# THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) FISCAL YEAR 2008 BUDGET PROPOSAL

## HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

MARCH 22, 2007

**Serial No. 110–16**

Printed for the use of the Committee on Science and Technology

Available via the World Wide Web: http://www.house.gov/science

U.S. GOVERNMENT PRINTING OFFICE

34–014PS WASHINGTON : 2007

For sale by the Superintendent of Documents, U.S. Government Printing Office
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**March 22, 2007**

# THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) FISCAL YEAR 2008 BUDGET PROPOSAL

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**THURSDAY, MARCH 22, 2007**

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
*Washington, DC.*

The Subcommittee met, pursuant to call, at 2:00 p.m., in Room 2318 of the Rayburn House Office Building, Hon. Nick Lampson [Chairman of the Subcommittee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

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**The Subcommittee on Energy and Environment**

Hearing on

***"The National Oceanic and Atmospheric Administration (NOAA) Fiscal Year 2008 Budget Proposal"***

2318 Rayburn House Office Building
Washington, DC

Thursday, March 22, 2007
2:00 p.m. – 4:00 p.m.

## WITNESS LIST

**Vice Admiral Conrad C. Lautenbacher, Jr.**
*Under Secretary for Oceans and Atmosphere and Administrator*
*National Oceanic and Atmospheric Administration*

**Dr. Len Pietrafesa**
*Associate Dean, Office of External Affairs*
*Professor of Ocean & Atmospheric Sciences*
*College of Physical & Mathematical Sciences, North Carolina State University*

HEARING CHARTER

# SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
# COMMITTEE ON SCIENCE AND TECHNOLOGY
# U.S. HOUSE OF REPRESENTATIVES

# The National Oceanic and Atmospheric Administration (NOAA) Fiscal Year 2008 Budget Proposal

THURSDAY, MARCH 22, 2007
2:00 P.M.–4:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

## Purpose

On Thursday, March 22, 2007 at 2:00 p.m. the House Committee on Science and Technology's Subcommittee on Energy and Environment will hold a hearing to examine the National Oceanic and Atmospheric Administration (NOAA) fiscal year 2008 (FY08) budget proposal.

## Witnesses

**Vice Admiral Conrad Lautenbacher, Jr.,** Under Secretary of Commerce for Oceans and Atmosphere and Administrator, National Oceanic and Atmospheric Administration

**Dr. Len Pietrafesa,** Associate Dean, Office of External Affairs, Professor of Ocean & Atmospheric Sciences, College of Physical & Mathematical Sciences, North Carolina State University

## Background

The President's FY 2008 budget request for the National Oceanic and Atmospheric Administration (NOAA) is $3.96 billion, 2.7 percent below the FY 2006 appropriated funding.

NOAA's mission includes weather forecasting, climate prediction, management of fisheries and coastal and ocean resources. In addition, NOAA is responsible for mapping and charting our coastal areas and providing other navigation support services through programs of the National Ocean Service (NOS). NOAA also conducts research in support of these missions including atmospheric sciences, coastal and oceanic science, climate and air quality research, ecosystem research, and fisheries and marine mammal research. NOAA also operates a constellation of satellites that monitor and transmit data for weather forecasting, climate prediction, space weather forecasting, and Earth and ocean science research through the National Environmental Satellite Data and Information Service (NESDIS).

The President's requests for NOAA routinely exclude funding for a wide array of Congressionally-mandated projects with some of this funding is re-directed to Presidential priorities. However, much of this funding is simply cut from the NOAA budget resulting in a lower funding request for NOAA. This is especially true for accounts in NOS which has the highest number of Congressionally-mandated activities.

The table below shows the six primary accounts of the agency's budget. The only line office receiving a substantial increase in the FY 2008 request is the National Weather Service (NWS). The FY 2008 request would result in funding levels below FY 2006 appropriations for all other offices, with NOS receiving the largest reduction of $122 million, a 21 percent reduction.

