuarine Research Reserves in Alabama, Mississippi, North Carolina, South Carolina, Texas,

California, Oregon, Maryland, Virginia, New Hampshire, Maine, Massachusetts, Rhode Island, New York, and Florida.

Protecting Coastal Communities

Helping Pacific Northwest Communities

Prepare for Coastal Storms

The NOAA Coastal Storms Program developed a suite of products for Oregon and Washington coastal communities to improve storm planning, prediction, and recovery. The Pacific Northwest is vulnerable to flooding, debris flows, and coastal erosion because of battering coastal storms during the winter months. The impacts of these storms range from treacherous navigation conditions at the mouth of the Columbia River (known as “the graveyard of the Pacific”), to storm-water impacts on spawning salmon. Chief among the new products is an online decision-support tool that combines hazard-related real-time and forecast information into a mapping interface identifying coastal-storm impacts and hazard risks. The tool helps emergency managers and the public monitor coastal storms and identify location-specific hazards. Other tools developed by the program include ecological assessments of aquatic impacts from stormwater runoff, an atmospheric profiler, a digital elevation model, and a precipitation atlas. Together, these tools will benefit communities and emergency managers by equipping them to better prepare for and mitigate the effects of coastal hazards.

American Samoa Celebrates Milestone for Mapping Tool

In 2007, staff members of the American Samoa Coastal Management Program processed the 1,000th permit application on the Island of Tutuila using the Tutuila Hazard Assessment Tool (T-HAT). T-HAT is an Internet mapping application developed in 2004 through a partnership between the program and NOS. T-HAT quickly identifies the risks of potential hazards for any location on the island and is a valuable tool in the coastal management program’s day-to-day operations.

Helping Louisiana Stay Ahead of the Next Big Storm

NOS published new elevations for more than 340 benchmarks in southern Louisiana in 2007. The published values provide official elevations in 27 parishes across the southern portion of the state, which suffered extensive damage from hurricanes Katrina and Rita. This effort was conducted within NOAA’s Height Modernization Program, which provides accurate height information by integrating Global Positioning System (GPS) technology with existing survey techniques. For years, GPS has been used to determine accurate positions (latitude

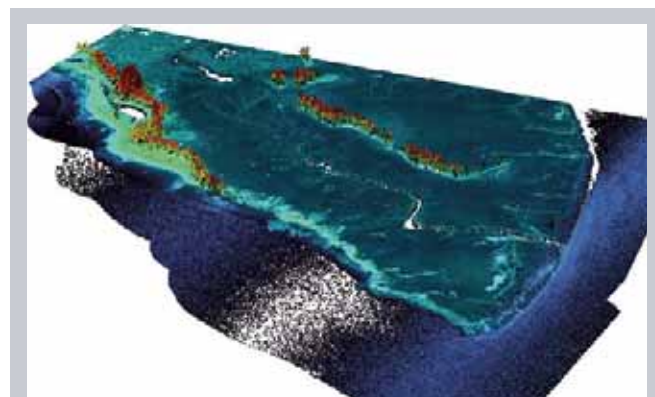
and longitude), but now, by following Height Modernization standards, specifications, and techniques, GPS can establish accurate elevations for all types of positioning and navigational needs with increased efficiency. A cooperative agreement between NOAA and the Federal Emergency Management Agency (FEMA) provided much of the project funding, and the Louisiana Spatial Reference Center at Louisiana State University in Baton Rouge was involved in the project.

“NOAA’s National Ocean Service recognizes the importance of continuing to support rebuilding and restoration efforts in Louisiana by providing accurate benchmarks made possible through this cooperative effort with FEMA,” said John H. Dunnigan, NOAA assistant administrator for the National Ocean Service. “One of NOAA’s central missions is to promote public safety and preparedness. These new, accurate elevations are a significant contribution to that effort.”

Training Coastal Managers

New Training Courses for Coastal Managers

In the fall of 2007, two new geographic information system (GIS) training courses became part of NOS’s GIS training curriculum. The first course, “GIS Tools for Strategic Conservation Planning,” was co-developed with The Conservation Fund, a nonprofit environmental group dedicated to protecting America’s most important landscapes and waterways for future generations. The course teaches coastal managers and planners how to apply GIS tools, methodologies, and analyses to strategic conservation planning using a green infrastructure approach. In the second course, floodplain managers, county and state officials, and



This elevation model of a coastal marsh in South Carolina was created using LIDAR data. Elevation models are used to document shoreline change, plan beach nourishment efforts, map and monitor natural habitats, create storm surge models, and analyze watershed systems.

coastal managers learn about coastal inundation (flooding) issues and gain knowledge of spatial techniques for mapping inundation events.

