

STRATEGIC GOAL 3

*Observe and manage the Earth's environment
to promote sustainable growth*



DEPARTMENT OF COMMERCE



★ UNITED STATES OF AMERICA ★



National Oceanic and Atmospheric Administration

Mission Statement

The National Oceanic and Atmospheric Administration's (NOAA's) mission is to describe and predict changes in the Earth's environment, and conserve and manage wisely the nation's coastal and marine resources so as to ensure sustainable economic opportunities.

NOAA is a future minded environmental science agency whose mission is to describe and predict changes in the Earth's environment and conserve and manage the nation's coastal and marine resources to ensure sustainable economic opportunities. Known as the oceans and atmosphere agency, NOAA is also an Earth sciences and space agency. Understanding ocean and atmosphere is essential to sustaining the U.S.'s environmental and economic health. As an agency, NOAA provides products that form a critical part of the daily decisions made across the U.S. From satellite imagery to tornado warning, navigational charts to fishery stock assessments, hurricane tracking to El Niño and harmful algal bloom predictions, severe weather forecasts to coastal zone management—every day NOAA's science, service and stewardship are essential to the lives of millions of people in the U.S. Accurate predictions of severe weather safeguard both lives and economic structure of communities. A deeper understanding of long-term climate and environmental trends can impact daily activities from the strategic planting of crops to better management of water and energy resources. Coastal communities, representing over 30 percent of the U.S. gross domestic product, depend heavily on sustaining healthy marine habitats and a robust ocean ecosystem. With effective partnerships among governments, universities, non-governmental organizations, and communities, NOAA helps to manage the critical issues along the U.S. coasts and the Great Lakes. A healthy coastal environment is intrinsic to the U.S.'s economic prosperity.

On September 11, 2001, the U.S. experienced unprecedented attacks on the World Trade Center and the Pentagon. NOAA responded to the attacks rapidly and with focused support through its agency-wide Incident Response Plan. NOAA was able to deploy critical assets, capabilities, and expertise immediately to support response and recovery efforts. NOAA personnel in weather offices, satellite and remote-sensing teams, hazardous materials units, marine transportation and geodesy offices, and fisheries enforcement teams provided a range of products and services to assist first responders in dealing with this tragedy. The September 11 attacks altered the context of NOAA's incident response planning by providing the impetus to reexamine all of NOAA's response capabilities and improve internal safety and preparedness.

To coordinate the diverse functions needed for this effort, NOAA has established a Homeland Security Coordination Team that includes representatives from across the organization. NOAA is striving to develop the capacity to support federal and state partners and local communities, and will respond to the evolving needs of the Office of Homeland Security. NOAA will continue to protect property, serve as environmental stewards, and, most important, save lives.

Priorities/Management Challenges

In FY 2002, a task force comprised of NOAA senior managers and staff was formed to take a bottom-up review of NOAA's organization, operation, and resource utilization. The mandate of the Program Review Team (PRT) was to respond to three central questions:

- Is NOAA's organization aligned with its current missions, now and for the future?
- Are NOAA's resources properly aligned with requirements?
- Is NOAA doing things as efficiently as possible?

The review was expected to not only develop answers and positions on the larger issues of NOAA's requirements and structure, but to improve NOAA's business processes like Grant Management and Facilities planning and capital improvement. This review also assisted in developing and refining the new NOAA Strategic Plan.

Based on the program review, several recommendations were provided, many of which can be implemented at the NOAA level. A limited number of proposals will require the concurrence of the Department, Office of Management and Budget, and/or Congress. For a more detailed listing and explanation of the recommendations, please visit the following Web site:

http://www.accessnoaa.noaa.gov/laut_letter.html

NOAA, as described by the recommendations developed by the PRT, reflects a dynamic organization that builds upon current programs and talents while embracing the central themes of the President's Management Agenda: an organization that is citizen-centered, results-oriented and market-based. The future mission statement will build on NOAA's current programs and talents in order to remain the premier oceanic and atmospheric science, service, and stewardship agency for the U.S. NOAA will carry out these missions innovatively in partnership with other nations; other federal, state and local agencies; the private sector, and academia.

FY 2002 Performance

NOAA met 71 percent of the targets for FY 2002. In the case of the Advanced Short-term Weather Forecast goal, nine out of twelve performance targets were met in FY 2002. Performance targets were met for tornado, winter storm, and flash flood warning lead time and accuracy; hurricane track forecasts; and heavy precipitation forecasts.

NOAA performance measures in long-term climate focused on observing system development. Substantial advances took place in deployment of an observing system for tracking carbon storage in North America and in the ocean. For monitoring of the global carbon cycle, expanded carbon measurements allow more precise characterization of global trends in greenhouse gases. In addition, early deployments of the highly accurate Climate Reference Network are resulting in reduced uncertainty in U.S. average measures of temperature and precipitation.

In terms of Promote Safe Navigation, NOAA produced eighty new Electronic Navigational Charts (ENCs), and now maintains a suite of 215 ENCs. Built to international standards, NOAA ENCs are an accurate and detailed chart database that can be displayed on electronic charting systems aboard ships. In partnership with local sponsors, NOAA dedicated two new PORTS® (Physical Oceanographic Real-Time System)—Chesapeake Bay, and Anchorage, Alaska—bringing the total number of PORTS® to nine. PORTS® supports safe and cost-efficient navigation by providing shipmasters and pilots with accurate real-time information required to avoid groundings and collisions. In recognition of the 2002 Winter Olympic Games in Salt Lake City, NOAA established a commemorative, high accuracy reference station on the campus of the University of Utah.

The commemorative station will provide the means for the local surveying and mapping community to access the National Spatial Reference System, which provides accurate and timely positioning through a consistent national coordinate system. NOAA has now mapped and/or evaluated the shoreline in over 60 percent of the nation's critical port areas within the past five years.

In FY 2002, NOAA accomplished a number of activities related to Sustain Healthy Coasts. For example, NOAA and the Environmental Protection Agency granted full approval to two new state coastal nonpoint pollution programs, bringing the total number of fully-approved programs to ten. In addition, NOAA responded to several oil and chemical spills, search and rescue efforts, and other emergencies. NOAA's Damage Assessment Center (DAC) worked on approximately twenty natural resource damage assessment and restoration cases. Five major cases were finalized in FY 2002. In addition, the Department of Commerce Office of the Inspector General conducted a review of this strategic goal and provided several recommendations.

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. Therefore, it is not possible at this time to assess fisheries-related performance goals and determine whether the targets have been met. However, NOAA continued its work to build sustainable fisheries and recover protected species. NOAA Fisheries implemented harvest specifications and management measures that included many new protective management measures to reduce or eliminate directed or incidental catch of overfished Pacific groundfish stocks. In addition, Fisheries Management Plans have been amended and rebuilding plans will be crafted to address overfished stocks. Regarding protected species, NOAA proposed changes to fishing rules to better protect North Atlantic right whales and other large whales from entanglement in lobster trap, pot, and gillnet gear along the east coast of the U.S. NOAA also implemented measures to reduce incidental capture of sea turtles and modifications to the Turtle Excluder Device (TEDs) regulations to ensure exclusion (escapement) of turtles in affected fisheries.

Targets and Performance Summary

See individual Performance Goal section for further description of each measure.

Performance Goal 1: Build Sustainable Fisheries							
Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Reduce the number of overfished major stocks of fish from 56 to 45 by FY 2007	New	56	46	55	Available in the FY 2003 report		
Reduce the number of major stocks with an "unknown" stock status to no more than 98 by FY 2007	New	120	120	120	Available in the FY 2003 report		
Increase the percentage of plans to rebuild overfished major stocks to sustainable levels	New	93%	93%	94%	Available in the FY 2003 report		

Performance Goal 2: Sustain Healthy Coasts							
Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Number of acres of coastal habitat benefited (cumulative)	New	New	83,802 ¹	108,531 ¹	108,531	X	
Reduce introductions and effects of invasive species in a total of six regions within the United States	0	1	2	2	2	X	
Percentage of U.S. shoreline and inland areas that have improved ability to reduce coastal hazard impacts	7%	8%	8%	15%	8%		X

Performance Goal 3: Recover Protected Species							
Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Reduce by 10 (from a FY 2000 baseline of 27) by FY 2007, the number of threatened species at risk	New	New	2	2	Available in the FY 2003 report		
Increase the number of commercial fisheries that have insignificant marine mammal mortality	New	New	2	6	Available in the FY 2003 report		
Reduce by 11 (from a FY 2000 baseline of 29) by FY 2007, the number of endangered species at risk of extinction	New	New	3	6	Available in the FY 2003 report		

Performance Goal 4: Advance Short-term Warnings and Forecasts

Measure		FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Lead time (minutes), accuracy (%), and false alarm rate (FAR, %) for severe weather warnings for tornadoes	Lead Time	12	10	10	11	12	X	
	Accuracy	70%	63%	67%	69%	77%	X	
	FAR	73%	76%	73%	71%	76%		X
Lead time (min) and accuracy (%) for severe weather warnings for flash floods	Lead Time	44	43	46	45	52	X	
	Accuracy	85%	86%	86%	86%	89%	X	
Accuracy of hurricane track forecasts (48 hour)	Nautical Miles	New	New	New	142	124	X	
Accuracy (%) of three-day forecast of precipitation		New	16%	19%	17%	26%	X	
Lead time (hours) and accuracy (%) for winter storm warnings	Lead Time	11	9	13	13	13	X	
	Accuracy	85%	85%	90%	86%	89%	X	
Accuracy (%) and FAR (%) of forecasts of ceiling and visibility (aviation forecasts)	Accuracy	19%	15%	18%	18%	13%		X
	FAR	52%	53%	51%	52%	58%		X
Accuracy (%) of forecast for winds and waves (marine forecasts)		50%	51%	52%	53%	53%	X	

Performance Goal 5: Implement Seasonal to Interannual Climate Forecasts

Measure		FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Determine the accuracy of the correlation between forecasts of the southern oscillation index (SOI) and El Niño / La Niña events		0.85	0.84	0.85	0.85	0.85	X	
U.S. temperature—skill score		23	25	20	20	18		X
Number of new monitoring or forecast products that become operational/year (cumulative)		New	New	4	8	8	X	
New climate observations introduced		New	New	132	174	192	X	

Performance Goal 6: Predict and Assess Decadal to Centennial Climate Change

Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Assess and model carbon sources and sinks throughout the United States	New	New	New	Establish five new pilot atmospheric profiling sites and four new oceanic carbon tracks	Identified five new pilot atmospheric profiling sites and four new oceanic carbon tracks.		X
Assess and model carbon sources and sinks globally	New	New	New	Establish three new global background sites as part of the global flask network.	Established three new global background sites as part of the global flask network.	X	
Determine actual long-term changes in temperature and precipitation throughout the United States	New	New	New	Capture more than 60% of true contiguous U.S. temperature trend and capture more than 25% of true contiguous U.S. precipitation trend.	Captured more than 85% of true contiguous U.S. temperature trend and captured more than 55% of true contiguous U.S. precipitation trend.	X	

Performance Goal 7: Promote Safe Navigation

Measure	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Target	FY 2002 Actual	FY 2002 Met	FY 2002 Not Met
Reduce the hydrographic survey backlog (square nautical miles) for critical navigation areas (cumulative percentage)	20.8%	24.3%	31.2%	35.0%	34.3%		X
Percentage of National Spatial Reference System completed (cumulative)	59%	71%	75%	78%	81%	X	

¹ Based upon the recommendations from the draft U.S. Department of Commerce Office of the Inspector General Audit Report No. FSD-14998 (November 2002), the targets and actuals for FY 2001 and FY 2002 have been revised to more accurately document this performance measure. As a result, the actual for FY 2001 is 83,802 acres and the target for FY 2002 should have been 108,531 acres (as opposed to the original target of 122,000) which is also the actual for FY 2002.

Resource Requirements Summary

(Dollars in Millions. Funding amounts reflect direct obligations.)

Information Technology (IT)

Full Time Equivalent (FTE)

Performance Goal 1: Build Sustainable Fisheries				
	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Operations, Research, and Facilities				
National Ocean Service	9.2	9.1	0.0	9.8
National Marine Fisheries Service	291.4	309.1	439.1	400.4
NOAA Research	35.1	37.1	93.0	44.0
Program Support	26.2	21.6	18.7	41.1
Procurement, Acquisition, and Construction				
National Marine Fisheries Service	–	–	62.5	14.8
Program Support	–	–	3.7	5.8
Other Accounts				
Discretionary—National Marine Fisheries Service	–	–	2.4	0.0
Mandatory—National Marine Fisheries Service	–	–	6.9	16.4
Mandatory—Program Support	–	–	3.5	–
Total Funding	404.4	441.6	629.8	533.7
IT Funding ²	24.5	13.5	17.9	5.2
FTE	2,330	2,205	2,053	2,158

Performance Goal 2: Sustain Healthy Coasts

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Operations, Research, and Facilities				
National Ocean Service	152.6	165.0	275.8	275.3
National Marine Fisheries Service	17.1	17.3	23.0	28.4
NOAA Research	63.2	58.4	28.3	80.0
National Environmental Satellite, Data, and Information Service (NESDIS)	6.2	6.2	4.0	4.8
Program Support	6.7	7.9	14.9	25.1
Procurement, Acquisition, and Construction				
National Ocean Service	–	–	53.9	61.7
NOAA Research	–	–	14.0	0.0
Program Support	–	–	3.5	3.1
Other Accounts				
Discretionary—National Ocean Service	–	–	152.9	142.7
Mandatory—National Ocean Service	–	–	0.0	9.0
Mandatory—Program Support	–	–	2.6	1.3
Total Funding	260.9	278.6	572.9	631.4
IT Funding ²	N/A	2.1	16.2	4.6
FTE	890	509	1,047	1,144

Performance Goal 3: Recover Protected Species

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Operations, Research, and Facilities				
National Ocean Service	0.0	0.3	0.0	2.8
National Marine Fisheries Service	74.1	90.2	172.0	157.9
NOAA Research	0.3	0.3	0.0	0.0
NESDIS	1.2	0.0	0.0	0.4
Program Support	3.2	4.6	8.5	18.6
Procurement, Acquisition, and Construction				
National Marine Fisheries Service	–	–	0.0	0.0
Program Support	–	–	9.8	5.2
Other Accounts				
Discretionary—National Marine Fisheries Service	–	–	109.8	154.4
Mandatory—Program Support	–	–	1.2	3.7
Total Funding	79.4	153.4	301.3	343.0
IT Funding ²	24.5	7.2	7.0	1.9
FTE	575	519	813	824

