

STRATEGIC GOAL 3

*Observe, protect, and manage
the Earth's resources to promote
environmental stewardship*



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The Department plays a significant role in the stewardship of our natural resources to ensure that the economic benefits of those resources are available on a sustainable basis to the nation as a whole.

Success in a global economy is linked not only to our ability to respond or react to events but to anticipate or forecast them. As NOAA moves forward into the twenty-first century, the ability to deliver effective climate services is as important to economies and societies as weather forecasting is today. NOAA's improved climate predictions enable resource managers in the climate sensitive sectors such as agriculture, water, energy, and health management to alter strategies and ensure sustainable and efficient operations in the future. Foresight of climate-related events will reduce economic and human vulnerability, and secure America's competitive edge in the global marketplace.

There is also a strong linkage between the economic necessity for environmental prediction and stewardship, and scientific necessity. Societal and economic decisions need to be strongly coupled with a comprehensive understanding of the environment. A major part of Commerce's mission is to ensure sustainable economic opportunities, and this requires managing the nation's marine and coastal resources, and predicting how changes in the Earth's environment will affect those resources.

Bureau Contributing to this Goal

The NOAA mission touches every part of the American economy. Marine ecosystem management supports coastal communities and businesses; climate information is increasingly important to many economic sectors, especially agriculture and energy; weather and water information is a vital part of decision-making every day; and information services for commerce and transportation are essential for the safety and efficiency of operations in every transport mode.

General Goal/Objective 3.1

Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs

Performance Outcomes

- Improve accuracy and timeliness of weather and water information (NOAA)
- Increase understanding of climate variability and change (NOAA)

Improve accuracy and timeliness of weather and water information

On average, hurricanes, tornadoes, tsunamis, and other severe weather events cause \$11 billion in damages per year. Weather, including space weather, is directly linked to public safety, and about one-third of the U.S. economy (about \$3 trillion) is weather sensitive. With so much at stake, NOAA's role in observing, forecasting, and warning of environmental events is expanding, while economic sectors and the public are becoming increasingly sophisticated at using NOAA's weather, air quality, and water information to improve their operational efficiencies and their management of environmental resources and quality of life.

NOAA is strategically positioned to conduct sound science and provide integrated observations, predictions, and advice for decisionmakers to manage many aspects of environmental resources from fresh water to coastal ecosystems and air quality. Bridging weather and climate time scales, NOAA will continue to collect environmental data and issue forecasts and warnings that help protect life and property and enhance the U.S. economy.

NOAA is committed to excellent customer service. NOAA depends on partners in the private sector, academia, and government to help disseminate critical environmental information. NOAA will work even closer with its existing partners and will develop new partnerships to achieve greater public and industry satisfaction with the weather, air quality, and water information. NOAA will expand its services to support evolving national needs, including space weather, freshwater and coastal ecosystems, and air quality predictions throughout the nation.

NOAA anticipates that it will accomplish the following outcomes:

- Increased accuracy and amount of lead-time by category of storm type, e.g., hurricanes.
- Increased satisfaction with and benefits from NOAA information and warning services, as determined by surveys and analysis of emergency managers, first responders, natural resource and water managers, public health professionals, industry, government, and the public.

NOAA will use cost-effective observation systems that meet diverse and expanding societal needs for accuracy, parameters observed, and temporal and geographic coverage. NOAA will invest in new technologies, techniques, and weather and water forecast modeling. NOAA will improve forecast and warning capabilities to reduce uncertainty and increase economic benefits. NOAA will promote appropriate responses to hazardous weather- and water-related conditions, in order to enhance human preparedness. Traditional delivery methods, the Internet, and other e-commerce approaches will be used to deliver products that customers need for safety-related decisions, operating efficiencies, and better resource management. NOAA will also provide information to support effective air quality decision-making.

Increase understanding of climate variability and change

Society exists in a highly variable climate system with conditions changing over the span of seasons, years, decades, and longer. Weather- and climate-sensitive industries, both directly and indirectly, account for about one-third of the nation's GDP, or \$3 trillion.