Participant evaluations of NOS trainings held in 2006, which targeted more than 1,000 coastal management professionals from 43 U.S. states as well as Canada, Europe, and Southeast Asia, revealed positive feedback: 93 percent of participants reported that their time was well spent and 94 percent reported achievement of the learning objectives. E-learning courses offered by NOS also logged thousands of user sessions during 2007. Course topics covered technology, natural resource management issues, and natural resource management techniques.

Conferences Attract Capacity Crowds

In March 2007, the Coastal GeoTools 2007 conference, hosted by the NOAA Coastal Services Center, attracted a capacity crowd of 400 coastal resource management professionals to Myrtle Beach, South Carolina. The biennial conference provides a venue to discuss technology applications useful in managing coastal resources and developing resilient coastal communities. In July 2007, nearly 1,000 coastal and ocean management professionals attended Coastal Zone 2007 in Portland, Oregon. The theme of the conference, "Brewing Local Solutions to Your Coastal Issues,"

incorporated a wide variety of related sessions, trainings, and field trips. The biennial Coastal Zone conference series, also organized by the NOAA Coastal Services Center, is the largest international gathering of its kind.

Positioning for Our Future

National Spatial Reference System Updated

In March 2007, NOS completed a two-year project to readjust the National Spatial Reference System (NSRS). NOAA defines and maintains the NSRS, which provides the Nation's positioning infrastructure for transportation and communication, mapping and charting, and a multitude of scientific and engineering applications. The NSRS includes a network of permanently marked points; a consistent, accurate, and up-to-date national shoreline; a network of Continuously Operating Reference Stations that supports three-dimensional positioning activities; and a set of accurate models describing dynamic, geophysical processes that affect spatial measurements.

The NSRS readjustment updated all Global Positioning System survey control point positions in North America. NOS released the readjusted coordinates with local and network accuracies and made them available through online data sheets. This accomplishment significantly improves the Nation's fundamental positioning infrastructure.



The Global Positioning System revolutionized surveying, providing latitude, longitude, and height information more quickly, inexpensively, and accurately than was possible by traditional surveying methods.



OPUS, the Online Positioning Users Service, Updated

In January 2007, NOS, with help from researchers at Ohio State University, released a new version of its Online Positioning Users Service (OPUS). The new version is known as "OPUS Rapid Static," or OPUS-RS. OPUS enables scientists, engineers, surveyors, and others to obtain Global Positioning System (GPS) positions with centimeter-level accuracies. OPUS-RS requires as little as 15 minutes' worth of GPS data to produce an improved, highly accurate GPS position. This compares to the two to six hours of data required for standard OPUS.

NOAA Ranked Number One in Global Positioning System Accuracy

NOS achieved a precision level of nearly one centimeter in the computation of Global Positioning System (GPS) satellite orbits. The satellite locations are computed daily in collaboration with seven other analysis centers that are part of the International Global Navigation Satellite System Service (IGS), a voluntary federation of more than 200 worldwide organizations that pool resources and continuous satellite-tracking data to generate precise products.

Over the past year, numerous model upgrades and strategy changes were applied to GPS data analysis, bringing the daily orbit errors down to about two centimeters. In January 2007, NOS achieved a new level of excellence in its orbit computations, and was ranked number one among contributing IGS agencies, which include the National Aeronautics and Space Administration (NASA) and the Massachusetts Institute of Technology. Incorporating accurate GPS data into the Nation's consistent coordinate system enhances the reliability of transportation and communication systems, boundary and property surveys, land record systems, mapping and charting, and many other scientific and engineering applications.

Global Positioning Data Improves Weather Forecasts

For almost two decades, NOS has generated accurate Global Positioning System (GPS) orbits by processing data collected by a global network of ground-based satellite tracking stations. In 2007, NOS collaborated with seven other international GPS-analysis organizations to provide valuable meteorological information in the vicinity of 150-200 tracking stations around the world. At stations with known barometric pressure, the amount of water vapor situated above the tracking station can be accurately inferred. This information can help meteorologists improve weather forecasts because adverse weather is most often associated with water-vapor content.