Performance Goal 4: Advance Short-term Warnings and Forecasts

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Operations, Research, and Facilities				
NOAA Research	56.8	61.6	49.7	48.8
National Weather Service	547.8	587.0	629.0	674.1
NESDIS	54.4	54.0	56.2	73.0
Program Support	43.9	41.2	49.0	50.6
Procurement, Acquisition, and Construction				
NOAA Research	–	–	3.0	2.0
National Weather Service	–	–	63.4	71.9
NESDIS	–	–	515.0	517.1
Program Support	–	–	8.5	6.2
Other Accounts				
Mandatory – Program Support	–	–	2.2	2.3
Total Funding	1,269.4	1,260.9	1,376.0	1,446.0
IT Funding ²	160.9	290.3	241.1	232.8
FTE	6,351	5,812	5,997	5,859

Performance Goal 5: Implement Seasonal to Interannual Climate Forecasts

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Operations, Research, and Facilities				
NOAA Research	63.6	70.5	58.5	77.8
National Weather Service	4.7	4.7	0.4	1.0
NESDIS	40.0	41.6	61.8	64.2
Program Support	3.6	4.3	4.0	10.3
Procurement, Acquisition, and Construction				
Program Support	–	–	0.8	1.2
Other Accounts				
Mandatory – Program Support	–	–	1.4	2.7
Total Funding	112.5	121.1	126.9	157.2
IT Funding ²	20.4	22.8	35.8	30.4
FTE	549	350	323	399

Performance Goal 6: Predict and Assess Decadal to Centennial Change

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Operations, Research, and Facilities				
NOAA Research	67.9	69.2	97.8	95.4
National Weather Service	8.2	9.7	0.0	0.0
NESDIS	8.2	6.3	3.0	0.5
Program Support	5.1	5.2	3.5	11.8
Procurement, Acquisition, and Construction				
NOAA Research	0.6 ¹	4.9 ¹	–	–
NESDIS	–	–	6.0	11.6
Program Support	–	–	0.0	0.0
Program Support	–	–	0.7	0.8
Other Accounts				
Mandatory – Program Support	–	–	0.9	1.0
Total Funding	90.0	95.3	111.9	121.0
IT Funding ²	9.6	22.1	18.9	26.1
FTE	485	127	370	487

Performance Goal 7: Promote Safe Navigation

	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Operations, Research, and Facilities				
National Ocean Service	92.2	98.4	114.4	118.6
NOAA Research	0.4	0.4	0.0	0.9
Program Support	4.9	5.7	5.5	20.2
Procurement, Acquisition, and Construction				
Program Support	–	–	–	–
Program Support	–	–	12.6	15.6
Other Accounts				
Mandatory – Program Support	–	–	3.5	3.7
Total Funding	97.5	104.5	136.0	159.0
IT Funding ²	3.9	9.7	22.8	13.5
FTE	878	807	870	734

Grand Total	FY 1999 Actual	FY 2000 Actual	FY 2001 Actual	FY 2002 Actual
Operations, Research, and Facilities				
National Ocean Service	254.0	266.3	390.2	406.4
National Marine Fisheries Service	382.6	416.6	634.1	586.8
NOAA Research	287.3	297.5	327.3	347.3
National Weather Service	560.7	601.4	629.4	675.2
NESDIS	100.6	101.8	125.0	142.5
Program Support	93.6	90.5	104.1	177.8
Procurement, Acquisition, and Construction				
National Ocean Service	–	–	53.9	61.7
National Marine Fisheries Service	–	–	62.5	14.8
NOAA Research	–	–	23.0	13.6
National Weather Service	–	–	63.4	71.9
NESDIS	–	–	515.0	517.1
Program Support	–	–	39.6	37.7
Other Accounts				
Discretionary	–	–	–	–
National Ocean Service	–	–	152.9	154.4
National Marine Fisheries Service	–	–	112.2	142.7
Mandatory	–	–	–	–
National Ocean Service	–	–	0.0	9.0
National Marine Fisheries Service	–	–	6.9	16.4
Program Support	–	–	15.3	16.2
Total Funding	2,304.7	2,442.6	3,254.6	3,391.5
Direct	2,304.7	2,442.6	3,254.6	3,391.5
Reimbursable ³	256.0	290.6	204.0	197.0
IT Funding ²	243.8	367.7	408.2	314.5
FTE	12,058	10,329	11,472	12,330

¹ For FY 1999 and FY 2000, detailed stewardship portfolio spreads were not available for program support, PAC, and other accounts.

² IT funding included in total funding.

³ Reimbursable funding not included in total fundng.

Notes:

NOAA changed its methodology for allocating support costs by Performance Goal to more accurately reflect the distribution of the budget across performance goal.

Other Accounts/Mandatory/Program Support is a breakout of the CSRS funds.

PAC/Program Support includes the distribution of CAMS.

The differences between FY 1999 IT dollars and FY 2000, FY 2001, and FY 2002 amounts is a result of several factors: (1) In previous years, the amounts accounted for major projects only. We have expanded the definition of IT dollars to include all projects identified in Exhibit 53, NOAA's President's Budget for FY 1999. (2) The FY 1999 amount for performance goal 3, "recover protected species," was in error. This amount was inadvertently duplicated from performance goal 1, "build sustainable fisheries." The appropriate response should have been not applicable. (3) The apparent decrease in dollars for performance goal 1, "build sustainable fisheries," is actually a realignment of the stewardship portfolio.

Skill Summary

Marine ecologists, environmental educators, land use planners, toxicologists, economists, hydrologists, electronic technicians, hydrometeorological technicians, atmospheric scientists, computer specialists, instrumentation engineers, instrumentation technicians, physicists, mathematicians, electronic engineers, cartographers, photogrammetrists, geodesists, hydrographers, fishery biologists, fishery economists, oceanographers, engineers, chemists, meteorologists, physical scientists, and computer scientists.

IT Requirements

- National Marine Fisheries Service Fishing Information Technology System
- Sustaining Healthy Coasts does not rely on any one IT system
- National Marine Fisheries Service Fishing Information Technology System
- Advanced Weather Interactive Processing System, Next Generation Weather Radar System, Geostationary Operational Environmental Satellites Ground System, and Automated Surface Observing System Satellite Active Archive, NOAA Virtual Data System, National Environmental Data Archive and Access System, and Climate Prediction Centers Climate Computer Geophysical Fluid Dynamics Laboratory Nautical Charting and Hydrographic Surveying System, Physical Oceanographic Real-time Systems, and Data Processing and Analysis Subsystem for National Water Level Observation Network, and Geodetic Support System

FY 2002 Performance Goals

Performance Goal 1: Build Sustainable Fisheries

Corresponding Strategic Goal

Strategic Goal 3: Observe and manage the Earth's environment to promote sustainable growth

Rationale for Performance Goal

Billions of dollars in economic growth, thousands of jobs, and countless commercial and recreational fishing opportunities are not realized as a result of overfishing and overcapitalization in commercial and recreational fisheries. While many fisheries are well-managed and produce positive benefits, others are severely depleted or overcapitalized and must be restored and managed to realize their long-term potential. Rebuilding and reducing overcapitalization in existing fisheries will promote the economic and biological sustainability of U.S. fishing resources. Building sustainable fisheries will increase greatly the nation's wealth and quality of life.

The basis for the existing suite of performance measures is the sequence of events associated with sustaining or rebuilding fisheries over time. In concept, these events occur in the following order: (1) The first task is to identify if a stock is overfished; the performance measure on stock assessment and reducing the number of unknown stocks addresses this step. (2) Once a stock has been classified as overfished, the National Oceanic and Atmospheric Administration (NOAA) is mandated to create a rebuilding plan by statute; the rebuilding performance measure addresses this outcome. (3) Each rebuilding plan will have a trajectory and timeframe to achieve the rebuilding objective of recovering the stock to sustainable levels; the performance measure describing the number of overfished stocks measures how closely this target and trajectory is being met and other measures for this goal that are important indicator measures of these influences. An additional important area of concern that NOAA will address through its performance measures in the future is the issue of bycatch and its effect on fish stocks and protected species. Beginning in FY 2005, NOAA Fisheries is planning to begin measuring its success in reducing bycatch in ten fisheries toward its ultimate goal of reducing the level of bycatch by 30 percent in all fisheries with unacceptable levels of bycatch from FY 2001 levels by FY 2008.

Changes to the Performance Measures

For the moment, NOAA will continue to use the existing performance measures for this strategic planning goal. However, NOAA Fisheries is currently making improvements on its performance measures to better reflect the Agency's challenging responsibilities and performance in managing the living marine resources of the U.S. To assist NOAA Fisheries, a workshop was held in June 2002 to solicit input from fisheries stakeholders and map a new path for fisheries management performance. Among the input, the workshop participants recommended three new focus areas for performance measures that could potentially be developed into objectives relevant to this strategic planning goal. The three areas are: 1) biological sustainability, 2) socio-economic sustainability, and 3) internal administration and process. Specific recommendations for each focus area are stated in the FY 2004 Annual Performance Plan.

FY 2002 Performance

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. Therefore, it is not possible at this time to assess this performance goal and determine whether the targets have been met. However, NOAA continued in FY 2002 the task of building sustainable fisheries.

Among the activities to address overfishing, NOAA implemented harvest specifications for the groundfish fisheries of the Bering Sea, Aleutian Islands, and Gulf of Alaska. The 2002 harvest limits and associated management measures became effective in January 2002 under an emergency rule that also implemented Stellar sea lion production measures. NOAA also proposed annual specifications and management measures which include many new protective management measures to reduce and eliminate directed or incidental catch of overfished Pacific groundfish stocks. In addition, NOAA declared that certain Pacific groundfish species were overfished. NOAA expects the Pacific Fishery Management Council to recommend large-scale closures for 2003 of the continental shelf off Washington, Oregon, and California to groundfish fishing. Some of the overfished species that are most severely depleted are continental shelf species. Rebuilding plans for all these species will be crafted in at least two amendments to the Fishery Management Plan (FMP). Regarding the east coast, the New England Fishery Management Council approved a new Deep-sea Red Crab FMP. The plan would put in place measures to prevent overfishing, provide better management information, and control effort in this fishery. Also, NOAA completed Amendment 6 to the FMP for the salmon fisheries in federal waters off Alaska. Amendment 6 brings the FMP into compliance with the requirements of the Magnuson-Stevens Act by specifying objective and measurable criteria for identifying when fisheries are overfished. Conservation and management measures are also included to prevent overfishing or end overfishing and rebuild fisheries.

Measure 1a: Reduce the Number of Overfished Major Stocks of Fish from 56 to 45 by FY 2007				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	New	55
Actual		56	46 ¹	Available in the FY 2003 report
Met/Not Met				

¹ The original baseline was fifty-six of which ten were later reclassified as not being subject to overfishing requirements as defined in the Fisheries Management Plan.

Explanation of Measure

This measure focuses on the total number of overfished stocks defined as major stocks for which status is known; major stocks for which status is known numbers 167. A major stock is defined as a stock that yields annual catches of more than 200 thousand pounds (90.7 metric tons). There are approximately 905 stocks overall (as reported in the Annual Report to Congress), of which more than 600 are either unknown or undefined. The goal for this measure is to decrease the number of overfished major stocks from a FY 2000 baseline of forty-six to thirty-one by 2008. The original baseline was fifty-six of which ten were later reclassified as not being subject to overfishing requirements as defined in the Fisheries Management Plan.

The term overfishing means that the harvest rate is above a prescribed threshold. Overfished means that the biomass of a given fishery’s stock is below a prescribed threshold. Overfished stocks are defined in the Fisheries Management Plan.

FY 2002 Performance

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. At this time, it is not possible to assess this performance measure and determine whether the target has been met. However, NOAA Fisheries continued carrying out activities to address overfishing in FY 2002.

As stated previously, NOAA Fisheries implemented harvest specifications for the groundfish fisheries of the Bering Sea, Aleutian Islands, and Gulf of Alaska. The 2002 harvest limits and associated management measures became effective in January 2002 under an emergency rule that also implemented Stellar sea lion production measures. NOAA also proposed annual specifications and management measures which include many new protective management measures to reduce and eliminate directed or incidental catch of overfished Pacific groundfish stocks.

NOAA Fisheries also implemented in FY 2002 a Grants-based Process for Quota-based Research on Federally-Managed Fisheries in the Mid-Atlantic. The research program will allow for the set-aside of up to three percent of a species’ annual quota for research purposes. The program provides a mechanism to fund research and compensate vessel owners through the sale of fish harvested under the research quota. Through the Federal Register, NOAA solicited proposals for research. Collectively, the proposals to NOAA Fisheries involved research relating to the evaluation of changes in gear design that could reduce bycatch and discards in certain fisheries and cooperative stock assessment surveys in areas not traditionally sampled by NOAA’s Northeast Fisheries Science Center.

NOAA Fisheries completed the Fishermen’s Report of the 2002 Spring Bottom Trawl Survey that contains a catch summary of commercially and recreationally important species caught in the Cape Hatteras–Gulf of Maine area. Although records in this report are provisional and subject to change, the data provide fishermen with useful information about the distribution and relative abundance of species inhabiting the survey area.

Measure 1b: Reduce the Number of Major Stocks with an “Unknown” Stock Status to No More than 98 by 2007				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	New	120
Actual		120	120	Available in the FY 2003 report
Met / Not Met				

Explanation of Measure

The NOAA Fisheries Stock Assessment Improvement Plan identifies the current status of knowledge regarding the health of each stock under NOAA Fisheries authority. In many cases the current status is unknown. Not all unknown stocks are of equal importance, based on such parameters as the value and quantity of landings and known role in the ecosystem as key predators or forage. This performance measure tracks progress on improving the state of knowledge regarding the relative health of major stocks as defined in the annual Report to Congress on the status of stocks. By conducting stock assessments, NOAA Fisheries can reveal the potential yield of the stock relative to current yield and potential benefits forgone by overfishing, as well as subsequently specifying a target and trajectory for rebuilding the stock if overfished. This metric reports on the outcome of investments in staff, data acquisition (e.g., charter and research vessel days-at-sea), and stock assessment methodological research.

FY 2002 Performance

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. At this time, it is not possible to assess this performance measure and determine whether the target has been met. However, to better understand the resources, NOAA continues to conduct stock assessments.

In FY 2002, NOAA completed a stock assessment for Pacific sardine with estimates indicating the stock biomass remains at a relatively high abundance level, nearly 1.1 million metric tons. The population had been increasing at a rate of about 30 percent per year since the mid 1980s, but the rate of increase now appears to be more moderate.