Seasonal and interannual variations in climate, like El Niño, led to economic impacts on the order of \$25 billion for 1997-98, with property losses of over \$2.5 billion and crop losses approaching \$2 billion. Given such stresses as population growth, drought, increasing demand for fresh water, and emerging infectious diseases, it is essential for NOAA to provide reliable observations, forecasts, and assessments of climate, water, and ecosystems to enhance decisionmakers' ability to minimize climate risks. This information will support decisions regarding community planning, public policy, business management, homeland security, natural resource and water planning, and public health preparedness. In the U.S. agricultural sector alone, better forecasts can be worth over \$300 million in avoided losses annually.

To enable society to better respond to changing climate conditions, NOAA, working with national and international partners, will employ an end-to-end system comprised of integrated observations of key atmospheric, oceanic, and terrestrial variables; a scientific understanding of past climate variations and present atmospheric, oceanic, and land-surface processes that influence climate; application of this improved understanding to create more reliable climate predictions on all time scales; and service delivery methods that continuously assess and respond to user needs with the most reliable information possible.

These activities will accelerate the development of a structure and process for improving the relevance of climate science to assist decisionmakers in their development of national, regional, and sectoral adaptation responses (actions to reduce vulnerability, seize opportunities, and enhance resilience) to variability and long-term changes in the climate, particularly for industry, natural resource and water managers, community planners, and public health professionals.

NOAA anticipates that it will accomplish the following outcomes:

- Increased use and effectiveness of climate observations to improve long-range climate, weather, and water predictions.
- Increased use and effectiveness of climate information for decisionmakers and managers (e.g., for industry, natural resource and water managers, community planners, and public health professionals).
- Increased use of the knowledge of how climate variability and change affect commerce.

NOAA will invest in needed climate quality observations and encourage other national and international investments to provide a comprehensive observing system in support of climate assessments and forecasts. NOAA will work with national and international partners to increase understanding of the dynamics and impacts of coupled atmosphere/ocean/land systems through research on climate variability and change. NOAA will improve its intraseasonal and interannual climate forecasts to enable regional and national managers to plan better for the impacts of climate variability and change and will provide improved regional, national, and international assessments and projections to support policy decisions with objective information. NOAA will work with users of climate information to enable and increase the application of climate information for health and safety; environmental, economic, and community planning, especially for freshwater supply; water quality; and coastal impacts.

Program Evaluation

NOAA's vision for FY 2008 is to provide significantly improved weather and water forecast products and services that enhance public safety and the economic productivity of the United States. While it is difficult to see the improvements on an annual basis because of the scientific nature and seasonal variations of weather events, historical trends have shown that NOAA continues to improve the accuracy and advance warning lead-time of severe weather hazards.

Program evaluations at NOAA's National Weather Service (NWS) field offices are conducted annually. Quality control procedures are followed to ensure the highest reliability of gathered data and weather products. The National Academy of Sciences (NAS) is also involved in program analysis and evaluation processes on a national level.

NOAA's Office of Oceanic and Atmospheric Research (OAR) conducts periodic reviews of the activities of its Environmental Research Laboratories (ERL). NOAA's National Environmental Satellite, Data and Information Service (NESDIS) holds management performance reviews several times a year. NWS conducts reviews of the National Centers for Environmental Prediction (NCEP). Programs are also evaluated by the National Science Foundation (NSF) and NRC. NOAA holds annual constituent workshops at which NOAA's seasonal climate forecast efforts are discussed with the community of climate and weather forecast users, and input is solicited to shape future efforts.

NOAA's programs are routinely evaluated by a variety of outside reviewers. The NOAA Science Advisory Board (SAB), made up completely of private sector, university, and federal agency scientists, provides input on climate and air quality research. NOAA's Office of Global Programs (OGP), funded in OAR's Climate and Global Change research line item, receives review from international science agencies, universities, and private sector scientists, as well as NRC and NSF. The NOAA Research Laboratories are reviewed on a regular basis. The review is conducted by the NOAA SAB, and is normally performed every three to five years. The Sea Grant Colleges are visited at least every two years by a review panel.