Software Will Help Census Reveal Who and Precisely Where

In 2007, NOS was successful in testing Global Positioning System (GPS) software it developed for the U.S. Census Bureau. The upcoming 2010 Census will be the first to incorporate GPS positions. Census takers will carry Personal Digital Assistants with built-in GPS capabilities to record the precise position of each address polled. NOS plans to test several of the units under adverse conditions in 2008 to determine if the Census Bureau will be able to meet its goal of three-meter horizontal accuracy. The first decennial U.S. Census was taken in 1790.

The 1,001st Continuously Operating Reference Station Installed

In January 2007, NOS installed a commemorative geodetic marker to recognize the installation of the 1,001st Continuously Operating Reference Station (CORS). The station ushers in a new generation of CORS by becoming the first to provide precise global positioning data in real time from both the U.S.-based Global Positioning System (GPS) and the Russian-based Global Navigation Satellite System. The 1,001st CORS is also part of the Integrated Ocean Observing System and is co-located with a NOAA tide station in Key West, Florida, where it collects local sea-level data for the globally consistent, rigorously defined International Terrestrial Reference System.

Managed by NOS, the CORS network is a cooperative effort involving 175 organizations. Each CORS sits at a known, precise location and receives GPS radio signals 24 hours a day, seven



NOS employees inspect a Continuously Operating Reference Station (CORS) in Alaska. CORS sites help NOS provide precise positioning services as well as a number of other scientific and engineering applications.

days a week. Information collected through the CORS network is processed by NOS and made available to surveyors, engineers, scientists, and others around the world. CORS data are essential for ensuring the reliability of transportation and communication systems, mapping and charting, and other scientific and engineering applications.

Mapping Coastal Areas

Developing an Integrated Ocean and Coastal Mapping Inventory

Less than 10 percent of the 3.4 million square nautical miles of the U.S. Exclusive Economic Zone has been mapped with current technology, and less than five percent has been mapped in high resolution. To address this issue, NOS worked with the U.S. Geological Survey, U.S. Army Corps of Engineers, and Minerals Management Service to develop an ocean and coastal mapping inventory in 2007. The ongoing project will define requirements for the inventory and develop a near-term ocean and coastal mapping implementation plan, including initial priorities, methods of development, and resource requirements.

Coastal Land Cover Baseline Completed

Remote sensing technology offers the best way to document and monitor land-cover changes over time. The resulting land-cover maps are used in a variety of ways, from land-use planning to evaluation of the cumulative impacts of development. Land-cover data are provided by the NOAA Coastal Change Analysis Program. In 2007, a multi-year effort to create a baseline of coastal land-cover changes was completed for the lower 48 United States and Hawaii. The standardization of collection methods and data products will allow users to compare maps over a period of years, to more accurately document changes in land cover. The goal of this project is to update the baseline every five years.

Aerial Photographs Disclose Emergencies in Record Time

High-resolution aerial photographs are a major source of information about coastal change. Obtaining these photographs for the U.S. shoreline is the responsibility of NOS. Data from these photographs can be used following coastal disasters, allowing officials and others to obtain information about casualties, major economic impacts, and types of damage. This information can assist in targeting areas for damage assessment teams and response activities, testing and assessing model outputs, and identifying geographic areas for future mitigation projects.

NOS upgraded its aerial damage assessment system in 2007, allowing NOAA to collect reliable, geo-referenced imagery via aircraft in record time. In an emergency situation, such as following a hurricane or oil spill, imagery can now be delivered over the Internet four to six hours after the aircraft lands. Previously, the process took at least 24 hours.

Collaborating with International Partners

NOS Participates in Signing of New U.S.-Morocco Science and Technology Agreement

In November 2006, NOS participated in the U.S. delegation to accompany Claudia McMurray, Assistant Secretary for the U.S. State Department's Office of Ocean and Earth Sciences, to Morocco for a new science and technology agreement between the Kingdom of Morocco and the U.S. State Department. As part of the environmental work program, NOS will assist the government of Morocco in developing a National Program of



In the top image, Dr. Minkyu Choi talks with environmental chemist Dr. Clifford Rice at the U.S. Department of Agriculture Laboratory in Beltsville, Maryland, about analyses of endocrine disrupting compounds. In the bottom image, Dr. Choi and Dr. Un-Ki Hwang prepare to go out sampling for sediments on the South River near Annapolis, Maryland, with the U.S. Fish and Wildlife Service and NOAA.