In FY 2002, NOAA Fisheries researchers began cooperative research with tuna scientists from Japan and Taiwan on a new stock assessment model for North Pacific albacore. The research represents the first attempt to explore length-based modeling for albacore in the North Pacific. Length-based catch, size frequency, and fishing effort statistics have been compiled for some twenty-six international albacore fisheries across the North Pacific and a preliminary modeling framework has been established.

NOAA's Northwest Fisheries Science Center completed full stock assessments for Pacific whiting and canary rockfish. The Center provides the Pacific Fishery Management Council with stock assessments that are used to help determine the portion of the fish stock which may be harvested, given certain management objectives.

Also in FY 2002, NOAA completed a survey that provides the only fishery-independent estimate of juvenile pelagic shark abundance off the west coast. Some declines in catch per unit of effort and size of catch have been observed. Concurrent studies are providing valuable information on the life histories of these shark populations.

Measure 1c: Increase the Percentage of Plans to Rebuilding Overfished Major Stocks to Sustainable Levels				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	New	94%
Actual		93%	93%	Available in the FY 2003 report
Met / Not Met				

Explanation of Measure

This measure relates directly to the statutory requirements in the Magnuson Stevens Act that require Regional Councils to develop rebuilding plans for stocks of fish that have been identified as overfished. Section 304(e) outlines the specific parameters and time frames required for rebuilding. At this point in time, major and minor stocks have been differentiated to highlight the relative priorities and complexities of producing a rebuilding plan, and the consequent impact on performance measurement. Measurement of this metric will occur in the annual status of stocks report to Congress.

FY 2002 Performance

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. At this time, it is not possible to assess this performance measure and determine whether the target has been met. However, NOAA continued its task of rebuilding fisheries.

In FY 2002, NOAA declared that certain Pacific groundfish species were overfished. NOAA expects the Pacific Fishery Management Council to recommend large-scale closures for 2003 of the continental shelf off Washington, Oregon, and California to groundfish fishing. Some of the overfished species that are most severely depleted are continental shelf species. Rebuilding plans for all these species will be crafted in at least two amendments to the Fishery Management Plan.

Regarding the east coast, the New England Fishery Management Council approved a new Deep-sea Red Crab Fishery Management Plan. The plan would put in place measures to prevent overfishing, provide better management information, and control effort in this fishery.

NOAA also completed Amendment 6 to the FMP for the salmon fisheries in federal waters off of Alaska. Amendment 6 brings the FMP into compliance with the requirements of the Magnuson-Stevens Act by specifying objective and measurable criteria for identifying when fisheries are overfished. Conservation and management measures are also included to prevent overfishing or end overfishing and rebuild fisheries.

Program Evaluation

Virtually every aspect of National Marine Fisheries Service's (NMFS) fisheries science program is peer reviewed, either internally within NMFS or outside the agency by, for example, the National Academy of Sciences or the National Science Foundation. NMFS also relies on extensive informal networks of university partnerships and laboratories throughout the U.S. Moreover, reviews often occur by opposing parties' scientists in the court system when fisheries management decisions are litigated.

Performance Goal 2: Sustain Healthy Coasts

Corresponding Strategic Goal

Strategic Goal 3: Observe and manage the Earth's environment to promote sustainable growth.

Rationale for Performance Goal

The National Oceanic and Atmospheric Administration (NOAA) has three primary objectives to sustain healthy coastal ecosystems and the communities and economies that depend on them. These are to (1) protect, conserve, and restore coastal habitats and their biodiversity; (2) promote clean coastal waters; and (3) foster well-planned and revitalized coastal communities. To meet these objectives, NOAA integrates a broad range of research, assessment, and management activities from four of NOAA's five line offices: the National Ocean Service (NOS); the Office of Oceanic and Atmospheric Research (OAR); the National Marine Fisheries Service (NMFS); and the National Environmental Satellite, Data, and Information Service. NOAA works with many governmental and nongovernmental partners at local, state, national, and international levels to address the critical challenges facing coastal areas. NOAA measures its performance in meeting these objectives by tracking key outcomes, such as the acres of coastal habitat restored, changes in coastal water quality, number of coastal states with effective nonpoint pollution control programs, and the percentage of U.S. shoreline covered by improved ability to identify and mitigate the impacts of natural hazards.

FY 2002 Performance

In FY 2002, the Department of Commerce Office of the Inspector General conducted a review of this strategic goal and provided several recommendations. Some of these recommendations are reflected in the appropriate performance measures (see below).

In FY 2002, NOAA also accomplished a number of activities related to this strategic goal.

Several years of work with the State of Indiana paid off in 2002 when Indiana became the thirty-fourth state to join the Coastal Zone Management Program. In accordance with the Coastal Zone Management Act, Indiana is now eligible for federal funds in order to better manage its coastal zone. Under the program, Indiana is encouraged to balance economic growth with the protection of natural resources and sensible coastal development.

NOAA and the Environmental Protection Agency granted full approval to two new state coastal nonpoint pollution programs, bringing the total number of fully approved programs to ten. The Virgin Islands and Delaware join Maryland, Rhode Island, California, Puerto Rico, Virginia, Pennsylvania, New Hampshire, and Massachusetts as the only coastal states/territories with fully approved plans. States and territories with approved coastal nonpoint programs are eligible to receive federal funds intended to improve water quality by implementing enhanced stormwater management and erosion control programs, identifying and replacing failing septic systems, and building local capacity to manage pollution.

NOAA released the first-ever assessment of the conditions of the U.S. Coral Reefs. Led by NOS, under the auspices of the U.S. Coral Reef Task Force, this report indicates that there is increasing degradation of shallow-water reefs near inhabited coastal areas. In contrast, coral reefs distant from inhabited shores where fishing pressure is low are still in near-pristine condition. The report establishes a baseline against which future assessments will be compared, and provides scientists with a way to track and ultimately predict changes in reef conditions.

During FY 2002, NOAA's Hazardous Materials Response Division (HAZMAT) responded to more than ninety events, including oil and chemical spills, search and rescue efforts, and other emergencies. HAZMAT coordinated with industry and federal, state, and local agencies in these response efforts. For example, NOAA responded to a spill in Little Lake, Louisiana, of 70,000 to 90,000 gallons of oil from a submerged BP pipeline that ruptured when it was struck by a tugboat. HAZMAT assisted the USCG by coordinating the on-scene scientific response to the spill: conducting reconnaissance overflights, determining the fate and effect of the oil, evaluating cleanup techniques and results, and assessing the risk to natural resources and shorelines.

NOAA's Damage Assessment Center (DAC) worked on approximately twenty natural resource damage assessment and restoration cases. Five major cases were finalized in FY 2002. Among the cases brought to closure was one involving Mulberry Phosphates, Inc., which will pay \$4.6 million for the release of approximately fifty million gallons of acidic waste water into the Alafia River in Florida after a gypsum stack wall failed. Restoration of coastal wetland and riverine habitats and creation of oyster reefs will compensate for injuries that destroyed wetland vegetation, killed fish and shellfish, and violated water quality standards.

The multi-year cooperative effort between NOAA, the U.S. Navy, and the Mariners' Museum in Newport News, Virginia, to preserve the USS Monitor reached another major milestone in 2002. The ship's 150-ton revolving gun turret was successfully raised off the ocean floor, 140 years after it sank off the coast of North Carolina. This massive gun turret was the warship's most prominent feature and a landmark in naval engineering. The expedition has recovered more than 600 artifacts from the historic Civil War vessel, including its steam engine, condenser, a glass button, hydrometers, working thermometers, several intact lantern chimneys and two stanchions.

Measure 2a: Number of Acres of Coastal Habitat Benefited (Cumulative)				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	New	108,531
Actual			83,802	108,531
Met/Not Met				Met

Explanation of Measure

This measure, which tracks "acres benefited," replaces a discontinued measure that tracked "acres restored." Basically, this measure reflects the number of acres that benefit from projects sponsored by NMFS and funded under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA). The count includes acres adjacent to those restored that benefit from the restoration as well. For example, one project in 2001 will create seventy acres of marsh and protect up to thirty acres of the main habitat; it also will create about seventy-three acres of wetlands by trapping sediment. For a brief period the measure was changed to "acres restored," which does not accurately reflect the results of the program. The discontinued measure was recalibrated in FY 2001 and replaced with the more accountable measure of acres benefited. The new baseline includes acres benefited by NMFS-sponsored projects funded under CWPPRA. (See: <http://www.nmfs.noaa.gov/habitat/restoration/CWPPRA/index.html>)

FY 2002 Performance

Based upon the recommendations from the draft U.S. Department of Commerce Office of the Inspector General Audit Report No. FSD-14998 (November 2002), the targets and actuals for FY 2001 and FY 2002 have been revised to more accurately document this performance measure. As a result, the actual for FY 2001 is 83,002 acres and the target for FY 2002 should have been 108,531 acres (as opposed to the original target of 122,000) which is also the actual for FY 2002. Therefore, based on the revision, NOAA has met the target for FY 2002.

The original FY 2001 performance results incorrectly included one project scheduled for completion in FY 2002, two scheduled for completion in FY 2003, and two for which the number of benefited acres was overstated by 50 percent. Taken together, these five projects inflated NOAA’s FY 2001 count by approximately 33,000 acres (39 percent). The supported number of acres that should have been reported as benefited was approximately 83,002, not the 116,000 contained in the FY 2001 APP/FY 2003 APP.

Measure 2b: Reduce Introductions and Effects of Invasive Species in a Total of Six Regions within the United States				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	1	1	2	2
Actual	0	1	2	2
Met/Not Met	Not Met	Met	Met	Met

Explanation of Measure

Executive Order 13112, dated February 3, 1999, defines invasive species as “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” Many such species displace native species, disrupt the ecological integrity of ecosystems, and threaten the economic and recreational value of coastal resources. NOAA’s Sea Grant Program divides the country into six regions (Great Lakes, Northeast, Mid-Atlantic, Southeastern Atlantic and Gulf of Mexico, Pacific, and Northwest) for its activities related to invasive species.

Primarily through research and education, this measure covers the two components that result in an overall reduction in the number of invasive species introductions in the six regions around the country: (1) a decrease in the number of new non-indigenous species that become established in U.S. coastal regions from other countries, when compared to a base period and (2) a decrease in the spread of new non-indigenous species out of the region where they originally became established. Basically, this measure means that in any given period of time, NOAA is continually working towards the reduction of invasive species in at least two of the six regions, although the activities may also have positive effects on the other regions as well.

Invasive nuisance species have become a major threat to global biodiversity, second only to habitat degradation and loss. The nation’s coastal habitats and aquatic resources are both directly and indirectly affected by non-indigenous species silently entering our waters through a variety of pathways, including ballast water discharge, live bait, and aquaculture. Many of these invaders displace native species, disrupting the ecological integrity of their ecosystems and threatening the economic and recreational value of these coastal resources. A recent Cornell University assessment (Environmental and Economic Costs of Nonindigenous Species in the United States, by Pimental, Zuniga, and Morrison. 2000. BioScience 50: 53-65.) estimated that

the annual cost of all invasive species to the U.S. economy exceeds \$130 billion, which is more than twice the annual cost of damage caused by all natural disasters. NOAA's Office of Oceanic and Atmospheric Research will implement a program to monitor national marine sanctuaries for invasive species, develop rapid-response strategies to prevent and control invasive species in national marine sanctuaries and other areas, and continue support of ballast water demonstration projects.

FY 2002 Performance

In FY 2002, several projects were conducted by NOAA and could contribute significantly to solving invasive species. The following are examples of specific projects conducted within the six regions although final results will not be available until the end of the calendar year.

Preliminary reports indicate a degree of success in eradicating the invasive marine snail *Littorina saxatilis* from San Francisco Bay. In addition a control plan for the green crab that is likely to affect both shellfish aquaculture and crab fisheries on the west coast was completed in FY 2002. Although the plan covers both the east and west coasts, from a practical standpoint, control efforts are only likely to have an impact on the west coast.

NOAA's Great Lakes Environmental Research Laboratory has conducted research that demonstrates a serious environmental impact from zebra mussels in Lake Michigan. Amphipods, *Diporeia* spp., represent up to 75 percent of the benthic biomass in parts of Lake Michigan. They are a key prey item for many fish species, including whitefish, one of the few commercial species left in the Great Lakes. Because of competition from zebra mussels, *Diporeia* have virtually disappeared from large areas of Lake Michigan.

After successfully working to develop small-scale technology for ballast water treatment, NOAA has initiated a research program for ballast water technologies at a full-scale level. The Maritime Administration has partnered with NOAA and is allowing ships from the ready reserve fleet to be used as testing platforms.

NOAA has completed a rapid response protocol for western states that will enable the states to respond in a timely fashion to future invasions. Also, in order to detect new invasions in a timely manner, it is necessary to conduct monitoring activities. The National Estuarine Research Reserve System held a workshop on conducting monitoring surveys in coastal and estuarine areas.

NOAA's National Centers for Coastal Ocean Sciences has completed an inventory of non-native species for most taxa in Hawaiian waters. This establishes a baseline to enable NOAA to respond rapidly to new introductions of invasive species.

After testing over 600 different pathogens, NOAA Sea Grant-sponsored research may have found a pathogen which is extremely effective against zebra mussels and species specific so that it will not harm native bivalves. It is a pseudomonas bacterium found in soil and it affects the digestive gland on zebra mussels.

Measure 2c: Percentage of U.S. Shoreline and Inland Areas that have Improved Ability to Reduce Coastal Hazard Impacts

	FY 1999	FY 2000	FY 2001	FY 2002
Target	5%	14%	6%	15%
Actual	7%	8%	8%	8%
Met/Not Met	Met	Not Met	Met	Not Met

Explanation of Measure

This measure tracks improvements in NOAA's ability to estimate the risks of natural hazards in U.S. coastal regions. Activities are underway to develop a coastal risk atlas that will enable communities to evaluate the risk, extent, and severity of natural hazards in coastal areas. The risk atlas will help coastal communities make more effective hazard mitigation decisions to reduce the impacts of hazards to life and property. Currently, many coastal communities make major decisions on land use, infrastructure development, and hazard responses without adequate information about the risks and possible extent of natural hazards in their area. Through the coastal risk atlas, NOS, with other federal and state agencies, will provide a mechanism for coastal communities to evaluate their risks and vulnerabilities to natural hazards for specific U.S. coastal regions and improve their hazard mitigation planning capabilities. Two projects begun in FY 2001, however, were not scheduled for completion until FY 2002. Annual percentages are calculated by dividing the total amount of U.S. shoreline (97,128 miles) into the cumulative amount of shoreline addressed by projects in support of this measure.