**FIGURE 1: NOAA FY 2008 BUDGET REQUEST**
**(in millions of dollars)**

| NOAA Program | FY06 Enacted | President's FY08 Request | FY08 Request vs. FY06 Enacted | % Change |
|---|---|---|---|---|
| National Weather Service | 848.2 | 903.5 | + 55.3 | + 6.5 % |
| Oceanic & Atmospheric Research | 379.6 | 368.8 | −10.8 | −2.8 % |
| National Environmental Satellite, Data, and Information Service | 952.2 | 978.3 | + 26.1 | + 2.7 % |
| Program Support | 491.0 | 442.1 | −48.9 | −9.9 % |
| National Ocean Service* | 590.5 | 468.5 | −122.0 | −20.7 % |
| National Marine Fisheries Service** | 803.8 | 795.9 | −7.9 | −0.98 % |
| | | | | |
| TOTAL Direct Obligations*** | 4065.3 | 3957.1 | −108.2 | −2.7 % |

* NOS programs are shared jurisdiction with the Resources Committee or not within the jurisdiction of the Committee on Science and Technology
** NMFS is solely within the jurisdiction of the Resources Committee
*** This figure includes appropriated funds plus transfers from fisheries funds

**National Weather Service:**

The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, adjacent waters, and ocean areas for the protection of life and property. NWS provides a national infrastructure to gather and process data worldwide from the land, sea, and air.

The NWS is the only line office that receives a substantial increase in the President's FY 2008 request. The FY 2008 request for NWS is 6.5 percent higher than the 2006 enacted levels. Three areas account for most (about 84 percent) of the $55.3 million increase: mandatory federal pay raises ($18.3 million); operation and maintenance of the Advanced Weather Interactive Processing System (AWIPS), Automated Surface Observing System (ASOS), and Next Generation Weather Radar (NEXRAD) ($11.3 million); and the expansion of the Tsunami Warning Network ($17.2 million).

AWIPS is the specialized software package that enables forecasters to prepare accurate, timely forecasts and warnings. ASOS is composed of the sensors needed to measure and record significant weather conditions. NEXRAD is the radar system that shows patterns and movement of weather conditions.

The increases for the Tsunami network involves funds to repair one of the weather data buoys that add to the enhanced real-time hurricane observations and storm monitoring as well as complete the 39 DART buoy network system. The completion of the tsunami detection network expands NWS's operational capabilities.

However, this is the only area where the Administration proposes to make an investment in improved forecasting to protect life and property. If funds for the mandatory pay raise and tsunami network expansion are excluded from the FY 2008 request, the proposed NWS budget increase is a little over two percent. The Tsunami Hazard Mitigation Program was moved from Oceanic and Atmospheric Research (OAR) with a request of $2.1 million.

NWS also requests a $1.9 million increase to fund operations, maintenance and transition costs associated with the planned frequency conversion and technical updating of the NOAA Wind Profiler Network (NPN). The NPN improves NWS forecast capability during tornadoes, winter storms, and other severe storms improving their ability to provide aviation and fire weather warnings. The NPN has been in a quasi-operational status. The funds requested will provide for the transition of the NPN to full operational status.

NOAA requests an increase of $2.3 million for the Space Environment Center (SEC) over the FY 2006 enacted funding level. The $6.2 million request will support SEC real-time monitoring and forecasting of solar and geophysical events. This will support the space weather alerts and warnings for disturbances that can affect satellite operations, electric utility transmission equipment, astronauts working in the space station and people in aircraft flying along polar flight paths.

This FY 2008 request increase may not be sufficient to fully cover all operational and maintenance requirements for current weather forecasting equipment especially if we experience a year with high frequency of severe weather events and hurricanes that often result in damage or loss to weather monitoring and forecasting equipment. This level of funding will not enable NWS to move new monitoring and forecasting equipment from research to fully operational mode.

**National Environmental Satellite Data and Information Service (NESDIS):**

The President's budget FY 2008 budget request would increase the overall NESDIS budget increased by three percent ($26 million increase). The budget for NESDIS is dominated by the procurement, acquisitions and construction (PAC) accounts for the polar and geostationary satellite systems.