Action (NPA) to address the impacts of coastal development and polluted runoff to the marine environment. NOS has ongoing work with the United Nations Environment Programme to implement NPAs, a management tool designed to reduce or control marine pollution from land-based activities and promote an integrated approach to watershed and coastal management.

NOS and Korea Sign Work Plan

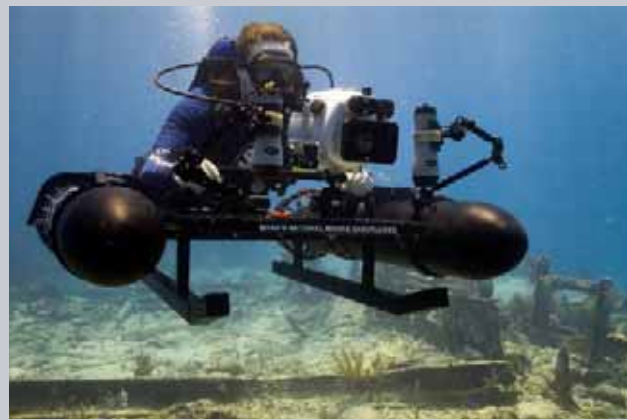
In December 2006, NOS signed a one-year work plan for cooperation with the Ministry of Maritime Affairs and Fisheries (MOMAF) of the Republic of Korea. The plan outlines collaboration between NOAA and MOMAF in areas such as coastal management, protected area management, LIDAR applications, aquaculture, coastal and ocean observations and warnings (including for tsunamis and storm surge), fisheries and ecosystem-based resource management, watershed planning, Sea Grant, and data exchange.

Helping to Survey the U.S./Mexico Border

In 2007, NOS, with support from the International Boundary and Water Commission, began work to precisely define the border between the United States and Mexico from the Pacific Ocean to El Paso, Texas. Although the actual legal border is defined by the physical location of stone monuments (permanent survey markers), their geographic position is being determined using the latest Global Positioning System (GPS) surveying techniques, including NOAA's Online Positioning Users Service (OPUS). OPUS is an on-line software package that provides GPS users with an easy way to determine positions with respect to the Continuously Operating Reference Station network. NOS is working in cooperation with its Mexican colleagues at the Instituto Nacional de Estadística Geografía e Informática on this effort and on other issues involving international borders and national security.

Modernizing Benin's Spatial Reference Frame

Representatives from NOS traveled to Benin in West Africa in January 2007 to provide technical assistance to the Institut Géographique National (IGN) in support of its efforts to modernize the country's spatial reference frame. With funding support from the Millennium Challenge Corporation (MCC) and working with technical specialists from IGN, NOAA staff traveled to six major communities to review sites for the



A NOAA archaeologist photographs a wreck site in the Florida Keys National Marine Sanctuary using a specially constructed sled mounted with a high-resolution camera.

installation of a network of Continuously Operating Reference Stations. The stations will provide the spatial framework for the efficient use of global positioning to support multi-million-dollar, MCC-sponsored efforts for land and port improvements over the next five years. The stations will also have a positive impact on the activities of Global Positioning System users in neighboring countries, which will contribute to the development of the unified African Reference Frame initiative.

Honoring Historic Places

Shipwreck *Paul Palmer* Listed on National Register of Historic Places

In 2007, the wreck of the coal schooner *Paul Palmer*, which rests on the sea floor within the Stellwagen Bank National Marine Sanctuary off the coast of Massachusetts, was listed on the National Register of Historic Places, the Nation's official list of cultural resources worthy of preservation. The schooner, which sank in 1913, is historically, architecturally, and archaeologically significant in U.S. maritime history. In compliance with President George W. Bush's Preserve America Executive Order, NOAA is increasing efforts to inventory, preserve, and protect

historic resources in the agency's care, from shipwrecks to historic buildings. Since NOAA's discovery of the then-unknown shipwreck in 2000, the Sanctuary has investigated the site with divers, remotely operated vehicles, and autonomous underwater vehicles, capturing detailed video and still imagery to document the vessel's construction and artifacts.