External Factors

A major failure of Earth observing and computing infrastructure would impair NOAA's ability to produce seasonal to interannual forecasts. NOAA has been looking for backup outside the organization. For example, the Department of the Navy provides backup to the NCEP mainframe computer. NOAA is seeking a backup to current observing and computing infrastructure (because a major failure to these systems would impair NOAA's ability to produce seasonal to interannual forecasts). NWS is requesting funding in the FY 2004 President's Budget for a Weather and Climate Supercomputing Backup. In the past, NWS had looked into a Navy backup and found that it would not be as cost-effective.

Although the performance for these goals may improve, the impact on society may not be obvious because of factors beyond NOAA's control. For example, hurricane warnings may become more accurate, but because of the increase in population along the coastlines, the deaths, injuries, and/or damage estimates may increase.

NOAA relies on its partners in the media, private sector, and the state and local emergency management community to disseminate weather warnings. The purpose for disseminating the information is to ensure that people receive vital information regarding impending weather occurrences, i.e., tornadoes, hurricanes, etc., so that people can take necessary precautions. The sooner people get the message, the more time they have to prepare.

The science of climate change crosses generations and has progressed as a result of evolving technology. NOAA's ability to measure performance is contingent upon many external factors, including the advancement of climate change itself. While the time frame of these processes spans decades and even centuries, the reporting periods extend over years.

A number of factors unique to the atmospheric sciences must be considered when reviewing the performance measures for this goal. The primary factor to consider is the natural variation of this goal related to annual fluctuations in meteorological conditions. Another factor concerns the damage to critical equipment (for example, supercomputer fire and satellite outages) that can affect daily operations for extended periods, even though numerous safety measures and backup procedures are in place.

General Goal/Objective 3.1: Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs

Bureau	Outcome	Performance Measure
NOAA	Improve accuracy and timeliness of weather and water information	<ul style="list-style-type: none"> Lead time (minutes), accuracy (%), and false alarm rate (FAR,%) for severe weather warnings for tornadoes Lead time (minutes) and accuracy (%) for severe weather warnings for flash floods Hurricane forecast track error (48-hour) Accuracy (%) of 1-day threat score forecast for precipitation Lead time (hours) and accuracy (%) for winter storm warnings Cumulative percentage of U.S. shoreline and inland areas that have improved ability to reduce coastal hazard impacts
	Increase understanding of climate variability and change	<ul style="list-style-type: none"> U.S. temperature forecasts New climate observations introduced Assess and model carbon sources throughout the United States Assess and model carbon sources and sinks globally Determine actual long-term changes in temperature and precipitation throughout the United States

General Goal/Objective 3.2

Enhance the conservation and management of coastal and marine resources to meet America's economic, social, and environmental needs

Performance Outcomes

- Improve protection, restoration, and management of coastal and ocean resources through ecosystem-based management (NOAA)
- Support the nation's commerce with information for safe, efficient, and environmentally sound transportation (NOAA)

Improve protection, restoration, and management of coastal and ocean resources through ecosystem-based management

Coastal areas are among the most developed in the nation, with over half of our population residing within less than one-fifth of the land area in the contiguous United States. Coastal counties are growing three times faster than counties elsewhere, adding more than 3,600 people a day to their populations. Coastal and marine waters support over 28 million jobs, generate over \$54 billion in goods and services a year, and provide a tourism destination for 180 million Americans a year. The value added to the national economy by the commercial fishing industry is over \$28 billion annually, and about 18 million Americans engage in marine recreational fishing every year. Within this context, NOAA works with its partners to achieve a balance between the use and protection of these resources to ensure their sustainability, health, and vitality for the benefit of this and future generations and their optimal contribution to the nation's economy and society.

NOAA has identified three strategic objectives to further delineate what it does related to protecting, restoring, and managing the coastal and ocean resources goal:

- 1 Protect and restore ocean, coastal, and Great Lakes resources.
- 2 Recover protected species.
- 3 Rebuild and maintain sustainable fisheries.

NOAA recognizes that these three objectives are scientifically, socially, and economically interdependent, and is moving toward managing living marine and other ocean and coastal resources using a truly integrated ecosystem management approach. Until ecosystem approaches are adopted, NOAA will continue to manage on a more narrowly focused species- and site-specific basis. However, NOAA will be improving the science, management, and regulatory processes to implement a more comprehensive ecosystem approach that will allow it to make better management decisions for the nation's ocean, coastal, and Great Lakes resources. In a first move toward this integrated approach, the strategies and measures under Objective 1 also apply to protected resources and fishery management that have been placed under Objectives 2 and 3. Increasingly, NOAA will turn to international cooperation to protect large marine ecosystems and areas beyond its national jurisdiction.