The Operations, Research and Facilities (ORF) account for NESDIS contains the programmatic funding for management, processing, analyzing, and archiving the data received from all of NOAA's weather monitoring equipment—both ground-based and space-based. This program account includes funds for data processing and analyses at data centers located in Kentucky, North Carolina, Maryland, and West Virginia.

This account also supports a number of regional climate centers. The FY 2008 request for these accounts is $20 million below the FY 2006 enacted levels. The FY 2008 request also eliminates $4 million in funding for NOAA–NASA Partnerships to facilitate the transfer of research to operations. The Data Centers and Information Services accounts are reduced by $18 million from the FY 2006 enacted levels.

*NESDIS Procurement, Acquisitions and Construction (PAC) Accounts:*

NOAA operates two satellite systems that collect data for weather forecasting. The polar satellites (Polar-Orbiting Environmental Satellites—POES) orbit the Earth and provide information for medium to long-range weather forecasts. The geostationary satellites (GOES) gather data above a fixed position on the Earth's surface and provide information for short-range warnings and current weather conditions. Both of these systems are scheduled for replacement through the NPOESS and GOES–R programs, respectively. Because of the long time period required to design and develop new satellite series, the procurement of a new series begins years before the current series has completed its production cycle. Therefore, NOAA's procurement budget in this area includes both funds to complete and launch current weather satellites (POES and GOES) and funds to design and develop the next generation of weather satellites (NPOESS and GOES–R).

The current series of Geostationary Operational Environmental Satellites (GOES–N, O and P) are nearing completion. GOES–N was launched last May. The FY 2008 request of $80.4 million will support the continued development, procurement and launch of the remaining GOES satellites scheduled for April 2007 and October 2008, respectively. The request for GOES–R, the new series of geostationary satellites ($279 million) has been reduced from the original FY 2008 estimate ($532 million) to reflect changes in the program's content (reducing the number of instruments and planned number of satellites) and to provide additional time to re-structure the program.

The current series of Polar-Orbiting Environmental Satellites (POES) is nearing the end of its production cycle. There is one remaining satellite in this series to be launched (POES N–Prime). This satellite was damaged in production in 2003. Problems with the new series of polar satellites, National Polar Orbiting Environmental Satellite System (NPOESS) has resulted in a delay for the first launch of an NPOESS satellite. To decrease the risk of gaps in weather data from these satellites, the last POES satellite will now be launched in 2009. The original planned request for POES in FY 2008 was $62 million. The FY 2008 request is $43 million above the original estimate for FY 2008 provided in the FY 2007 request. The extra

funds are to cover costs for rebuilding and storage costs for N–Prime, support for testing of a European satellite, installation of NOAA instrumentation on a European satellite, and to restore N–Prime funding that was re-directed to POES–N due to an unplanned delay in the launch of the POES–N satellite.

The request for NPOESS, the new polar satellite series, is $331 million. This is $13 million less than the planned FY 2008 request included in the FY 2007 budget. The funding will cover the continued development, production and risk reduction activities for the four key instruments to be included on the test satellite, the NPOESS Preparatory Project (NPP), scheduled for launch in 2010. Funding for this program will be officially re-evaluated and estimated and the prime contract will be re-negotiated later this year.

**Oceanic and Atmospheric Research:**

The office of Oceanic and Atmospheric Research (OAR) is the primary research arm of NOAA that provides the scientific information and tools needed for better understanding of the oceans and atmosphere. OAR conducts the scientific research, environmental studies, and technology development needed to improve NOAA's operations. OAR consists of seven internal research laboratories and manages extramural research at 30 National Sea Grant colleges and universities. Therefore, OAR contains over half of the research programs at NOAA. These programs are reduced by nearly $11 million below the FY 2006 enacted levels an approximate three percent reduction.