Regarding the dramatic decline in the FY 2001 target, the FY 2000 target was based on an expectation that the Coastal Risk Atlas would receive funding that year and work would be done. The project was not funded in FY 2000, so anticipated progress on the measure was not made. The one percent added in FY 2000 (from 5 percent in 1999 to a total cumulative 6 percent in 2000) resulted from other projects benefiting the shorelines of Tillamook County, Oregon; Maui County, Hawaii; and the entire coast of Rhode Island.

FY 2002 Performance

In FY 2002, NOAA anticipated the completion of coastal risk atlas pilot projects for Mississippi and Florida. Florida has 8,436 miles of shoreline and Mississippi has 359 miles of shoreline. However, following an end-of-year review of the product delivered by a project partner, NOAA determined that the pilots needed additional work before they could be considered complete. Therefore, NOAA did not meet its FY 2002 target for this measure.

In FY 2002, the Department of Commerce Office of the Inspector General performed an audit on this particular performance measure. Findings from the audit required NOAA to modify performance figures reported in past years. Specifically, earlier reporting included only 675 miles of shoreline in North Carolina. The entire shoreline of North Carolina, totaling 3,375 miles, should have been counted. In addition, an updated calculation of the total amount of shoreline in the United States revealed a total of 97,128 miles. The figure previously used was 95,439 miles. These adjustments are reflected in the numbers reported above.

Program Evaluation

NOAA's goal to sustain healthy coasts is the product of more than twenty-five years of experience helping to understand and manage coastal resources so that their ecological and economic productivity can be fully realized and sustained. Evaluation efforts exist at a variety of levels, from peer reviews of proposals and evaluations of individual projects, to internal and external reviews of entire programs and quarterly reviews of NOAA's overall performance in coastal stewardship areas. Constituent input is an important part of the evaluation process and is solicited regularly through constituent workshops.

Performance Goal 3: Recover Protected Species

Corresponding Strategic Goal

Strategic Goal 3: Observe and manage the Earth's environment to promote sustainable growth.

Rationale for Performance Goal

To recover protected species, the National Oceanic and Atmospheric Administration (NOAA) aims to prevent the extinction of protected species and to maintain the status of healthy species. NOAA measures its performance in meeting these objectives by focusing on the Agency's ability to manage protected species through conservation programs and recovery plans and through constant monitoring of and research into the status of species and the stresses that affect their mortality.

Changes to the Performance Measures

For the moment, NOAA will continue to use existing performance measures for this strategic planning goal. However, NOAA Fisheries is continually making improvements on its performance measures to better reflect the Agency's challenging responsibilities and performance in managing the living marine resources of the U.S. These new measures will be integrated as they are developed and will also be considered carefully during the development of a new NOAA strategic plan.

To assist NOAA Fisheries, a workshop was held in June 2002 to solicit input and map a new path for fisheries management performance. Regarding endangered and threatened species, recommendations were made that performance measures should not only evaluate recovery of the stock but also show whether the stock population is increasing or decreasing and how it relates to recovery plan or take reduction plan goals. Performance measures should also indicate the value added of fishing gear modification and change, e.g., number of turtles saved. With regards to bycatch, performance measure needs to define the bycatch level, evaluate the level of bycatch, and show changes in response to management actions. Performance measure should also evaluate how well the U.S. meets international bycatch agreements.

FY 2002 Performance

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. Therefore, it is not possible at this time to assess this performance goal and determine whether the targets have been met. However, NOAA continued its work to recover protected species.

NOAA proposed changes to fishing rules to better protect North Atlantic right whales and other large whales from entanglement in lobster trap, pot and gillnet gear along the east coast of the U.S. The proposed rule changes would add to existing measures to reduce large whale entanglements. NOAA also worked with Cornell University and the Gulf of Maine Oceanographic Observation Program to support and help coordinate the installation of passive listening devices in right whale habitats. The outcome has been very good with numerous right whale detections being made and correlated with co-occurrence of prey.

NOAA developed a Stock Assessment Improvement Plan for Marine Mammals in FY 2002 which includes an appraisal of information needs to assess the status of marine mammals and to support the management decisions related to marine mammal conservation. NOAA also completed draft recovery plans for loggerhead and Kemp's ridley turtles.

In early FY 2002, NOAA published a policy on human recreational interactions with wild marine mammals. The policy is intended to be an immediate step to address the numerous inquiries NOAA Fisheries receives from constituents about inappropriate, impermissible, and potentially harmful interactions between the public and marine mammals in their natural habitats.

NOAA's Northwest Fisheries Science Center has developed a "biggest bang for the buck" approach that melds economics and biology in one cost-effectiveness ratio for Pacific salmon management actions. Pilot research has established this to be both feasible and defensible. NOAA fisheries scientists are now applying this approach to particular recovery arenas. Specifically, scientists are estimating the increase in growth of EPA-listed salmon populations per million dollars of direct costs associated with well-defined management actions.

Measure 3a: Reduce by 10 (from a FY 2000 Baseline of 27) by FY 2007, the Number of Threatened Species at risk of extinction				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	2	2
Actual			2	Available in the FY 2003 report
Met/Not Met			Met	

Explanation of Measure

The measure addresses ten of the twenty-seven threatened species that have been identified as the threatened species most in danger of becoming endangered with extinction. The authority to list species at "threatened" or "endangered" is shared by the National Marine Fisheries Service, which is responsible for listing most marine species, and the Fish and Wildlife Service of the Department of the Interior, which administers the listing of all other plants and animals. There are two classifications under which a species may be listed:

- Species determined to be in imminent danger of extinction throughout all of a significant portion of their range are listed as "endangered"
- Species determined likely to become endangered in the foreseeable future are listed as "threatened."

The threatened species include the Atlantic salmon, Johnson's seagrass, the loggerhead turtle, the green turtle, the olive ridley turtle, Stellar sea lions, and four species of Pacific salmonids.

Strategies to accomplish this performance measure include enforcing existing conservation measures; conducting priority research as identified in species recovery plans; developing partnerships with states and others to implement conservation programs; and building the tools and technology to improve the effectiveness of conservation actions.

FY 2002 Performance

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. At this time, it is not possible to assess this performance measure and determine whether the target has been met. However, NOAA undertook several activities relevant to this performance measure.

In FY 2002, NOAA implemented an emergency rule to protect Stellar sea lions, which includes harvest limits and associated management measures for the groundfish fisheries in federal waters off the coast of Alaska. The rule initiates the permanent implementation of the Fisheries Management Council’s recommendation on measures to mitigate impacts of the Pollock, Pacific cod, and Atka mackerel fisheries on Stellar sea lions and their critical habitat.

NOAA Fisheries implemented measures to reduce incidental capture of sea turtles in pound net fisheries of the mid-Atlantic. Strandings of sea turtles have been documented in high numbers and have been primarily linked to the pound net fishery in certain areas and under certain gear configurations.

NOAA Fisheries also implemented modifications to the Turtle Excluder Device (TEDs) regulations to ensure exclusion (escapement) of large loggerheads, green turtles, and leatherbacks in affected fisheries. In addition, NOAA Fisheries increased enforcement through stepped-up state and federal patrols for TEDs enforcement along the Atlantic seaboard.

NOAA Fisheries also completed the estimation of survival of juvenile salmon passing through the Snake and Columbia River dams and reservoirs. Accurate and up-to-date survival information is essential for recovering listed populations of Columbia River Basin salmon and to ensure sustainability of non-listed stocks.

Measure 3b: Increase the Number of Commercial Fisheries that Have Insignificant Marine Mammal Mortality

	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	2	6
Actual			2	Available in the FY 2003 report
Met/Not Met			Met	

Explanation of Measure

This measure tracks the number of commercial fisheries where marine mammal deaths are substantial and where deaths will be reduced to insignificant levels by 2007. By definition, insignificant levels mean that total mortality or rate of death is no more than 10 percent of the maximum number of marine mammals that could die from human-caused mortality. For this measure, fifteen out of thirty-two fisheries have been targeted.

One of the most significant impacts on marine mammal stocks is death from entanglement and drowning in fishing gear. Certain marine mammal species are particularly vulnerable to interactions with fisheries because of location and type of fishing gear used. The fifteen fisheries and marine mammal stocks targeted in this measure are the following: For the Western North Atlantic stock of coastal bottlenose dolphins, the fisheries are the Mid Atlantic coastal gillnet, North Carolina inshore gillnet, Southeast Atlantic gillnet, Southeast Atlantic shark gillnet, Atlantic blue crab trap or pot, Mid Atlantic haul or beach seine, North Carolina long haul seine, North Carolina roe mullet stop net, and Virginia pound net. For the Gulf of Main/Bay of Fundy stock of harbor porpoise, the fishery is the Northeast sink gillnet. For the Atlantic large whale, the fisheries are the Northeast and Mid Atlantic American lobster trap or pot, Northeast sink gillnet, Mid Atlantic coastal gillnet, and Southeast Atlantic shark gillnet. Finally, for the Pacific new fishing technologies to reduce gear impacts need to be developed, and strategies to reduce offshore cetaceans, it is the California and Oregon fishery for thresher shark and swordfish. interactions between fishing gear and marine mammals need to be devised. NOAA also needs to educate fishermen about how they can avoid marine mammals while still being able to catch fish.

A successful program to reduce mortality of marine mammal stocks will require research on marine mammal behavior, assessment of marine mammal populations, reduction of interactions in problem fisheries, and monitoring and analysis via the observer program.

FY 2002 Performance

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. At this time, it is not possible to assess this performance measure and determine whether the target has been met.

In FY 2002, NOAA Fisheries implemented multiple management components to increase protection for right whales. This is consistent with the provisions of reasonable and prudent alternatives in biological opinions on the lobster, multispecies, monkfish, and dogfish fishery management plans. The components include management provisions and expanded gear modifications for lobster and gillnet fisheries.

In FY 2002, NOAA Fisheries reported on the incidental mortality of marine mammals in the California gillnet fisheries. The incidental mortality estimates of marine mammals in this fishery are used to monitor the magnitude of marine mammal/fishery interactions and to assist in fishery management.

In addition, NOAA partnered with the states of Maine, Massachusetts, and Rhode Island and representatives of the commercial fishing industry and organized a workshop on gear modifications to reduce the risk of entanglement to marine mammals.

Measure 3c: Reduce by 11 (from a FY 2000 Baseline of 29) by FY 2007, the Number of Endangered Species at Risk of Extinction				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	3	6
Actual			3	Available in the FY 2003 report
Met/Not Met			Met	

Explanation of Measure

The term “endangered species” is defined in the Endangered Species Act as any species that is in danger of extinction. Of the list of twenty-nine endangered species, eleven have been identified as the most critically in danger of extinction. These eleven species include the Pacific leatherback turtle, kemp’s ridley turtle, hawksbill turtle, Hawaiian monk seal, Western Stellar sea lion, shortnose sturgeon, and five species of Pacific salmonids. Efforts to prevent extinction will focus on identifying the factors that contribute to extinction and developing and implementing recovery plans to address these factors. Reducing the probability of extinction requires a reduction in human activities that are detrimental to the survival of protected species, that is, reducing incidental and direct catch (takes), increasing species habitat, decreasing negative interactions, and mitigating natural phenomena.

FY 2002 Performance

The FY 2002 fisheries data will not be available until the FY 2003 Annual Program Performance Report is published. At this time, it is not possible to assess this performance measure and determine whether the target has been met.

In FY 2002, NOAA conducted surveys off the coastal waters of Puerto Rico and the U.S. Virgin Islands combining passive acoustic technology and visual sighting methods to effectively document the distribution and habitat use of humpback whales during winter breeding season. Significant numbers of endangered humpback whales migrate to the West Indies each year to breed, and many occupy the coastal waters of Puerto Rico and the U.S. Virgin Islands.

NOAA also conducted three comprehensive aerial surveys to determine nesting activity of leatherback turtles along the Pacific coast of Mexico and Central America. These collaborative surveys with Mexico fulfill U.S. commitments under the Mexico-U.S. Pacifico Agreement to census and protect nesting leatherback turtle populations.

NOAA completed a draft recovery plan for the endangered Gulf of Maine Distinct Population Segment Atlantic salmon. In FY 2001, NOAA Fisheries and the Department of Interior Fish and Wildlife Service listed this species as endangered. The final recovery plan should be completed by May 2003.

In FY 2002, research was conducted on the genetic effects of interactions between hatchery and native salmon species (wild). A key conservation goal is to mitigate any adverse genetic effects that hatchery fish may have on wild populations of salmon, but this is possible only if genetic effects can be quantified. Biologists understand that a big step in that direction is to acquire a sound estimate of the relative mating success and survival of hatchery-produced and natural-produced salmon.

Program Evaluation

Evaluation efforts include peer reviews of proposals, internal and external reviews of programs, and quarterly reviews of NOAA's overall performance in protected species recovery. Constituent input is an important part of the evaluation process and is solicited regularly through constituent workshops.

Performance Goal 4: Advance Short-term Warnings and Forecasts

Corresponding Strategic Goal

Strategic Goal 3: Observe and manage the Earth’s environment to promote sustainable growth.

Rationale for Performance Goal

The environment has profound effects on human welfare and economic well-being. Each year hundreds of lives and billions of dollars are lost due to severe storms, floods, and other natural hazards. The National Oceanic and Atmospheric Administration’s (NOAA’s) current ability to predict short-term change is restricted by observations that are incomplete. This limits the ability to improve basic understanding and predictive modeling of weather and other natural phenomena. Although we can do nothing to prevent natural disturbances, we must do everything possible to minimize impact on humans. NOAA must improve its observing systems, develop a better understanding of natural processes, and enhance numerical weather prediction models and dissemination systems.

FY 2002 Performance

Overall, nine out of twelve performance targets were met for this goal in FY 2002. NOAA met its performance targets for tornado, winter storm and flash flood warning lead time and accuracy; hurricane track forecasts, and heavy precipitation forecasts. The targets for aviation ceiling and visibility forecasts and tornado warning false alarm rate were not met.