In the short term, NOAA will apply this new focus by giving increased priority to: habitat protection and restoration for all species; interactions of target species management decisions with nontarget species and ecosystem effects; and partnerships with international organizations, foreign governments, federal agencies, state and local governments, academia, and nongovernmental organizations in applying ecosystem approaches to coastal, ocean, and Great Lakes resource management.

In the longer term, NOAA will strive to manage multiple aspects of sustainable ecosystems, including fisheries resources, threatened and endangered species, marine mammals, biodiversity, important habitats that support those resources, and the impacts of ecosystem-based management decisions on the economy and communities. Ecosystem management will also require improved understanding of the pressures—both natural and human-induced—that change ecosystems.

Regarding Objective 1, *Protect and Restore Ocean, Coastal, and Great Lakes Resources*, NOAA and its partners will monitor and observe aspects of ocean, coastal, and Great Lakes areas and associated communities to provide basic information on habitats, resources, human activities, and uses that may impact coastal ecosystems. NOAA will characterize ocean, coastal, and Great Lakes resources and conduct research to understand and describe the linkages among the resource components and processes and human impacts on them, and will develop new tools and techniques to facilitate sound management decisions. NOAA will develop and implement models and integrate data sets to assess current ecosystems and predict their future state and the causes for ecological changes. NOAA will ensure that decisionmakers are well informed about safe and wise uses of ocean, coastal, and Great Lakes resources, and about factors, especially hazards, that affect environmental health and safety. NOAA will also endeavor to provide the state-of-the-art tools and techniques needed for effective resource management. NOAA will develop and implement appropriate plans, regulations, permits, and enforcement activities for the protection, restoration, and wise use of ocean, coastal, and Great Lakes resources.

Regarding Objective 2, *Recover Protected Species*, NOAA will monitor and observe all aspects of protected resources to provide basic information on those resources, their habitats, and human activities that affect them. NOAA will conduct research to understand and describe the ecological and biological population aspects of protected species as a basis for sound management decisions. NOAA will develop and implement models and integrated data sets to assess current protected species populations and predict their future abundance. NOAA will ensure that decisionmakers and the public are well informed about the condition and adverse effects of human interactions with protected species. NOAA will also endeavor to provide the state-of-the-art tools and techniques needed for effective resource management. NOAA will develop and implement appropriate plans, regulations, permits, and enforcement activities for the conservation and restoration of protected resources.

Regarding Objective 3, *Rebuild and Maintain Sustainable Fisheries*, NOAA will monitor and observe all aspects of fish species to provide basic information on fish species, their habitats, and the human activities that affect them. NOAA will conduct research to understand and describe the ecological and biological aspects of fish species and social and economic impacts as a basis for sound management decisions. NOAA will develop and implement models and integrated data sets to assess fish species populations and predict their future abundance. NOAA will ensure that decisionmakers are well informed about the health of fish species and impacts of fishing or other activities on fish species. NOAA will also endeavor to provide the state-of-the-art tools and techniques needed for effective resource management. NOAA will develop and implement appropriate plans, regulations, permits, and enforcement activities for the conservation, rebuilding, and wise use of fish species.

NOAA anticipates that it will accomplish the following outcomes:

- Increased number of coastal and marine ecosystems maintained at a healthy and sustainable level
- Increased social and economic value of the marine environment and resources (e.g., seafood, recreation, and tourism)
- Increased number of acres and stream-miles restored for coastal and ocean species
- Increased number of protected species in a stable condition or an upward trend
- Increased number of managed species that are at optimum levels
- Improved ecological conditions in coastal and ocean protected areas

Support the nation's commerce with information for safe, efficient, and environmentally sound transportation