NOAA's FY 2008 budget request for Climate Research increases by $23 million (13.5 percent) over FY 2006 enacted funding. Most of this increase is in the competitive research program and is accomplished by redirection of funds from Congressionally-mandated projects. This includes $50 million for Laboratories and Cooperative Institutes and Climate Data and $133 million for the Competitive Research Program. A portion of this increase of $5 million will enhance our understanding of the link between ocean currents and rapid climate change. An additional $1 million in funding will provide additional computational support for assessing abrupt climate change.

The Administration's FY 2008 NOAA budget reflects an increase in requested funds for ocean activities included in the Ocean Action Plan (OAP) and the recently released Ocean Research Priorities Plan (ORPP). The FY 2008 NOAA budget includes $143 million to support three major areas outlined in the OAP: (1) Enhanced ocean science and research; (2) Protection and restoration of sensitive marine and coastal areas; and (3) Ensuring sustainable use of ocean resources.

The FY 2008 budget includes funding for several important ocean and coastal programs for the first time and the FY 2008 budget request is higher than the FY 2007 request. However, the $143 million provided in the Ocean Action Plan represents a decrease of over $200 million from the FY 2006 request for ocean, Great Lakes, and fisheries programs at NOAA. The Integrated Ocean Observing System (IOOS) receives a request of $11.5 million for regional observations.

The Administration's budget once again cuts the Ocean, Coastal, and Great Lake Research account below previous years' funding. The FY 2006 appropriation level is reduced from $127 million to $105 million, a 17 percent decrease for these programs.

Sea Grant receives a very small increase ($166 thousand), and the Administration requests an increase for Ocean Exploration of about $14 million. The Administration proposed last year to merge the National Undersea Research Program (NURP) with the Ocean Exploration Program. The budget appears to reflect this proposal. All funding for NURP is eliminated ($9 million). Again, the largest reduction comes through the elimination of Congressionally-mandated projects under the category of Other Partnership Programs.

The FY 2008 budget request for programs authorized in the *Harmful Algal Bloom and Hypoxia Research and Control Act* (HABHRCA) is $8.9 million, a $9.5 million decrease from FY 2006 funding. HABHRCA authorizes funding for research on harmful algal blooms (HABs) and hypoxia to advance scientific understanding and our ability to detect, assess, predict, control, and mitigate these events.

Weather and Air Quality research accounts are reduced in the FY 2008 request by $21 million dollars (30 percent decrease) from the FY 2006 enacted levels. The Laboratories and Joint Institutes would receive about $6 million above FY 2006 enacted levels, but the other Partnership Programs are reduced by $25 million with the elimination of over a dozen Congressionally-mandated projects.

The OAR budget also contains funding for the High-Performance Computing and Communication (HPCC) program. NOAA relies upon sophisticated computer models to make major improvements in NOAA's ability to forecast the weather and climate

and to model ecosystems and ocean processes. The FY 2008 budget request proposes $12.97 million, a $6.6 million increase for this program.

**National Ocean Service:**

The National Ocean Service (NOS) protects the National Marine Sanctuaries and is an advocate for coastal and ocean stewardship. It also introduced electronic nautical charts which they combine with Global Positioning Systems (GPS) to enhance the safety and efficiency of navigation of U.S. waterways. The President's FY 2008 request for NOS would reduce funding for NOS programs by over 20 percent. The largest reductions are in the Ocean Assessment program ($36 million) and in the Response and Restoration program ($13 million) of the Ocean Resources, Conservation and Assessment accounts.

Funding for Navigational Services including mapping and charting and geodetic surveys (measuring and monitoring the size and shape of the Earth and locating points on its surface) would be reduced by over $5 million in the FY 2008 request.

The Ocean and Coastal Zone Management accounts would receive about $4 million additional in funding primarily through an increase in the request for funds in the Marine Sanctuary program.

**Program Support:**

The Program Support account includes funding for corporate services and agency management. This is the Under Secretary's office, the office of the Chief Financial Officer, and the Program, Planning and Integration Office.

The Program Support account also includes the NOAA Education Program. Overall, the Program Support account is reduced by about 10 percent as compared to the FY 2006 enacted level. Most of this reduction is due to a reduction in the procurement accounts.