Measure 4a: Lead Time (minutes), Accuracy (%), and False Alarm Rate (FAR, %) for Severe Weather Warnings for Tornadoes					
		FY 1999	FY 2000	FY 2001	FY 2002
Lead time (min)	Target	11	12	13	11
	Actual	12	10	10	12
	Met / Not Met	Met	Not Met	Not Met	Met
Accuracy (%)	Target	70%	70%	68%	69%
	Actual	70%	63%	67%	77%
	Met / Not Met	Met	Not Met	Not Met	Met
FAR (%)	Target	72%	65%	73%	71%
	Actual	73%	76%	73%	76%
	Met / Not Met	Not Met	Not Met	Met	Not Met

Explanation of Measure

The lead time for a tornado warning is the difference between the time the warning was issued and the time the tornado affected the area for which the warning was issued. The lead times for all tornado occurrences throughout the year are averaged to get this statistic. The accuracy of the warnings is the percentage of times a tornado actually occurred in an area that was covered by a warning. The false alarm rate is the percentage of times a tornado warning was issued but no tornado occurrence was verified. The false alarm rate was added as a reportable measure in FY 2000, although it had been collected and used internally previously. NOAA will continue data collection and verification, and false alarm rates will be reported in future years.

FY 2002 Performance

NOAA Weather Service exceeded the performance targets for both tornado warning lead time and accuracy. The target for FAR was missed by two percent that is statistically insignificant when considering the overall trend line for the measure. Improved performance in FY 2002 can be attributed to, in part, improved training for NOAA field forecasters through use of a weather event simulator, implementation of best practice procedures during storm events, and providing improved resolution of precipitation data to forecasters by retrofitting NEXRAD processors.

Measure 4b: Lead Time (minutes) and Accuracy (%) for Severe Weather Warnings for Flash Floods

		FY 1999	FY 2000	FY 2001	FY 2002
Lead time (min)	Target	54	55	45	45
	Actual	44	43	46	52
	Met / Not Met	Not Met	Not Met	Met	Met
Accuracy (%)	Target	85%	86%	86%	86%
	Actual	85%	86%	86%	89%
	Met / Not Met	Met	Met	Met	Met

Explanation of Measure

The lead time for a flash flood warning is the difference between the time the warning was issued and the time the flash flood affected the area for which the warning was issued. The lead times for all flash flood occurrences throughout the year are averaged to get this statistic. The accuracy of the warnings is measured by the percentage of times a flash flood actually occurred in an area that was covered by a warning. NOAA's actions include data collection and verification, and new performance measures will be reported in future years. NWS expects steady improvement in both flash flood lead time and accuracy leading into FY 2003. The steady improvement is linked to the planned implementation of new flash flood decision assistance tools in FY 2002 and NEXRAD retrofits in FY 2003. The NEXRAD retrofits will allow NWS forecasters to run new algorithms for improved rainfall estimates.

FY 2002 Performance

NOAA met both goals for flash flood warning lead time. Improved performance in FY 2002 can be attributed, in part, to implementation of new software (FFMP 2.0) that provides improved decision-making tools for forecasters during flash flood events. In addition, NOAA Weather Service has improved training for field forecasters through use of a weather event simulator and by providing them with improved resolution of precipitation data by retrofitting NEXRAD processors (i.e., ORPG).

Measure 4c: Accuracy of Hurricane Track Forecasts (48 Hours)

	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	New	142
Actual				124
Met/Not Met				Met

Explanation of Measure

Track forecasts have a significant impact on the U.S. economy. The average cost to evacuate the Atlantic coastline of the U.S. is approximately \$1 million dollars per mile. By improving track forecasts NOAA can both save lives and avoid unnecessary economic losses. This goal measures the difference between the projected location and the actual location in nautical miles for a 48-hour forecast. This measure has been reintroduced in the FY 2003 Annual Performance Plan (in FY 1998, NOAA stopped using the 48-hour forecast), replacing hurricane landfall warning lead time. Although landfall warnings are critical, only one to two storms make landfall in the U.S. each year. No storms made landfall during 2000 and 2001. Based on feedback from our key users, including emergency managers, NOAA Weather Service has concluded the track forecast measure provides a better gauge for the performance of our hurricane forecasting operations. Although NOAA Weather Service maintains statistics on 24-, 48-, and 72-hour hurricane track forecasts, the 48-hour measure is the most important time frame for emergency managers and other government officials to make planning decisions related to hurricanes, including coastal evacuations. The FY 2002 target was consistent with the trend for the last thirty years. The track accuracy will show steady improvements in the outyears with continued investment in hurricane models and forecasting techniques, including use of ensemble forecasts and completion of ongoing research within the U.S. Weather Research Program (USWRP).

FY 2002 Performance

NOAA met its target for FY 2002. NOAA’s performance was better than expected during an El Niño year. Forecasts for late season storms such as Isador, Lila, and Kyle were better than average, improving the overall score for the year. The systems formed in the lower latitudes and lasted for a longer period of time, helping forecasters predict the track of the storm.

Measure 4d: Accuracy (%) of 3-day Forecast of Precipitation

	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	20%	22%	17%
Actual		16%	19%	26%
Met/Not Met		Not Met	Not Met	Met

Explanation of Measure

The measure reflects the ability to accurately forecast a precipitation event three days in advance. NOAA’s actions include data collection and verification.

The Hydrometeorological Prediction Center (HPC) of the NOAA National Weather Service began providing quantitative precipitation forecasts (QPFs) in 1961. These forecasts indicate how much precipitation is expected, not just whether it will rain or snow. HPC has focused on relatively heavy amounts of precipitation, usually a half inch or more in a 24-hour period, because of the major safety and economic impacts such heavy precipitation can have in producing flooding, alleviating drought, and affecting river navigation. The HPC began making QPFs through two days into the future in 1965 and through three days in 2000.

The HPC has tracked the accuracy of these forecasts very carefully over the years using a metric that is very challenging. This accuracy metric ranges from zero percent, indicating no skill, to 100percent for a perfect forecast. In verifying the accuracy of a one-inch precipitation forecast for day 1, for example, the HPC first determines everywhere in the U.S. where an inch or more actually fell and was observed by rain gauges. On a given day this occurs only over a very small percentage of the country, although wherever it falls is a significant event for the people and nature existing in that particular area. The HPC then compares these observed one-inch areas with the one-inch areas it had forecasted counting only those points in the U.S. where HPC forecasted and observed at least an inch as being an accurate forecast (these points are called “hits”). Thus, if HPC forecasts one inch to fall at the point representing Washington, DC, and it observed only three quarters of an inch actually had fallen in that specific area, the forecast is then rated as a “miss”, even if an inch of rain was observed to have fallen at the points nearby representing the area of Fairfax City, Virginia, or the area of Upper Marlboro, Maryland. The overall accuracy score for the country for that particular day 1 forecast is then determined by dividing the total number of correctly forecast points (hits) by the total number of points where HPC had either forecast it would rain an inch or it had actually rained an inch. In summary, to earn a high accuracy score, HPC has to forecast the time, place, and amount of precipitation very well.

Two important points should be noted. First, although the accuracy scores are low with respect to perfection, the accuracy is clearly sufficiently high to be of major utility to U.S. decision-makers. Second, the scores are continuing to improve in accuracy. The metrics from the last forty years indicate the day 2 forecasts of one inch of precipitation in 2001 had the skill of day 1 forecasts in 1984, and our day 3 forecasts in 2001 were as accurate as our day 2 forecasts in 1989.

FY 2002 Performance

The skill in FY 2002 was significantly higher than anticipated. The higher scores can be attributed to the following factors: 1) higher resolution regional weather models run on the new weather and climate supercomputer, 2) a focused training effort for forecasters, 3) new collaborative forecasts approach between HPC and the River Forecast Centers, and 4) a higher number of intense rainfall events in the later half of the year that were easier to forecast. NOAA Weather Service plans to revise out-year performance targets for this goal, given the improved skill scores in FY 2002.

Measure 4e: Lead Time (Hours) and Accuracy (%) of Winter Storm Warnings					
		FY 1999	FY 2000	FY 2001	FY 2002
Lead time (hrs)	Target	New	12	13	13
	Actual	11	9	13	13
	Met / Not Met		Not Met	Met	Met
Accuracy (%)	Target	New	85%	86%	86%
	Actual	85%	85%	90%	89%
	Met / Not Met		Met	Met	Met

Explanation of Measure

A winter storm warning is issued when four or more inches of snow or sleet are expected in the next twelve hours, or six or more inches in twenty-four hours, or one-quarter of an inch or more of ice accretion. This performance indicator measures the accuracy and advance warning lead time of these conditions. Improving the accuracy and advance warnings of winter storms enables the public to take the necessary steps to prepare for disruptive weather conditions. With the introduction of high-resolution regional forecast models and the introduction of new operational forecast techniques in FY 2002 and FY 2003, NWS lead times will improve to fifteen minutes and 90 percent accuracy by FY 2005.

FY 2002 Performance

NOAA met both performance measure targets for Winter Storm Warnings. In FY 2002, NOAA Weather Service began using higher resolution (i.e., 12 km) regional weather forecast models and shorter-range ensemble forecasts to improve skill. In addition, NOAA Weather Service conducted intense field training sessions to leverage best practices processes and improve multi-office coordination during storm events.

Measure 4f: Accuracy (%) and FAR (%) of Forecasts of Ceiling and Visibility (Aviation Forecasts)					
		FY 1999	FY 2000	FY 2001	FY 2002
Accuracy (%)	Target	New	20%	21%	18%
	Actual	19%	15%	18%	13%
	Met / Not Met		Not Met	Not Met	Not Met
FAR (%)	Target	New	50%	51%	52%
	Actual	52%	53%	51%	58%
	Met / Not Met		Not Met	Met	Not Met

Explanation of Measure

In accordance with the NOAA Weather Service strategic plan, this measure was added in FY 2000 to reflect a segment of customers that had not been represented in other performance measures. Visibility and cloud ceiling forecasts are critical for the safety of aircraft operations.

FY 2002 Performance

NOAA Weather Service missed the target for accuracy and false alarm rate. The missed targets were primarily related to unforeseen season weather patterns. The winter of FY 2001/2002 was the second warmest winter on record, reducing the overall number of poor visibility events by thirty percent to thirty-five percent below the annual average. Fewer events tend to lower skill scores in a given year. NOAA Weather Service plans to replace this performance target in the FY 2004 Annual Performance Plan with aviation forecasts for instrument flight rules. This new goal is more relevant to key users, provides better skill targets, and occurs more often, reducing the impact of seasonal weather variation.

Measure 4g: Accuracy (%) of Forecast for Winds and Waves (Marine Forecasts)

	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	49%	51%	53%
Actual	50%	51%	52%	53%
Met/Not Met		Met	Met	Met

Explanation of Measure

In accordance with the NOAA Weather Service strategic plan, this measure was added in FY 2000 to reflect another segment of customers that had not been represented in other performance measures. This performance indicator measures the accuracy of wind and wave forecasts, which are important for marine commerce. NOAA actions to be taken include data collection and verification, which will be added to forecasts for the Great Lakes.

FY 2002 Performance

NWS met the target for FY 2002. Forecasting skill improved slightly due to implementation of a new wave forecasting model and focused training for NWS forecasters.

Program Evaluation

NOAA’s vision for FY 2005 is to provide significantly-improved short-term warning and forecast products and services that enhance public safety and the economic productivity of the U.S. 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 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 is also involved in program analysis and evaluation processes on a national level.

Performance Goal 5: Implement Seasonal to Interannual Climate Forecasts

Corresponding Strategic Goal

Strategic Goal 3: Observe and manage the Earth’s environment to promote sustainable growth.

Rationale for Performance Goal

The National Oceanic and Atmospheric Administration (NOAA) works with academic and international partners to provide one-year lead time forecasts of global climate variability, especially that result from El Niño/Southern Oscillation (ENSO), and consequent precipitation and surface temperature distributions. These forecasts increase society’s ability to mitigate economic losses and social disruption resulting from such events.

FY 2002 Performance

Based on preliminary data, the target was met on three of the four performance measures for this goal.

For the measure on correlation accuracy, the FY 2002 correlation was again computed using the past fifteen years of monthly values of forecast. Anomalous sea surface temperature (SST) was also observed in a particular area in the Eastern Tropical Pacific Ocean region. An anomalous SST or SST anomaly is the amount by which the SST differs from the long-term average (also called the climatological average).

Regarding the temperature skill score, NOAA missed the goal for the year. The El Niño pattern experienced in FY 2002 was less severe than anticipated, impacting the overall accuracy of climate forecasts for the year.

For the new climate observation measure, U.S. deployments of the Argo profiling float system increased substantially during FY 2002 and continued above target. This system is the largest new climate observing system currently being deployed with NOAA support.

Measure 5a: Determine the Accuracy of the Correlation between Forecasts of the Southern Oscillation Index (SOI) and El Niño / La Niña Events				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	0.85	0.85	0.85	0.85
Actual	0.85	0.84	0.85	0.85
Met/Not Met	Met	Not Met	Met	Met

Explanation of Measure

The atmosphere is tightly linked to ocean temperatures and circulation patterns. The pattern of warming of the tropical Pacific over periods of three to seven years known as ENSO has a tremendous impact on U.S. and global climate. This measure specifically assesses the correlation between forecasts of Pacific sea surface temperatures (based on models) and actual sea surface temperature (based on satellite and on site observations).

NOAA's ENSO forecasts have become much more reliable in recent years. The 1997–98 El Niño (the warm phase of the ENSO cycle) was the best monitored and most successfully predicted El Niño on record. Typical impacts on the U.S. and the Atlantic basin include the following:

- Hurricanes: Below normal number of tropical storms/hurricanes in the Atlantic, although this does not imply any limits on the strength or location of any given tropical system.
- Monsoons: A drier-than-normal North American monsoon, especially for Mexico, Arizona and New Mexico.
- Drought: A drier-than-normal fall and winter in the U.S. Pacific Northwest.
- Wintertime Storms: A wetter-than-normal winter in the Gulf Coast states from Louisiana to Florida, and in central and southern California if El Niño is strong.
- Warmer Temperatures: A warmer than normal late fall and winter in the northern Great Plains and upper Midwest.

NOAA provided advanced forecast of El Niño effects, leading to great savings in a variety of economic sectors. Weather and climate sensitive industries that are directly impacted by weather (such as agriculture, construction, energy distribution, and outdoor recreation) account for nearly 10 percent of GDP. Furthermore, weather and climate indirectly impact an even larger portion of the nation's economy, extending to parts of finance and insurance, services, retail and wholesale trade, as well as manufacturing. El Niño impacts important business variables like sales, revenues, and employment in a wide range of climate-sensitive industries and sectors. Overall, total U.S. economic impacts of the 1997-1998 El Niño were estimated to be on the order of \$25 billion.

ENSO forecasts require a variety of data, such as ocean observations, remote satellite-based observations, and terrestrial measurements. This program is the only federal effort aimed at providing forecasts of climate events and their consequent impact. NOAA will undertake efforts to determine the limits of predictability of atmospheric changes induced by tropical Pacific sea surface temperature changes; to diagnose and model the global response to warm, cold, and neutral states of the ENSO cycle; and to examine the changes in probabilities of extreme events induced by ENSO.