Safe and efficient transportation systems are crucial economic lifelines for the nation. NOAA's information products and services are essential to the safe and efficient transport of goods and people at sea, in the air, and on land and waterways. More accurate and timely warnings associated with severe weather threats, marine navigation products and services, and improved positioning data can better support the growing commerce on our road, rail, and waterways through improvements in transportation safety and "just-in-time" efficiencies. For example, the U.S. Marine Transportation System (MTS) ships over 95 percent of the tonnage and more than 20 percent by value of U.S. foreign trade through America's ports, including 48 percent of the oil needed to meet U.S. energy demands. Waterborne cargo alone contributes more than \$740 billion to the U.S. GDP and creates employment for over 13 million citizens. Every year, 134 million passengers are ferried to work and other destinations on U.S. waterways, along with five million cruise ship passengers. Better aviation weather information could significantly reduce the \$4 billion that is lost through economic inefficiencies as a result of weather-related air traffic delays. Improved surface forecasts and specific user warnings would likely reduce the 7,000 weather-related fatalities and 800,000 injuries annually from vehicle crashes.

As U.S. dependence on surface and air transportation grows over the next 20 years with significant increases in the volume of land transportation and the projected doubling of maritime trade, better navigation and weather information will be critical to protect lives, cargo, and the environment. NOAA is committed to improve the accuracy of its marine forecasts, provide advanced electronic navigational charts and real-time oceanographic information, and maintain a precise positioning network GPS that mariners need to navigate with confidence. Consistent, accurate, and timely information derived from NOAA's positioning services is critical for air and surface activities such as aircraft landings, and to improve the safety and efficiency of road and railroad delivery.

NOAA partners in the academic, government, and private sectors are essential to realize this goal. Improved NOAA information will enable the private weather sector to provide better weather-related forecasts and information to their clients helping to realize improved efficiencies. NOAA will work with the Federal Aviation Administration (FAA) and the private sector to reduce the impacts of weather on aviation without compromising safety through better forecasts. Reducing the risk of marine accidents and oil spills, better search and rescue capabilities, and other efficiencies that can be derived from improved navigation and coastal and ocean information and services could be worth over \$300 million annually around the nation's coasts. NOAA will work with port and coastal communities, and with federal and state partners, to ensure that port operations and development proceed efficiently and in an environmentally sound manner. On land, improvements in weather information will be used more effectively to reduce the \$42 billion annual economic loss and the 500 million vehicle-hour delays attributed to weather-related crashes.

NOAA anticipates that it will accomplish the following outcomes:

- Increased use and effectiveness of environmental information for planning for marine, air, and surface transportation systems
- Reduced number of and harm from navigation-related accidents due to grounding and allisions (hitting fixed objects)
- Increased number of ports where the environmental consequences of port development and operations are minimized
- Increased number of ports with an improved vessel cargo carriage capacity due to use of NOAA's marine navigation information products and services
- Increased safety and productivity of transportation systems
- Expanded advanced technology monitoring and observation

NOAA will expand its advanced technology monitoring and observation systems to provide accurate, up-to-date environmental data, such as weather and oceanographic observations, hydrographic surveys, and precise position coordinates. NOAA will develop and apply new technologies, techniques, and models. NOAA will develop and implement sophisticated assessment and prediction capabilities to support decisions on aviation, marine, and surface navigation efficiencies, coastal resource management, and transportation system management, operations, and planning. NOAA will work at the national and regional levels and will use advanced delivery systems, such as the Internet and other e-commerce approaches, to provide customers with the products and services they need for safety-related decisions, operating efficiencies, better management of coastal resources, and improved transportation system management and planning.

Program Evaluation

Virtually every aspect of NOAA's fisheries science and coastal programs is peer-reviewed, either internally or outside the agency. For example, reviews are conducted by NAS or NSF. NOAA also relies on extensive informal networks of university partnerships and laboratories throughout the United States for conducting work and reviews. Moreover, reviews often occur by opposing parties' scientists in the court system when fisheries management decisions are litigated.