However, the proposed funding for NOAA education programs is also reduced significantly below the $38 million enacted for these programs in FY 2006 to a proposed funding level of $19 million (48 percent reduction). NOAA plans to provide lower funding levels for the Hollings Scholarship ($3.7 million); the Nancy Foster Scholarship ($400,000); JASON Education and Outreach ($1 million) and the Education Partnership Program ($14 million).

With a nearly fifty-percent cut to the Education Program, the promotion of careers in environmental sciences to ensure future workforce in disciplines critical to NOAA's mission is undermined.

Chairman LAMPSON. I will call this meeting to order. I wish everyone a good afternoon. Welcome everyone to today's Subcommittee hearing on the National Oceanic and Atmospheric Administration Fiscal Year 2008 Budget Request. This important agency provides warnings to our citizens of severe weather, charts our seas and skies, guides the management of our ocean and coastal resources and conducts research to improve our understanding of the environment.

NOAA is a diverse agency with many important missions and responsibilities. However, issuing watches and warnings of severe storms may be the role for which NOAA is most famous. In Texas we experience storms every year in the form of tornadoes and hurricanes. In 2005, the Gulf Coast experienced one of the worst natural disasters in American history when Hurricanes Katrina and Rita slammed into our coastline back to back. Texas was hit especially hard by Rita causing billions of dollars in damage. Fortunately, many lives were saved as a result of the forecasting done by NOAA's National Hurricane Center and the local forecasting offices of the National Weather Service.

Accurate prediction of hurricanes and other severe storms and sound management of our ocean and coastal resources can only be achieved through sound investments in the personnel, equipment, and research at NOAA.

While there are some encouraging features of this year's budget request for NOAA, the Administration has once again requested less funding for 2008 than Congress appropriated in past years. The Administration's budget provides few opportunities to expand NOAA capacity to fulfill its diverse missions. If NOAA is to advance its capabilities to forecast the weather, if we are to restore our fisheries and coastal ecosystems to a productive and healthy state, if we are to advance our understanding of the oceans and the atmosphere, we must invest additional funds in this agency. I have said it a thousand times that an investment will give us significant return when we make those investments, if they are done right.

We continue to be concerned about the procurements for the new polar and geostationary weather satellite systems. It is essential that we have these new systems completed and delivered in time to avoid any gaps in coverage of weather data. I am also concerned about the long-term implications of the cost overruns in the polar satellite program, NPOESS, for NOAA's budget in the future. The Committee will continue to follow both of these procurements closely.

On the positive side, the Administration included funding for an integrated ocean observing system, funding for the National Integrated Drought Information System, NOAA's wind profilers, and funding to complete the Tsunami Warning Network. I also support the provision of funds to cover the cost of pay raise for NOAA employees. The work NOAA does every day impacts our everyday lives and supports our economy.

I look forward to hearing the testimony of our witnesses who are here today, and I thank you very much, your views on the Administration's budget proposal, and your recommendations for improving NOAA's capabilities in the atmospheric and ocean sciences.

At this time I'd like to recognize our distinguished Ranking Member, Mr. Inglis, of South Carolina, for his opening statement.

[The prepared statement of Chairman Lampson follows:]

PREPARED STATEMENT OF CHAIRMAN NICK LAMPSON

Good Afternoon. I want to welcome everyone to today's Subcommittee hearing on the National Oceanic and Atmospheric Administration FY 2008 budget request.

This important agency provides warnings to our citizens of severe weather; charts our seas and skies; guides the management of our ocean and coastal resources; and conducts research to improve our understanding of the environment.

NOAA is a diverse agency with many important missions and responsibilities. However, issuing watches and warnings of severe storms may be the role for which NOAA is the most famous.

In Texas we experience severe storms every year in the form of tornadoes and hurricanes. In 2005, the Gulf Coast experienced one of the worst natural disasters in American history when Hurricanes Katrina and Rita slammed into our coastline back-to-back.