FY 2002 Performance

The FY 2002 correlation was computed using the past fifteen years of monthly values of forecast. Anomalous sea surface temperature (SST) was also observed in a particular area in the Eastern Tropical Pacific Ocean region. As stated previously, an anomalous SST or SST anomaly is the amount by which the SST differs from the long-term average (also called the climatological average). For example, if an observed SST is thirty degrees Celsius and the climatological average for that location and for that time of year is twenty-eight degrees Celsius, then the anomalous SST is two degrees Celsius. The area with this observed anomaly extends from about 550 kilometers south of the Equator to 550 kilometers north, starting from about 1100 km east of the dateline and extends eastward 5500 km. Researchers will refer to this area in shorthand as the Nino3.4 area.

The global atmospheric circulation is particularly sensitive to the surface temperatures of the tropical oceans. Persistent temperature anomalies in the tropics can lead to a shift in the global climate. On seasonal to interannual time-scales the El Niño -Southern Oscillation (ENSO) phenomenon is by far the strongest example. One way that El Niño manifests itself is by strong SST anomalies in the eastern tropical Pacific. In the ENSO forecasts, it is of particular concern that these anomalies are accurately observed. So to measure the accuracy of the forecast, the forecast temperature anomalies are compared with subsequently observed temperature anomalies averaged over the Nino3.4 area. This performance measure is the correlation between these two series of numbers. For FY2002 the series extend from September 1987 through August 2002. The computed correlation is 0.85.

This sea surface temperature correlation is a measure of how accurately we can predict the warmth in a key part of the tropical Pacific, a central feature of the ENSO cycle. A correlation of 1.0 would be a perfect forecast, which is unattainable. In years when there is a strong El Niño, NOAA will typically do better than when such a warm event is absent.

Measure 5b: U.S. Temperature – Skill Score				
	FY 1999	FY 2000	FY 2001	FY 2002
Target	20	20	20	20
Actual	23	25	20	18
Met/Not Met	Met	Met	Met	Not Met

Explanation of Measure

The Heidke Skill Score is one of several accepted standards of forecasting in the scientific community. It is calculated as follows:

$$\text{Heidke skill score: } S = ((c-e)/(t-e)) \times 100$$

where c = number of stations correct

and e = number of stations correct by chance = (1/3) x total number of stations in a 3 equal class system

and t = number of stations, total

S is approximately equal to one-half of the correlation between forecast and observations.

The end of the year actual represents a running average of mean score for the previous forty-eight months. Accurate measures of temperature are critical to many sectors of the U.S. economy, including agriculture and energy utilities. This measure compares actual observed temperatures with forecasted temperatures from areas around the country. For those areas of the U.S. where a temperature forecast (warmer than normal, cooler than normal, normal) is made, this score measures how much better the prediction is than the random chance of being correct.

Therefore, the HSS is a function of both whether a forecast verifies and whether it was predicted, but does not reward when the forecast verifies by chance. Skill score is based on a scale of -50 to +100. If forecasters match a random prediction, the skill score is zero. Anything above zero shows positive skill in forecasting. Given the difficulty of making advance temperature and precipitation forecasts for specific locations, a skill score of 20 is considered quite good and means the forecast was correct in almost 50 percent of the locations forecasted. Forecasts will likely be better in El Niño years than in non-El Niño years. A physical interpretation of small departures in the average skill score around 20 is hard to quantify.

FY 2002 Performance

NOAA Weather Service missed the target for the year. Skill of seasonal prediction is influenced by the strength of predictors, El Niño being one. The El Niño pattern experienced in FY 2002 was weak-to-moderate, resulting in reduced overall accuracy of climate forecasts for the year. However, the preliminary actual is within the standard deviation of +/- 1 point for this measure. NWS is planning a major increase in climate computing capacity and associated model resolution in FY 2003. These computing enhancements may provide some improvement in skill scores.

Measure 5c: Number of New Monitoring or Forecast Products that Become Operational per Year (cumulative)

	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	4	8
Actual			4	8
Met/Not Met			Met	Met

Explanation of Measure

This performance measure reflects the seasonal to interannual climate team’s commitment to public service by stressing products that are available for public usage rather than data sets. A major motivation for this change was the formation of the new NOAA Climate Observations and Services program. New products will be developed and tested through NOAA research and implemented operationally through the NWS’s Climate Prediction Center or NCDC, as appropriate. As NOAA implements these products, usage will be evaluated through data transfers and external constituent interactions.

FY 2002 Performance

Four new operational monitoring and forecast products became available to the public in FY 2002, namely:

- 1 A gridded, daily U.S. surface temperature analysis for monitoring monthly and seasonal outlooks.
- 2 Global monthly precipitation analyses extending back to 1948.
- 3 A prototype near real-time global precipitation analyses every half hour at 8 Km spatial resolution.
- 4 Heat Index forecasts expressed in probabilistic terms.

Research advances provide the potential for NOAA to significantly expand its range of climate products and services, particularly in areas of high customer demand for information and where climate variability significantly affects national interests. Examples include improved information on and forecasts of extreme climate events, such as droughts and floods, and development of new forecasts on time scales that are not currently included in NOAA’s operational product line but where customer demand and interest is large and growing.

Measure 5d: New Climate Observations Introduced

	FY 1999	FY 2000	FY 2001	FY 2002
Target	New	New	120	174
Actual			132	192
Met/Not Met			Met	Met

Explanation of Measure

NOAA is undertaking new efforts to better describe the atmosphere—ocean—land system to improve its climate monitoring and prediction capability. As a part of this effort, the Office of Oceanic and Atmospheric Research and NESDIS will expand their existing observation systems, that is, data buoys and new satellites.

The oceans provide the largest source of potential predictability for the climate system as well as the potential to produce large climatic surprises, and yet they are currently critically underobserved for certain variables and in many regions. This measure will continue NOAA’s long-term and sustained effort to improve ocean observational capabilities, and to increase the usefulness of observations for this critical part of the Earth’s climate system. NOAA will complete an annual report detailing how these new climate observations increased data density and coverage and how they will be used in climate analysis and prediction.

NOAA’s actions include, as resources permit, expanding its ocean observing systems, focusing on the highest priority variables for climate monitoring and prediction, and addressing critical oceanic data voids. NOAA will also place high priority on improving the assimilation and optimal use of ocean observations in climate models that are used for climate analyses and forecasts. NOAA will also estimate the reduction in analysis error that accompanies increases in data quality, density, and coverage.

FY 2002 Performance

U.S. deployments of the Argo profiling float system, the largest new climate observing system currently being deployed with NOAA support, increased substantially during FY 2002 and continued above target. As of October 2002, the U.S. contributed 33 percent of the global Argo array and was the largest international contributor. The profiling floats provide report measurements of the upper ocean temperature and salinity in real time. This is a critical measure for climate, as heat storage in the ocean will largely determine the rate of climate change. Current description of the global Argo array can be found online at <http://argo.jcommops>

Program Evaluation

A number of NOAA line offices participate in the seasonal- to-interannual goal. The Office of Oceanic and Atmospheric Research conducts periodic reviews of the activities of its Environmental Research Laboratories. NESDIS holds management performance reviews several times a year. NOAA Weather Service conducts reviews of the National Centers for Environmental Prediction. In addition, the National Science Foundation and the National Research Council also evaluate programs. NOAA holds annual constituent workshops where NOAA’s seasonal climate forecasts efforts are discussed with the community of seasonal-to-interannual climate forecast users and where NOAA solicits input to shape future efforts.

Performance Goal 6: Predict and Assess Decadal to Centennial Change

Corresponding Strategic Goal

Strategic Goal 3: Observe and manage the Earth's environment to promote sustainable growth.

Rationale for Performance Goal

National Oceanic and Atmospheric Administration (NOAA) scientists provide policymakers with the scientific information and expert assessments necessary to make decisions on long-term global and regional environmental issues. NOAA research, conducted in conjunction with its national and international partners, contributes significantly to the understanding of these issues. Experts in these fields periodically compile, summarize, and evaluate the current state of scientific knowledge and report their findings in assessment documents. NOAA's research, authors, and review of these documents are essential to ensure the highest quality science is available to support important decisions on long-term climate issues. Additionally the national effort in climate research increasingly focuses on reducing uncertainty in projections of climate change and on building the research, modeling, and observational systems to further this objective. Central to the issue of climate change are descriptions of the greenhouse gases that influence how radiation is absorbed by the planet. Knowledge of how carbon dioxide is stored and released and how this will change in the future is essential. Other greenhouse gases and aerosols with shorter atmospheric lifetimes may offer the chance to influence climate change over a shorter period, as well as provide benefits for other environmental issues.

FY 2002 Performance

NOAA performance measures in long-term climate focused on observing system development. Substantial advances took place in deployment of an observing system for tracking carbon storage in North America and in the ocean. For monitoring of the global carbon cycle, expanded carbon measurements allow more precise characterization of global trends in greenhouse gases. In addition, early deployments of the highly accurate Climate Reference Network are resulting in reduced uncertainty in U.S. average measures of temperature and precipitation.

For the FY 2003 APP / FY 2001 APPR, NOAA substantially changed their performance measures for this performance goal in an effort to better show the activities related to this performance goal. Therefore, targets and actuals for FY 1999–FY 2001 do not exist.

Measure 6a: Assess and Model Carbon Sources and Sinks Throughout the United States

FY 2002

Target	Establish five new pilot atmospheric profiling sites and four new oceanic carbon tracks.
Actual	Identified five pilot carbon profiling sites and four new oceanic carbon tracks.
Met/Not Met	Not Met

Explanation of Measure

Carbon dioxide is the most important of the greenhouse gases that are undergoing change due to human activity. On average, about one half of all the carbon dioxide emitted by human activity is taken up by the oceans and the terrestrial biosphere (trees, plants and soils). These reservoirs of carbon are known as carbon “sinks.” However, the variation in the uptake from year to year is very large and not understood. A large portion of the variability is believed to be related to the terrestrial biosphere in the Northern Hemisphere, and quite likely North America itself. NOAA needs to understand the source of this variability if it is to provide scientific guidance to policy-makers who are concerned with managing emissions and sequestration of carbon dioxide. This can only be done by making regional-scale measurements of the vertical profile of carbon dioxide across the U.S. which, combined with improved transport models, can be used to determine carbon dioxide sources and sinks on a regional (about 600 mile) scale. This will provide a powerful tool to gauge the effectiveness of carbon management and enhanced sequestration efforts.

Additional data on carbon dioxide will reduce the uncertainties in climate projections and depends on major advances in understanding and modeling radiative forcings (atmospheric concentrations and radiative roles of greenhouse gases and aerosols) and climate feedback mechanisms. In addition, these data will provide the advanced climate-modeling community with the capability to project future climate under a range of potential scenarios.

FY 2002 Performance

Atmospheric Profiling Sites: The five pilot carbon profiling sites have been tentatively identified and include preliminary aircraft measurements with existing equipment at a site in Wisconsin near the tall tower site that NOAA Climate Monitoring and Diagnostics Laboratory (CMDL) has been operating for several years. New coastal sites being planned include Vancouver Island, near the U.S.–Canadian border, and Trinidad Head, California, to cover inflow into North America from the Pacific; Corpus Christi, Texas, to cover inflow from the Gulf; and sites to be chosen in New Hampshire and North Carolina to cover outflow from the continent. The carbon profiles will be made in conjunction with on-going surface carbon measurements at a co-located lighthouse. For the remaining sites there will be some delay in equipment procurement because of bidding regulations and receipt of funds late in the FY 2002 fiscal year. Contracts for construction of the automatic aircraft sampling systems are still in the bidding process and it is likely that measurements will not begin until summer 2003.

Oceanic Carbon Tracks: The oceanic component of the Northern Hemisphere Carbon sink project will entail producing seasonal carbon flux maps in the North Atlantic and North Pacific. These maps will be produced by an integrated effort of surface observations, remote sensing, and modeling. To obtain appropriate coverage the ocean observations will be made from many ships of opportunity, such as merchant marine ships, cruise ships, and NOAA ships performing their routine missions. A consortium has been formed between the NOAA research laboratories, Atlantic Oceanographic and Meteorological Laboratory (AOML), Pacific Marine Environmental Laboratory (PMEL), and three academic institutions to install state-of-the-art sensors to measure surface water and marine air carbon dioxide on ships sailing from Newark, Delaware to Bermuda;

Norfolk, Virginia to Iceland; and Los Angeles, California to the Far East. Operational protocols have been instituted and plans for common instrumentation have been developed. Instrumentation to measure surface water carbon dioxide was installed on the cruise ship *Explorer of the Seas* in March 2002, providing the first weekly estimates of carbon dioxide fluxes in the Intra-American seas.

Measure 6b: Assess and Model Carbon Sources and Sinks Globally

FY 2002

Target	Establish three new global background sites as part of the global flask network ¹ .
Actual	Established three new global background sites as part of the global flask network ¹ .
Met/Not Met	Met

¹ The Global Flask Network is an observational network of monitoring stations with headquarters in Boulder, Colorado.

Explanation of Measure

The research community is moving toward monthly mean maps, but it is hampered by data that are not at the appropriate temporal resolution. In addition, carbon models are only partially coupled to computer models that account for a changing ocean, atmosphere, and land.

Preliminary work suggests that feedbacks between the land and ocean and the atmospheric carbon dioxide concentration can be strong and result in release of carbon to the atmosphere from the stored pools on land and in the ocean.

Activities planned to assess and model carbon sources and sinks in both the North American and global programs are similar but vary in scale with the North American network having a finer spatial scale. These activities consist of increasing the observing network by establishing new sampling sites, and completing and improving computer models to simulate atmospheric transport of carbon. Both cases will result in more accurate estimates of the atmospheric carbon balance.

The carbon atmospheric observing system over North America has been designed to develop regional (about 600 mile) scale estimates of carbon dioxide sources and sinks, especially within the U.S. It requires vertical profiling over terrestrial ecosystems using aircraft and tall towers.

The global atmospheric observing system is designed to determine carbon dioxide sources and sinks for global continental-scale regions and involves additional surface measurements at background (clean air) sites such as coastal regions. The current lack of data results in large variations in carbon source-sink estimates at this scale.