Restoring the Stones that Mark the Nation's Capital

In conjunction with President George W. Bush's Preserve America Initiative, NOS worked with the Daughters of the American Revolution (DAR), the National Capital Park Service, the District of Columbia Boundary Stone Committee, and local volunteer surveyors to restore the stone monuments marking the original diamond-shaped boundary of the District of Columbia. To commemorate these efforts, the Deputy Director of NOS's National Geodetic Survey presented a commemorative survey marker to the French Ambassador to the United States at a DAR-hosted ceremony in October 2006.

Archaeological Survey of Historic Sunken Vessel *Hassler*

An NOS archaeologist and a team of federal and state researchers completed an underwater archaeological survey of the U.S. Coast Survey vessel *Hassler*, which sank in 1898 in the Lynn Canal, 20 miles from Haines, Alaska. The *Hassler* was built in 1872 and named for Ferdinand Hassler, the first superintendent of the U.S. Coast and Geodetic Survey, NOAA's predecessor agency. The ship conducted mapping and research activities in Alaska and the Pacific for more than 20 years before it sank.

Enhancing Ocean Literacy

Partnership with National Science Teachers Association Continues to Grow

NOS completed three new Web-based "science toolboxes," called SciGuides, in 2007: "Coral Ecosystems," "Estuary Ecosystems," and "The Ocean Effect of Weather on Climate." Developed as part of a cooperative agreement between the National Science Teachers Association (NSTA) and NOAA, SciGuides gather the best Internet resources and organize them according to major theme areas for the classroom. Every Web-based resource included in a SciGuide is aligned with national science education standards for a range of grade levels and is reviewed and approved by a team of NSTA master teachers and NOAA scientists.

Other teacher professional development activities included a half-day symposium on the Global Positioning System (GPS) and geodesy at NSTA's 2007 annual conference and a series of follow-up online seminars for teachers of grades 5-12. Participants learned about the history of geodesy and how modern GPS technology is used in innumerable applications. Scientists from NOS also led two interactive Web seminars, "Virtual Globes" and "Geocaching and Benchmark Hunting."

Teacher Workshops Foster Ocean Education

In 2007, NOS and NOAA's Office of Ocean Exploration held three all-day professional development education workshops for classroom teachers. Educators attending the workshops learned about inquiry- and standards-based activities and multimedia resources available on the NOS Education and Ocean Explorer Web sites. Participants also learned how coastal and ocean sciences can be used in classrooms to help meet national teaching standards while fostering students' understanding and appreciation of the ocean realm. The workshops were held at aquaria in Chicago, Illinois; Corvallis, Oregon; and New Orleans, Louisiana. Follow-up evaluations will reveal how students and teachers used the online resources and activities.

NOAA WaterWays Student Conference

In June 2007, more than 100 fifth, sixth, and seventh graders, together with their teachers and parents, gathered at the NOAA Science Center in Silver Spring, Maryland, for a Student Conference as part of a problem-based learning project called "NOAA WaterWays." Students came prepared to show NOAA scientists and education specialists the results of their school-year work on ocean and atmospheric sciences. Students participated in a video-conference event in the NOAA auditorium with the Maritime Museum of Newport News, Virginia; the *Monitor* National Marine Sanctuary off Cape Hatteras, North Carolina; and the Thunder Bay National Marine Sanctuary in Alpena, Michigan. Students learned about shipwrecks and artifact conservation in varying water conditions and spoke with experts at all three sites and with students in Thunder Bay. ■

NOAA'S EDUCATIONAL PARTNERSHIP PROGRAM

In a continuing effort to increase the pool of well-qualified graduates from which NOAA may select its workforce, NOAA's Educational Partnership Program (EPP) provides financial assistance through competitive processes to increase the number of students, particularly from minority-serving institutions, who graduate with degrees in sciences directly related to NOAA's mission. The EPP also serves to increase collaborative research efforts between NOAA scientists and researchers and students at minority-serving academic institutions.

As a part of these efforts, the EPP provides financial assistance through four competitive program components, including the Cooperative Science Centers, the Environmental Entrepreneurship Program, the Graduate Sciences Program, and the Undergraduate Scholars Program.



The Environmental Cooperative Sciences Center

One of the EPP Cooperative Science Centers is the NOAA Environmental Cooperative Science Center (ECSC) at Florida A&M University. Funded by EPP, the ECSC is a consortium of six minority-serving institutions and two majority institutions, led by Florida A&M University. The National Ocean Service (NOS) has partnered with the ECSC since 2001 to develop qualified, minority scientists with expertise in NOAA-related sciences who may be recruited to work at NOAA or other resource management organizations.