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On the positive side, the Administration included funding for an integrated ocean observing system, funding for the National Integrated Drought Information System, NOAA's wind profilers, and funding to complete the Tsunami Warning Network. I also support the provision of funds to cover the cost of the pay raise for NOAA employees.

The work NOAA does everyday impacts our everyday lives and supports our economy.

I look forward to hearing your testimony, your views on the Administration's budget proposal, and your recommendations for improving NOAA's capabilities in the atmospheric and ocean sciences.

Mr. INGLIS. Thank you, Mr. Chairman, and thank you for being here today with us. Good afternoon. This hearing about the President's fiscal year 2008 request for the National Oceanic and Atmospheric Administration is an important part of what we do here at the Science Committee. This is a tight budget climate, and given all the competing demands for federal resources, this appears to be a balanced budget request for NOAA. It maintains ongoing operational needs while providing for some new initiatives that have been recommended by the U.S. Commission on Ocean Policy.

I am particularly interested in the budget for the National Weather Service. This arm of NOAA provides vital services that our citizens and economy depend on every day. My state of South Carolina faces threats from hurricanes, occasional ice storms, if you can believe it, and flooding just to name a few. Without the timely

and accurate forecast and warnings provided by the Weather Service, we would be in the dark about these dangers, and so I want to make sure that the Weather Service continues to have the resources to do its great work.

NOAA also provides important information services for other parts of our coastal communities or other aspects for our coastal communities. While I recognize that many in the ocean community would like to see an even larger budget for NOAA, I would give the Admiral credit for the new initiatives in the Fiscal Year 2008 Budget Request that reflect priorities in the President's Ocean Action Plan. At a time when many agencies face flat or declining budgets, he convinced the Administration to invest $123 million in programs that will improve our understanding of stewardship of coastal and ocean resources. We are grateful for your work on that, Admiral.

Thank you to both of you for being here, and we look forward to hearing more of the details of the NOAA proposed budget for 2008. And I yield back the balance of my time, Mr. Chairman.

[The prepared statement of Mr. Inglis follows:]

PREPARED STATEMENT OF REPRESENTATIVE BOB INGLIS

Good afternoon. Thank you, Chairman Lampson, for holding this hearing about the President's Fiscal Year 2008 request for the National Oceanic and Atmospheric Administration.

Outside this committee, we don't hear much about NOAA, but that's not because NOAA isn't doing much. The services NOAA provides have broad applications and impacts, and it's vital that these services have the resources necessary to continue to do the best job possible.

Take the National Weather Service for example. This arm of NOAA provides vital services that our citizens and economy depend on every day. One of those citizens and businessmen is my brother, who operates a shrimping boat in Bluffton, South Carolina. The timely and accurate forecasts and warnings provided by the Weather Service enable my brother to profit from the best weather, and avoid the worst. It's vital that this, and other services, have the resources necessary to continue to do the best job possible.

NOAA also provides important information and services for coastal communities. While I recognize that many in the ocean community would like to see an even larger budget for NOAA, I want to give Admiral Lautenbacher credit for the new initiatives in the FY 2008 budget request that reflect priorities in the President's Ocean Action Plan. At a time when many agencies face flat or declining budgets, he convinced the powers that be to invest $123 million in programs that will improve our understanding and stewardship of coastal and ocean resources. We should not overlook his good work on that issue.

I thank our witnesses for being here today and look forward to learning more details about NOAA's proposed FY 2008 budget.

I yield back the balance of my time.

Chairman LAMPSON. Thank you, Mr. Inglis. I ask unanimous consent that all additional opening statements, and we have so many Members here today, submitted by the Subcommittee Members be included in the record. Without objection so ordered.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good afternoon. I would like to thank the witnesses for appearing before our subcommittee today to discuss the President's fiscal year 2008 (FY08) budget proposal for the National Oceanic and Atmospheric Administration (NOAA).