FY 2002 Performance

The Climate Monitoring and Diagnostics Laboratory (CMDL) has established a new sampling site at the Max Planck Institute of Biogeochemistry (Jena, Germany) Ochsenkopf site in Germany. This will allow inter-comparisons with the German group. Discussions are underway to establish a new flask sampling site at the Global Atmosphere Watch (GAW) station on Mt. Kenya in Africa. This would be the first of several sites on the African continent. Other land-based sites that are high on the list are: Lampedusa, Italy (Mediterranean island), Bukit Kototabang, Indonesia (GAW station), Arembepe, Brazil (GAW station) and Tiahuanacu, Bolivia. The logistics of getting samplers to local scientists and technicians in these locations and getting them back to Boulder for analysis is difficult and will require some time to reach a smooth operation. The possibility of obtaining vertical carbon dioxide profiles with aircraft supplied by the South Africans is also being investigated.

CMDL's cooperative atmospheric carbon measurements aboard ships of opportunity have been reinstated with sampling on two ships in the Pacific Ocean traveling between Los Angeles and Auckland, New Zealand. This entails taking air samples every five degrees of latitude and returning the samples to Boulder for analysis. An additional ship that travels between Auckland and Valparaiso, Chile is being investigated for future measurements.

Measure 6c: Determine the Actual Long-term Changes in Temperature and Precipitation Over the United States

FY 2002	
Target	Capture more than 60% of true contiguous U.S. temperature trend and Capture more than 25% of true contiguous U.S. precipitation trend.
Actual	Captured more than 85% of true contiguous U.S. temperature trend and Captured more than 55% of true contiguous U.S. precipitation trend.
Met/Not Met	Met

Explanation of Measure

This measure is designed to address the significant shortcomings in past and present observing systems by capturing more than 95 percent of the true contiguous U.S. national temperature trend and 80 percent of the true contiguous U.S. national precipitation trend by FY 2006.

Inadequacies in the present observing system increase the level of uncertainty when government and business decision-makers consider long-range strategic policies and plans. The U.S. Climate Reference Network, a benchmark climate-observing network, will provide the nation with long-term (fifty to 100 years) high quality climate observations and records with minimal time-dependent biases affecting the interpretation of decadal to centennial climate variability and change. The fully deployed network will ensure that NOAA can measure more than 90 percent of the variance in monthly trends of temperature and precipitation at the national level. NOAA will deploy instrument suites in a combination of single and nearby paired sites.

Deployment of the U.S. Climate Reference Network is continuing, with stations added over the next several years. However, due to funding limitations, the full implementation has been scaled back to ensure that funds are allocated to maintain the operational performance of the network and that the quality of the data are the highest possible, given the current state of technologies. While national trends will still be captured, as noted in the performance measure, the smaller sized network will not be able to achieve the level of monitoring and evaluation of climate variations and trends at the regional scale.

FY 2002 Performance

The performance for this measure achieved the intended target. A total of twenty-one stations were operational across the coterminous U.S. by the end of the fiscal year. These stations collectively account for approximately 85 percent of the variance in the U.S. temperature time series and 55 percent in the U.S. precipitation time series. This exceeds the original targets of 60 percent and 25 percent, respectively.

Program Evaluation

NOAA's programs are routinely evaluated by a variety of outside reviewers. The NOAA Science Advisory Board, made up of private sector, university, and other federal agency scientists, provides input on climate and air quality research. NOAA's Office of Global Programs, 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 the National Research Council and the National Science Foundation. The NOAA Research Laboratories are reviewed on a regular basis. The Sea Grant Colleges are visited at least every two years by a review panel.

Performance Goal 7: Promote Safe Navigation

Corresponding Strategic Goal

Strategic Goal 3: Observe and manage the Earth's environment to promote sustainable growth.

Rationale for Performance Goal

The National Oceanic and Atmospheric Administration (NOAA) serves commercial and recreational mariners by providing these customers with nautical charts, tides and currents data, and geographic positioning data for safe navigation. Geodetic services are vital to the mapping and surveying industry nationwide because they provide integrity to geographic coordinates obtained from Global Positioning Satellite (GPS) system signals for accurate positioning in support of numerous applications, including land surveying, navigation, mapping, and infrastructure development such as 911 emergency response and scientific applications. Shoreline data and real-time tides and currents information also serve the coastal resource management and oil spill and disaster response communities. NOAA continues to explore innovative ways to modernize its services in a cost-efficient manner to meet customer needs.

FY 2002 Performance

Several offices within NOAA contributed to the Promote Safe Navigation Goal in FY 2002. NOAA produced eighty new Electronic Navigational Charts (ENCs), and now maintains a suite of 215 ENCs. Built to international standards, NOAA ENCs are an accurate and detailed chart database that can be displayed on electronic charting systems aboard ships. NOAA also produced 293 new paper chart editions. In partnership with local sponsors, NOAA dedicated two new PORTS® (Physical Oceanographic Real-Time System) — Chesapeake Bay, and Anchorage, Alaska — bringing the total number of PORTS® to nine. PORTS® supports safe and cost-efficient navigation by providing ship masters and pilots with accurate real-time information required to avoid groundings and collisions. NOAA made significant upgrades to the National Water Level Observation Network (NWLON) stations in the Great Lakes in 2002. Real-time access to all the Great Lakes water level gauges and associated data is now available on the Internet at <http://glakesonline.nos.noaa.gov/> and by phone. In addition, two new water level gauges were added to the network in areas critical to safe navigation, bringing the total number of stations to fifty-one. NWLON supports the marine transportation system, coastal managers, the scientific community, and many other users by providing both a long-term record of water levels, relevant to climate change and sea level trends, and real-time observations, critical for safe navigation, and storm surge warnings. In recognition of the 2002 Winter Olympic Games in Salt Lake City, NOAA established a commemorative, high accuracy reference station on the campus of the University of Utah. The commemorative station will provide the means for the local surveying and mapping community to access the National Spatial Reference System, which provides accurate and timely positioning through a consistent national coordinate system. This effort was undertaken cooperatively with the Utah Council of Land Surveyor, the City of Salt Lake, Salt Lake County, and the University of Utah. Shoreline in nine critical port areas was mapped this year. NOAA has now mapped and/or evaluated the shoreline in over 60 percent of the U.S.'s critical port areas within the past five years. Additional performance information concerning hydrographic surveys and the National Spatial Reference System follows below.

Measure 7a: Reduce the Hydrographic Survey Backlog (Square Nautical Miles) for Critical Navigation Areas (Cumulative Percentage)

	FY 1999	FY 2000	FY 2001	FY 2002
Target	20.7%	24.3%	27.8%	35.0%
Actual	20.8%	24.3%	31.2%	34.3%
Met/Not Met	Met	Met	Met	Not Met

Explanation of Measure

NOAA conducts hydrographic surveys to determine the depths and configurations of the bottoms of water bodies, especially of those that pertain to navigation. This includes the detection, location, and identification of wrecks, primarily through the use of side scan and multibeam sonar technology and GPS. This information is critically important to NOAA navigation products, such as paper and electronic navigational charts, for safe and efficient navigation. In addition to the commercial shipping industry, other user communities that benefit include recreational boaters, the commercial fishing industry, port authorities, coastal zone managers, and disaster response planners. Ships traversing our coastal waters rely on charts based on sounding data that are more than fifty years old in many places. Responsible for charting the entire U.S. Exclusive Economic Zone, NOAA determined in 1994 that of this 3.4 million square nautical mile Zone, 500,000 square nautical miles of U.S. waters were navigationally significant and in need of survey. NOAA then prioritized 43,000 square nautical miles as being in critical need of survey. This area is known as the critical survey backlog. Many of these high-priority areas carry heavy commercial traffic, are less than thirty meters deep, and are changing constantly. NOAA’s surveying activities balance in-house resources with contracts, and use the latest full bottom coverage sounding technologies to eliminate the remaining critical area backlog of approximately 28,250 square nautical miles in the U.S.’s ports, harbors, and other coastal areas. NOAA’s hydrographic fleet supporting in-house surveying capabilities consists of the Whiting, the Rude, and the Rainier. These assets are supplemented by contracts with the private sector for hydrographic survey data collection-

FY 2002 Performance

FY 2002 performance on the critical survey backlog was impacted by NOAA’s Homeland Security response. Following September 11, 2001, NOAA and the U.S. Navy redirected survey assets from planned activities to collecting baseline data for port and harbor approaches. Although this data will be very useful for general navigation and nautical chart updates, some areas surveyed do not count as part of the critical survey backlog reduction. NOAA’s in-house and contract resources collected a total of 1,669 square nautical miles (snm) of survey data in FY 2002. 1,314 of this total falls into the critical backlog category (1,314 / 43,000 = 3.1%). The remainder of the area surveyed in FY 2002 (335 snm) was for Homeland Security or other special projects. Had the 335 snm been included in reducing survey backlog, NOAA would have met the FY 2002 target. This measure will be revised in future to capture all categories of hydrographic survey data collected during a fiscal year.

Measure 7b: Percentage of National Spatial Reference System (NSRS) completed (Cumulative %)

	FY 1999	FY 2000	FY 2001	FY 2002
Target	59%	64%	75%	78%
Actual	59%	71%	75%	81%
Met/Not Met	Met	Met	Met	Met

Explanation of Measure

This measure was added in FY 2000 to replace the Physical Oceanographic Real Time System measure, which was discontinued due to lack of funding increases in 1999 and 2000. The NSRS performance measure is effective because it integrates the different components of the geodesy program (spatial earth measurements) into a product more useful to customers rather than measuring individual components of horizontal and vertical positioning.

In order to meet the U.S.'s navigation and other positioning needs, NOAA is enhancing the NSRS to provide the higher accuracy and accessibility needed for use with the space-based Global Positioning Systems (GPS), whose satellites transmit signals that allow determination of position, height, velocity, and time. The NSRS, a system of reference stations and monuments across the U.S., provides integrity to geographic coordinates obtained from GPS satellite signals for accurate positioning in support of numerous applications, including land surveying, navigation, mapping, and infrastructure development such as 911 emergency response and scientific applications. New uses for GPS are being found every day, and many of them involve precision heights.

NSRS has evolved over time in response to technological changes, growth in geodetic networks, and changes in ownership/responsibility. The primary technological change was the introduction of the Global Positioning System (GPS) and subsequently, the use of GPS for measuring accurate heights.

To measure progress on NSRS, NOAA uses three elements:

- 1 **Horizontal** — Percentage of permanent survey control networks with latitude and longitude coordinates accurately determined and referenced to the North American Datum of 1983 (NAD 83)
 - a There are over a million permanent survey control stations nationwide. These stations are survey markers constructed of brass and steel and set in bedrock or concrete marks set in the ground. These station markers are very stable and permanent. Users must actually visit the site and make measurements to access NSRS. Approximately 1500 of these are a federal responsibility. In the mid-1990s, NGS developed techniques using GPS to determine very accurate horizontal coordinates (latitude and longitude). Through a GPS survey campaign, NGS measured accurate latitudes and longitudes of the 1500 stations. The horizontal element of the NSRS reached 100 percent completion in FY 1999.
- 2 **Vertical** — Percentage of permanent survey control networks with elevation coordinates accurately determined and referenced to the North American Vertical Datum of 1988 (NAVD 88) — This element has several sub elements representing different types of networks.
 - b At the time the Horizontal survey campaign began, GPS was not able to provide accurate height information. By 1998, NGS had developed techniques to get accurate height data from GPS and began emphasizing the importance of the vertical or height component. The emphasis since then has been to provide permanently marked reference marks with accurate heights connected to the North American Datum of 1988 (NAVD 88). The Vertical element is itself made up of several sub elements representing different types of survey control networks. The Vertical component is 48 percent complete.

3 Continuously Operating Reference Stations (CORS) — Percentage of the Coterminous United States within 200 km of a National CORS.

- C** CORS allows GPS users to access NSRS without visiting the control site. Data from the CORS site are made available to the public via the Internet. GPS users are able to use CORS data to correct their own measurements and derive accurate locations. Progress on CORS has been captured by the percentage of the coterminous United States within 200 km of at least one CORS and serves as the third element in computing the NSRS performance metric.

FY 2002 Performance

In FY 2002 NOAA added ninety-five new stations to the National CORS network. Ninety-five percent of the coterminous U.S. is now within 200 km of a National CORS station. Accurate heights were connected to the North American Vertical Datum of 1988 (NAVD 88) for thirty-seven NWLON sites, bringing this element of the system to 81 percent completion. This is one element of the Vertical component of the NSRS.

The percentage completion of NSRS is equal to the sum of the percentages complete of the horizontal, vertical, and CORS components divided by three or:

$$((\% \text{ of Horizontal}) + (\% \text{ of Vertical}) + (\% \text{ of CORS}))/3 = ((100\%) + (48\%) + (95\%))/3 = 81\%$$

Program Evaluation

NOAA's goal to promote safe navigation is evaluated at a variety of levels, from peer reviews of products, papers, and projects, to internal and external reviews of entire programs and quarterly reviews of NOAA's overall performance in navigation products and services. Constituent input is an important part of the evaluation process and is solicited regularly through constituent workshops.

From 1992 to 1996, a number of National Research Council Marine Board studies examined the nautical charting program and its transition into the digital era. NOAA incorporated study recommendations on areas such as reducing the survey backlog, implementing new digital production techniques, and delivering new electronic chart products to the program. The Hydrographic Services Improvements Act of 1998 provided Congress and NOAA an opportunity to evaluate NOAA's capabilities for acquisition and dissemination of hydrographic data, develop standards and formats for hydrographic services, and contract for the acquisition of hydrographic data. NOAA now 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. A 2001 KPMG Consulting cost analysis of survey platform options supported NOAA's concept of a time charter for continuous survey operations. Pending FY 2003 appropriations, NOAA plans to contract for a time charter to test its effectiveness in real-world applications.

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 U.S. in terms of dollars and lives saved associated with GPS technology, and it led to current development of the vertical component of the 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. Marine Transportation System (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 Data Validation and Verification

NOAA's Office of Finance Administration/Budget Office coordinates an annual review of the performance data to ensure that it is complete and accurate. During this process, significant deviations from projected targets, if any, are discussed with the appropriate NOAA Line Office so that changes or corrections can be made to help meet NOAA's performance goals. The actual validation process is conducted by individual NOAA Line Offices. The verification aspects depend on individual Line Office. For oceans and fisheries-related measures, stock assessments and reviews (internal, and/or peer) are common. For weather related measures, the verification process is, among other things, through comparison of predicted weather to the actual event. For the climate-related measures, verification is through, among other things, quality control of data. Satellite data are compared with on site data to help validate data accuracy. The NOAA Data Validation and Verification table can be found starting on the following page.