ECSC research addresses ecological and coastal management issues at specific National Estuarine Research Reserves and the Florida Keys National Marine Sanctuary. The ECSC develops tools, including conceptual models that assess the response to coastal ecosystem and community disruptions. The ECSC also creates measurement programs that monitor ecosystem attributes, improve the scientific basis for coastal resource management, and facilitate community and outreach programs.

NOS takes an active role in guiding and assisting the ECSC institutions and students. NOS also consistently encourages and helps to facilitate efforts among offices to engage in collaborative research or teaching efforts with the ECSC.

The Graduate Sciences Program

NOS also participates in the NOAA EPP's Graduate Sciences Program (GSP), designed to provide graduate-level training in NOAA-related sciences particularly to students at minority-serving institutions. The GSP offers support for both masters and doctoral candidates in fields of research related to our Nation's oceans, coasts, and atmosphere. In 2007, three of seven GSP students were hosted by NOS. These students worked in the areas of oceanography, environmental science, and international affairs, covering areas such as immunity defense systems in corals and habitat research from the sub-tropic to the sub-arctic.

GSP alumni have gone on to work for NOS, employed as cartographers, oceanographers, and research ecologists working on projects such as shellfish contamination and the ecological impacts of hurricanes.

The Undergraduate Scholars Program

NOS laboratories and offices participate in the EPP's Undergraduate Scholars Program. This program targets students completing their sophomore year at a minority-serving institution and who have recently declared (or are about to declare) a major in atmospheric or oceanic sciences or an environmental discipline supporting these sciences. The students in this program become actively involved in research and policy work within NOAA, supporting the agency's mission and helping students to more clearly define their career plans and gain valuable experience. During 2007, three of 15 Undergraduate Scholars Program students worked with NOS. ■



LEGISLATION SUPPORTS NOS'S ROLE AS A STEWARD TO NATION'S RESOURCES, LEADER IN SCIENCE

During fiscal year 2007, several pieces of legislation were passed or proposed to help the National Ocean Service (NOS) provide products, services, and information that promote safe navigation, support coastal communities, sustain marine ecosystems, and mitigate coastal hazards.

President Signs Law Establishing Marine Debris Program

In December 2006, President George W. Bush signed into law an act establishing the NOAA Marine Debris Program. The Marine Debris Research, Prevention, and Reduction Act authorizes \$10 million annually for a program to research, map, identify, assess, remove, and prevent marine debris and otherwise mitigate its impacts on the marine environment. This new law provides NOAA with the authority to improve public awareness and promote productive ecosystems and reinforces NOS's role as a steward and trustee of the Nation's marine resources.

Proposed Legislation to Strengthen Coral Reef and Hydrographic Programs

The Bush Administration delivered, in May 2007, proposed legislation to Congress calling for greater protection of the Nation's coral reefs. Enactment of the Coral Reef Ecosystem Conservation Amendments Act would increase NOAA's ability to manage and understand issues associated with climate-related impacts on corals such as disease and bleaching. The legislation would: reauthorize the Coral Reef Conservation Act of 2000; establish a new account to fund emergency response, stabilization, and restoration following vessel-related injuries to coral reefs; and make it unlawful to destroy or injure any coral reef.

The Administration also delivered proposed legislation to reauthorize its hydrographic and navigation services programs. The Hydrographic Services Improvement Act Amendments of 2007 was introduced in the Senate and a similar bill was introduced in the House of Representatives. The amendments would provide greater authority to NOAA to support safe and efficient marine transportation, including emergency response to reopen vital ports and harbors following major coastal storms and events.