NOAA's navigation services program has incorporated numerous recommendations made by independent analyses to improve operations and products. NRC Marine Board studies from 1992 to 1996 and congressional reviews concurrent with the Hydrographic Services Improvement Acts of 1998 and 2002 provided opportunities to evaluate NOAA's capabilities for acquisition and dissemination of hydrographic data, standards, and formats development for hydrographic services, contracts for the acquisition of hydrographic data, and digital production techniques. NOAA implemented study recommendations on such areas as reducing the survey backlog, implementing new digital production techniques, and delivering new electronic chart products to mariners. NOAA now also contracts out over 50 percent of its annual critical area hydrographic survey requirements while maintaining federal competence and expertise with existing and developing surveying technologies.

In 1998, Congress authorized the Height Modernization study to evaluate the technical, financial, legal, and economic aspects of modernizing the national height system with GPS. The study demonstrated the significant benefits to the United States in terms of dollars and lives saved associated with GPS technology, and it led to current development of the vertical component of the National Spatial Reference System (NSRS). In 1999, NOAA completed an assessment of its tidal currents program to develop guidelines for future current surveys to update U.S. reference stations for the Tidal Current Tables. Finally, the September 1999 Report to Congress that assessed the U.S. MTS further articulated the need for coordinated federal leadership to achieve the MTS vision of becoming the world's most technologically advanced, safe, efficient, globally competitive, and environmentally responsible system for moving goods and people. NOAA's navigation safety support functions underwent substantial review to identify opportunities for greater integration among federal agencies. NOAA continues its lead role on the Interagency Committee for the MTS to support this integration effort.

External Factors

Various external factors may affect NOAA's ability to reach its targets. These factors include the impact of climate, biological, and other natural conditions, such as El Niño, on its efforts to recover protected species and maintain the status of healthy species. In addition, the effect of national and/or local economic conditions may have an impact.

Changes in climate, biological, and other natural conditions may affect NOAA's ability to carry out activities to sustain healthy coasts. In addition, many of these coastal stewardship activities depend on contributions from multiple partners, particularly states, territories, and other federal agencies. The failure of one or more of these partners to fulfill their cooperative contributions could have very serious consequences on the overall effort to sustain healthy coasts.

Weather has a significant impact on the promotion of safe navigation activities. Both in-house and contract hydrographic survey schedules can be affected by adverse weather conditions (storms, winds, and high seas) and equipment failure, as can aerial photography flights scheduled for shoreline photogrammetry. Storm damage frequently renders water-level stations inoperable, affecting surveying capabilities and real-time observations of water levels and currents so critical to safe navigation. Natural disasters such as earthquakes and hurricanes can elevate the critical priority of an area because of shoreline changes or obstruction accumulation; man-made impacts such as shifts in shipping patterns, newly regulated shipping lanes, port expansions, or wrecks will also increase NOAA's designated critical areas. NOAA also receives requests to survey areas not identified as critical. For example, ship groundings frequently prompt requests from the U.S. Coast Guard and others to survey noncritical areas, diverting efforts away from the survey schedule. Finally, in addition to mission activities, NOAA ships and aircraft provide immediate response capabilities for unpredictable events such as recovery and search efforts after the TWA Flight 800 and EgyptAir Flight 990 crashes; damage assessments after major oil spills such as the Exxon Valdez, the Persian Gulf War, and the New Carissa; and severe hurricanes.

General Goal/Objective 3.2: Enhance the conservation and management of coastal and marine resources to meet America's economic, social, and environmental needs

Bureau	Outcome	Performance Measure
NOAA	Improve protection, restoration, and management of coastal and ocean resources through ecosystem-based management	Number of overfished major stocks of fish Number of major stocks with an "unknown" stock status Percentage of plans to rebuild overfished major stocks to sustainable levels Increase in number of threatened species with lower risk of extinction Number of commercial fisheries that have insignificant marine mammal mortality Increase in number of endangered species with lower risk of extinction Number of habitat acres restored (cumulative)
	Support the nation's commerce with information for safe, efficient, and environmentally sound transportation	Reduce the Hydrographic Survey backlog within navigationally significant areas (square nautical miles surveyed per year) Percentage of National Spatial Reference System (NSRS) completed (Cumulative %) Accuracy (%) and FAR of forecasts of ceiling and visibility (3 miles/1000 ft.) (aviation forecasts) Accuracy (%) and FAR of forecasts for winds and waves (marine forecasts) wind speed and wave height