NOAA Data Validation and Verification

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
Measure 1a: Reduce the number of overfished major stocks of fish from 56 to 45 by FY 2007	NOAA/National Marine Fisheries Service (NMFS) report to Congress; <i>Status of Fisheries of the United States.</i>	Annual	NMFS Office of Sustainable Fisheries.	Stock assessments and peer reviews (internal and outside the agency).	None	None
Measure 1b: Reduce the number of major stocks with an "unknown" stock status to no more than 98 by 2007	NOAA/National Marine Fisheries Service (NMFS) report to Congress; <i>Status of Fisheries of the United States.</i>	Annual	NOAA/NMFS Office of Sustainable Fisheries.	Stock assessments and peer reviews (internal and outside the agency).	None	None
Measure 1c: Increase the percentage of rebuilding plans in place for overfished major stocks to sustainable levels	NOAA/National Marine Fisheries Service (NMFS) report to Congress; <i>Status of Fisheries of the United States.</i>	Annual	NOAA/NMFS Office of Sustainable Fisheries.	Stock assessments and peer reviews (internal and outside the agency).	None	None
Measure 2a: Number of acres of coastal habitat benefited (cumulative)	Primary source is NMFS's Office of Habitat Conservation; NOS provides additional input.	Annual	NMFS's Habitat Office will collect information, conduct assessments, and store data.	NMFS's Habitat Office will collect quality controlled data to ensure performance data criteria are being met.	None	None
Measure 2b: Reduce introductions and effects of invasive species in a total of six regions within the United States	OAR, U.S. Department of the Interior, and state agencies.	Annual	OAR will collect data, conduct assessments, and store data.	Original research data verified through peer review; OAR will obtain quality-controlled data from other sources to ensure criteria are being met for inclusion in performance calculations.	Reaching these targets depends on activities of other federal and state agencies with management responsibilities in this area.	None
Measure 2c: Percentage of U.S. shoreline and inland areas that have improved ability to reduce coastal hazard impacts.	NOS, other federal and state agencies.	Annual	NOS will collect information, conduct assessments, and store data.	All data used in coastal hazard risk assessments are quality controlled; risk assessment models are tested for accuracy and coverage (amount of shoreline covered). Shoreline in the states of NC, SC, AL, RI, OH, and parts of OR and HI were counted under earlier projects, and could potentially be double counted if a coastal risk atlas is generated for those states.	This measure tracks development and implementation of coastal hazard risk atlases as an indicator of improved ability to identify the extent and severity of coastal hazards. Reaching these targets will depend on the activities of other federal and state agencies with management responsibilities in this area.	None

NOAA Data Validation and Verification (cont.)

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
<p>Measure 3a: Reduce by 10 (from a FY 2000 baseline of 27) by FY 2007, the number of threatened species at risk of extinction</p> <p>Measure 3b: Increase the number of commercial fisheries that have insignificant marine mammal mortality</p> <p>Measure 3c: Reduce by 11 (from a FY 2000 baseline of 29) by FY 2007, the number of endangered species at risk of extinction</p>	NMFS	Annual	NMFS's Office of Protected Resources.	Audits and internal peer review within NOAA and external peer review by regional fishery councils, the National Science Foundation, the National Academy of Science, and other organizations.	None	None
<p>Measure 4a: Lead time (minutes), accuracy (%) and false alarm rate (FAR, %) for severe weather warnings for tornadoes</p>	National Weather Service (NWS) field offices.	Monthly	NWS headquarters and the Office of Climate, Water, and Weather Services (OCWWS).	Verification is the process of comparing the predicted weather to the actual event. The process begins with the collection of warnings from every NWS office across the nation. The severe weather event program includes extensive quality control procedures to ensure the highest reliability of each report. The data in each report are entered into a database that contains severe weather warnings where the warnings and events are matched and appropriate statistics are calculated and made available to all echelons of the NWS.	There are limitations of scientific verification in assessing data. The fundamental purpose of scientific verification is to objectively assess program performance through the use of standard statistical analysis. However, a number of factors unique to the atmospheric sciences must be considered to ensure proper interpretation of objectively derived statistics. The primary factor to consider is the natural variation of this performance measure related to annual fluctuations in meteorological conditions associated with severe weather.	Review the storm data from individual events to pinpoint the causes and take corrective actions.
<p>Measure 4b: Lead time (minutes) and accuracy (%) for severe weather warnings for flash floods</p>	National Weather Service (NWS) field offices.	Monthly	NWS headquarters and the Office of Climate, Water, and Weather Services (OCWWS).	Verification is the process of comparing the predicted weather to the actual event. The process begins with the collection of warnings from every NWS office across the nation. The severe weather event program includes extensive quality control procedures to ensure the highest reliability of each report. The data in each report are entered into a database that contains severe weather warnings where the warnings and events are matched and appropriate statistics are calculated and made available to all echelons of the NWS.	There are limitations of scientific verification in assessing data. The fundamental purpose of scientific verification is to objectively assess program performance through the use of standard statistical analysis. However, a number of factors unique to the atmospheric sciences must be considered to ensure proper interpretation of objectively derived statistics. The primary factor to consider is the natural variation of this performance measure related to annual fluctuations in meteorological conditions associated with severe weather.	NOAA will continue to collect data while reporting additional measures in the future.

NOAA Data Validation and Verification (cont.)

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
<p>Measure 4c: Accuracy of hurricane track forecasts (48 hours)</p>	NWS/Tropical Prediction Center (TPC).	Annual	TPC	Hurricane storm verification is performed for hurricanes, tropical storms, and tropical depressions regardless of whether these systems are over land or water. The TPC issues track and intensity forecast throughout the life of a hurricane. The actual track and intensity are verified through surface and aircraft measurements. NOAA calculates the average accuracy of the TPC track and intensity forecasts for the Atlantic basin at the end of each hurricane season.	Verification of actual track and intensity versus forecast is very accurate. However, actual annual scores vary up to 20% in some years due to the type and location of the hurricane events. Some types of systems can be more accurate forecasted than others. For example, hurricanes that begin in the northern sections of the hurricane formation zone tend to be much harder to accurately forecast. Outyear measures depend on a stable funding profile and take into account improved use of the Weather Service Radar (WSR-88D), new satellites, improved forecast models, new and continued research activities of the U.S. Weather Research Program (USWRP), and investments in critical observing systems.	NOAA will report on the tracking of forecasts at 24-, 48-, and 72-hour intervals.
<p>Measure 4d: Accuracy (%) of 3-day forecast of precipitation</p>	The Hydrometeorological Prediction Center.	Annual	World Weather Building.	The Hydrometeorological Prediction Center has produced the Quantitative Precipitation Forecast since the early 1960s and has kept verification statistics related to the Quantitative Precipitation Forecast program since that time. All data are examined for accuracy and quality control procedures are applied.	The NWS routinely prepares and distributes to internal and external customers predictions of heavy rainfall. The Hydrometeorological Prediction Center has the responsibility to prepare both graphical and text products depicting the areas threatened by heavy precipitation in the contiguous United States. There will be a significant amount of variability, and the improvements may not be achieved exactly as predicted. Out-year measures depend on a stable funding profile and take into account improved use of the WSR-88D, new satellites, improved forecast models, new and continued research activities of the USWRP investments in critical observing systems, and continued support of the Advanced Weather Interactive Processing System (AWIPS).	NOAA will implement planned weather model improvements along with ongoing research projects.
<p>Measure 4e: Lead time (hours) and accuracy (%) of winter storm warnings</p>	NWS field offices.	Daily	NWS headquarters and OCWWS.	Verification is the process of comparing the predicted weather with the actual event. The process begins with the collection of forecasts and observations from each NWS office across the nation. The quality-controlled, collated data are transmitted to the National Centers for Environmental Prediction in Camp Springs, Maryland, where the data are stored as computer files. The data files are retrieved by the NWS headquarters' Office of Science and Technology. Following additional quality control the data are stored on an Office of Science and Technology workstation and used to generate semiannual statistics on forecast accuracy.	Documentation for heavy snowfall is printed annually. Due to the relatively few number of cases each year, the projections assume a three-year average (current plus two previous years, all equally weighted). Due to the large volume of data gathered and computed, a document for lead time and accuracy of winter storm warnings cannot be finalized until well into the following fiscal year. Outyear measures depend on a stable funding profile and take into account improved use of the WSR-88D, new satellites, improved forecast models, new and continued research activities of the USWRP investments in critical observing systems, and continued support of AWIPS.	Introduce high-resolution regional models.

NOAA Data Validation and Verification (cont.)

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
Measure 4i: Accuracy (%) and FAR (%) of forecast of ceiling and visibility (aviation forecasts)	NWS field offices.	Daily	NWS headquarters and OCNWS.	Verification is the process of comparing the predicted weather with the actual event. The process begins with the collection of forecasts and observations from each NWS office across the nation. The quality-controlled, related data are transmitted to the National Centers for Environmental Prediction in Camp Springs, Maryland, where the data are stored as computer files. The data files are retrieved by the NWS headquarters' Office of Science and Technology. Following additional quality control the data are stored on an Office of Science and Technology workstation and used to generate semi-annual statistics on forecast accuracy.	Due to the large volume of data gathered and computed, documentation for this measure cannot be finalized until well into the following fiscal year. Out-year measures depend on a stable funding profile and take work with the National Aeronautics and Space Administration and the Federal Aviation Administration to develop new software tools and forecast techniques.	NOAA will improve and expand its training program and work with the National Aeronautics and Space Administration and the Federal Aviation Administration to develop new software tools and forecast techniques.
Measure 4g: Accuracy (%) of forecast for winds and waves (marine forecasts)	NWS field offices.	Daily	The NWS and the National Centers for Environmental Prediction's Ocean Modeling Branch.	Verification is the process of comparing the predicted weather with the actual event. The process begins with the collection of forecasts and observations from each NWS office across the nation. The quality-controlled, related data are transmitted to the National Centers for Environmental Prediction, where they are stored as computer files. The data files are retrieved by the NWS and the National Centers for Environmental Prediction's Ocean Modeling Branch. Following additional quality control the data are used to generate quarterly statistics on forecast accuracy.	Due to the large volume of data gathered and computed, documentation for the accuracy of forecast for wind and waves cannot be finalized until well into the following fiscal year. Out-year measures depend on a stable funding profile and take into account improved use of the WSR-88D, new satellites, improved forecast models, new and continued research activities of the USWRP, investments in critical observing systems, and implementation of AWIPS.	NOAA will deploy enhanced versions of AWIPS (Build 5), implement new wave forecast models, and improve communication and dissemination techniques to marine users.
Measure 5a: Determine the accuracy of the correlation between forecasts of the southern oscillation index (SO) and El Niño/La Niña events	Forecasts of sea surface temperature in a portion of the Pacific Ocean and observations from buoys, ships, and satellites.	Annual	The National Weather Service's (NWS's) National Centers for Environmental Prediction.	NOAA quality controls the incoming data (for example, through error checking and interstation comparison) and compares the satellite data with on site data to help validate data accuracy.	This measure assesses the correlation between forecasts of sea surface temperature (based on models) and actual sea surface temperature (based on satellite and on site observations). Improvements in forecasting ability depend upon improved observations, models, and research. Forecasts will likely be more accurate in El Niño years than in non-El Niño years.	None
Measure 5b: U.S. temperature skill score	Forecast data, observations from U.S. Weather Forecast Offices, and from a cooperative network maintained by volunteers across the nation.	Annual	NWS's National Centers for Environmental Prediction.	NOAA performs quality assurance analysis of the data (for example, error checking, elimination of duplicates, and interstation comparison) both at the national and U.S. Weather Forecast Office level.	Given the difficulty of making advance temperature and precipitation forecasts for specific locations, a skill score of 20 is considered quite good and means the forecast was correct in almost 50% of the locations forecasted. Forecasts will likely be better in El Niño years than in non-El Niño years.	None
Measure 5c: Number of new monitoring or forecast products that become operational per year (cumulative)	NWS's Climate Prediction Center and National Environmental Satellite, Data, and Information Service's (NESD/IS's) National Climatic Data Center (NCDC).	Annual	NCDC	Products are reported to NOAA management at quarterly reviews.	The new products are a response to increasing customer demands for expanded NOAA climate information and services. New products will be subsequently monitored for use and, in the case of forecast products, current skill and projected improvements.	None

NOAA Data Validation and Verification (cont.)

Performance Measure	Data Source	Frequency	Data Storage	Verification	Data Limitations	Actions to be Taken
Measure 5d: New climate observations introduced	Observations from data buoys, ships, and satellites.	Annual	Oceanic and Atmospheric Research Laboratories, NES-DIS, and NDCD.	NOAA performs quality assurance analysis and data processing.	Percentages of observing platforms operational at a given time and analyses of data quality and errors; observations received in time to be incorporated in operational climate analyses and forecasts.	None
Measure 6a: Assess and model carbon sources and sinks throughout the United States	Observations from atmospheric profiling sites in North America and ship-board ocean-board carbon sampling.	Annual	Climate Monitoring and Diagnostics Laboratory.	Quality assurance and calibration against known standards performed by NOAA.	Number of profiling/ocean sites and our ability to incorporate these data into advanced carbon models.	None
Measure 6b: Assess and model carbon sources and sinks globally	Flask samples taken from a global network and analyzed by NOAA.	Annual	Climate Monitoring and Diagnostics Laboratory.	Quality assurance and calibration against known standards performed by NOAA.	Number of flask sites and our ability to incorporate these data into advanced carbon models.	None
Measure 6c: Determine the actual long-term changes in temperature and precipitation over the United States	NOAA's National Climatic Data Center.	Annual	NOAA's National Climatic Data Center.	Monte Carlo simulations based on operation stations.	None	None
Measure 7a: Reduce the hydrographic survey backlog (square nautical miles) for critical navigation areas (cumulative percentage)	Progress reports on data collected from hydrographic survey platforms.	Annual	National Ocean Service will store data and publish nautical charts.	National Ocean Service will apply established verification and validation methods.	Progress in reducing the backlog is measured against a base line value of 43,000 square nautical miles as determined in 1994. Weather can affect scheduled surveys.	None
Measure 7b: Percentage of national spatial reference system (NSRS) completed (cumulative %)	The National Ocean Service and the National Geodetic Survey define and manage the NSRS, the foundation for the nation's spatial data infrastructure.	Ongoing, annual reporting.	Automated database at National Ocean Service.	National Ocean Service will apply standard verification and validation methods.	Weather conditions, security, employment, and funding issues can affect field operations. The National Geodetic Survey also works cooperatively with state organizations; accommodating partners can also impact activities to some extent.	None