Looking Ahead: Fiscal Year 2008 Funding for NOS Programs

On December 26, 2007, President Bush signed the Consolidated Appropriations Act, 2008 (P.L. 110-161). This law, which includes appropriations for the fiscal year ending September 30, 2008, provides \$525 million for NOS programs. Highlights include:

- More than \$26 million for integrated ocean observing. Funds will increase the development of the 11 Integrated Ocean Observing System (IOOS) regions, as well as the implementation of a core IOOS operating program plan.
- A total of \$4.8 million to support priorities for the Gulf of Mexico, as identified in the *Governors' Action Plan for Healthy and Resilient Coasts*. The *Action Plan*, developed by the Gulf of Mexico Alliance, challenges the Gulf States to make tangible progress over the next three years on several critical issues, including water quality and wetland and coastal conservation.
- \$46 million for the operation of the National Marine Sanctuaries Program (NMSP) and an additional \$14 million for the construction of NMSP facilities and exhibits across the United States. There are 13 designated national marine sanctuaries and one national monument, which is located in the Northwest Hawaiian Islands.
- Nearly \$5 million to implement the Height Modernization Program. Height Modernization is an NOS program that uses the Global Positioning System and other new technologies to increase the accuracy of elevation measurements that comprise the vertical portion of the National Spatial Reference System. Height Modernization funds provide better access to accurate and consistent height data at the local level.
- Over \$64 million for grants to states for implementation of the Coastal Zone Management Act. These funds provide grants to 35 coastal and Great Lakes states and territories. In addition, \$4 million was provided to implement non-point pollution control grants to the states. ■



THE NATIONAL OCEAN SERVICE AT A GLANCE

We value your interest, questions, and comments.
Please feel free to contact us.

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NOAA Coastal Services Center
(843) 740-1200
<http://csc.noaa.gov/>

State coastal resource management programs do not always have the information, tools, technical capacity, or expertise needed to fulfill their mandates. Answering this need is the role of the NOAA Coastal Services Center. Remote sensing, geographic information systems, information integration and sharing, hazards mitigation, habitat characterization, training, and coastal observing systems represent the Center's primary areas of expertise. The Center's efforts in these areas have produced hundreds of projects, including a helpful inventory of state dock and pier policies, satellite data sets used to document and predict coastal growth trends, and information that helps communities protect themselves from coastal storms. This assistance gives coastal managers the tools they need to effectively manage and protect the Nation's coastal communities.

Center for Operational Oceanographic Products and Services
(301) 713-2981
<http://tidesandcurrents.noaa.gov/>

The Center for Operational Oceanographic Products and Services (CO-OPS) provides water-level and current information for our coastal regions and the Great Lakes. They offer one-stop shopping for near real-time water-level and tide data at 175 different sites across the United States and distribute historical data for water levels, coastal currents, and other information. In addition, CO-OPS's Physical Oceanographic Real-Time System (PORTS®) supports safe and cost-efficient navigation by providing accurate, real-time environmental information required to avoid groundings and collisions and providing coastal managers with wetlands restoration information, tsunami and storm-surge measurements, and other data.

National Centers for Coastal Ocean Science
(301) 713-3020
<http://coastalscience.noaa.gov/>

Coastal stewardship means solving the problems of today, while planning better for the future. Scientists at the National Centers for Coastal Ocean Science study, monitor, and assess both natural and human impacts on coastal ecosystems—giving our Nation the information and, ultimately, the understanding needed to be better coastal stewards. In addition to the Centers based in Silver Spring, Maryland, there are facilities in Charleston, South Carolina; Beaufort, North Carolina; Oxford, Maryland; and Kasitsna Bay, Alaska.

Office of Coast Survey

(301) 713-2770

<http://nauticalcharts.noaa.gov/>

Navigating ships and boats safely in and out of ports and along our coasts requires accurate nautical charts. The Office of Coast Survey (OCS) manages the NOAA nautical charting program to help protect life and property, support economic growth and development, and protect the environment in support of the overall mission for safe and efficient navigation. OCS is responsible for surveying and charting U.S. and territorial waters to the limits of the Exclusive Economic Zone, an area of about 3.4 million square nautical miles.

National Geodetic Survey

(301) 713-3242

<http://geodesy.noaa.gov/>

The National Geodetic Survey (NGS) defines and manages the National Spatial Reference System - the nationwide framework latitude, longitude, and elevation. NGS surveys promote safe navigation and enhanced economics by delineating the national shoreline and locating features needed to construct nautical charts. NGS also identifies obstructions and aids to air navigation at the Nation's airports, supporting security and preparedness.

Office of Ocean and Coastal Resource Management

(301) 713-3155

<http://coastalmanagement.noaa.gov/>

Managing our Nation's 95,000 miles of coastline is a daunting task. The Office of Ocean and Coastal Resource Management provides the national policy leadership and conflict resolution necessary to maintain our Nation's valuable coastal resources. Additionally, the office is responsible for administering the Coastal Zone Management Act and assisting individual states in managing the system of national estuarine research reserves. The office also houses the National Marine Protected Areas Center, which was established by NOAA in cooperation with the Department of the Interior to provide science, technology, training, and information for the planning, management, and evaluation of the Nation's system of marine protected areas.

Coral Reef Conservation Program

(301) 713-3155

<http://coralreef.noaa.gov/>

NOAA's Coral Reef Conservation Program (CRCP) supports effective management and sound science to preserve, sustain, and restore valuable coral reef ecosystems. From mapping and monitoring to managing reef resources and removing harmful debris, the CRCP addresses the priorities laid out in both the

National Action Plan to Conserve Coral Reefs and the *National Coral Reef Action Strategy*, and helps fulfill NOAA's requirements under a number of mandates, including the Coral Reef Conservation Act of 2000. The CRCP is a partnership between the NOAA Line Offices working on coral reef issues, including NOS, NOAA Fisheries, NOAA Research, and NOAA Satellites and Information. The Program is headquartered in the NOS Office of Ocean and Coastal Resource Management. The CRCP facilitates and supports partnerships with scientific, private, government, and nongovernmental groups at local, state, federal, and international levels.

Office of Response and Restoration

(301) 713-2989

<http://response.restoration.noaa.gov/>

The Office of Response and Restoration (OR&R) is the focal point for NOS spill preparedness and response, hazardous waste site investigation, and environmental damage assessment. OR&R tackles environmental threats from catastrophic emergencies, such as oil and chemical spills, chronic toxic releases from Superfund waste sites, and vessel groundings in marine sanctuaries. OR&R helps emergency planners create software and other tools to help people respond to hazardous materials accidents and resolve contamination problems; find remedies for environmental damage; assess injury to coastal resources from releases of oil and hazardous material; and pursue restoration from those responsible for harm to the environment.

Marine Debris Program

(301) 713-2989

<http://marinedebris.noaa.gov/>

The NOAA Marine Debris Program serves as a centralized marine debris capability within NOAA to coordinate, strengthen, and increase the visibility of marine debris issues and efforts. The Program is undertaking a national and international effort focusing on identifying, reducing, and preventing debris in the marine environment. Additionally, the Marine Debris Program supports and works closely with various partners across the United States to fulfill the Program's mission and provides funding for projects focused on marine debris across the United States.

National Marine Sanctuary Program

(301) 713-3125

<http://sanctuaries.noaa.gov/>

The National Marine Sanctuary Program manages a national system of 14 underwater-protected areas, including 13 national marine sanctuaries and the Papahānaumokuākea Marine

National Monument in the Northwestern Hawaiian Islands. The Program works cooperatively with the public and federal, state, and local officials to promote conservation while allowing compatible commercial and recreational activities. Increasing public awareness of our marine heritage, scientific research, monitoring, exploration, educational programs, and outreach are just a few of the ways the Sanctuary Program fulfills its mission to the American people.

International Program Office

(301) 713-3078

<http://international.nos.noaa.gov/>

The International Program Office serves as a single focal point within NOS to coordinate and carry out international activities. These activities include improving international capacities to protect, conserve, and restore coastal habitat; mitigate the impacts of climate change; ensure safe, efficient, and environmentally sound maritime navigation in U.S. waters and beyond; and reduce impacts from natural disasters on our coastal resources.

Integrated Ocean Observing System Program

(301) 427-2420

<http://ioos.noaa.gov/>

Established as a new program within NOS in February 2007, the NOAA Integrated Ocean Observing System (IOOS) Program serves as the overall coordinator of NOAA's IOOS activities, represents NOAA on the Interagency Working Group on Ocean Observations, and provides a consistent planning and management function to advance NOAA and other regional IOOS efforts in support of the larger U.S. Integrated Ocean Observing System. The Program's mission is to "lead the integration of ocean, coastal, and Great Lakes observing capabilities, in collaboration with federal and non-federal partners, to maximize access to data and generation of information products; inform decision making; and promote economic, environmental, and social benefits to our Nation and the world."

Management and Budget Office

(301) 713-3056

<http://oceanservice.noaa.gov/>

The Management and Budget Office provides leadership to NOS in procurement, budget, strategic planning, policy development, communications, human resources, information technology, safety and security, and other administrative and management areas. This office also provides guidance and development expertise for highly technical and scientific special projects.

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