The National Weather Service (NWS) is under the jurisdiction of NOAA and it plays a significant role in providing weather forecasting for a variety of sectors. Specifically, the NWS's weather products and data are a vital component of the Federal Aviation Administration's (FAA's) air traffic control system, providing timely and ac-

curate weather information to local, regional, and national air traffic management, navigation, and surveillance systems. To ensure our nation's aviation weather technologies and services are accurate, cost effective, and efficient, I am pleased the Government Accountability Office (GAO) is in the process of evaluating the NWS's efforts to implement recommendations to improve aviation weather services and I look forward to hearing from our witnesses on the current status of the Nation's aviation weather technologies and services.

In addition to NWS's role in providing weather services to the aviation community, the agency within NOAA is also involved in forecasting weather for our communities. In Southwestern Illinois, there have been a series of bad weather-related storms causing significant damage and destruction to communities in the congressional district I am privileged to represent. As a result, several of the counties were declared federal disaster areas by the President, and our region has been eligible for assistance to rebuild and restore homes, schools, businesses, and local infrastructures. Before any storm hits, it is critically important to have accurate and timely information on weather forecasts in order to prepare.

While I recognize that weather forecasting is not 100% correct, computer modeling and weather forecasting programs continue to advance in order to reduce the margin of error. The President's FY08 proposed budget provides for a 6.5 percent increase than the 2006 enacted levels for the National Weather Service (NWS). I am pleased the Next Generation Weather Radar (NEXRAD), a radar system that shows patterns and movements of weather conditions, received an $11.3 million increase.

However, I have concerns that the FY08 increase for the NWS may not be sufficient to fully cover all operational and maintenance requirements for current weather forecasting equipment, especially if we experience a year with severe weather events and hurricanes that often result in damage or loss to weather monitoring and forecasting equipment.

I look forward to hearing the testimony of our witnesses.

Chairman LAMPSON. We do have one small problem. I think we can get our opening statements out of the way in convenient time, but we will have a vote that will come up probably sometime in the next five, maybe less than 10, minutes. We have got adequate time, I believe, to have both of your statements made, and then if you all will forgive us, we will run off and make our way back as quickly as we possibly can.

It is a pleasure to introduce the excellent panel of witnesses that we have with us here this afternoon. Vice Admiral Conrad Lautenbacher is the Under Secretary of Commerce for Oceans and Atmosphere and Administrator of NOAA and Dr. Len Pietrafesa is the Associate Dean of External Affairs and Professor of Ocean and Atmospheric Sciences at North Carolina State University and is the former Chair of NOAA's Science Advisory Board.

So we welcome both of you very much. You will each have five minutes for your spoken testimony. Your full, written testimony will be included in the record for the hearing. And when each of you have completed your testimony, we will begin with questions, and each Member will have five minutes to question the panel and we will rotate as normal.

Admiral Lautenbacher, would you please begin?

**STATEMENT OF VICE ADMIRAL CONRAD LAUTENBACHER, JR. (U.S. NAVY, RET.), UNDER SECRETARY OF COMMERCE FOR OCEANS AND ATMOSPHERE AND NOAA ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE**

Vice Admiral LAUTENBACHER. Thank you, Mr. Chairman. Good afternoon, Mr. Chairman, Ranking Member Inglis, members of the staff. We appreciate very much this opportunity to be able to testify on behalf of the 2008 budget. We thank this committee for its con-

tinuing support. This committee has been very important to the ability of NOAA to carry out its mission, and we look forward to working with you to build the best budget possible for the country.

This year I think everyone is aware NOAA is celebrating 200 years of science, service, and stewardship to the Nation. The precursor of NOAA was the first scientific agency in the United States Government, seen fit to be brought into existence by President Thomas Jefferson and the Congress in those days. Since that point, we have been joined by the Weather Bureau, Commission on Fish and Fisheries in the 1870's and up until today where we have satellites and a fabulous research branch that works for us. So it has been a long road. Our folks are very proud of their contributions, and we are looking forward to celebrating this legacy this year.

I have a couple of details on the 2008 request. Allow me to mention just a couple of the accomplishments that have occurred in the past year thanks to the support of Congress. In June, the President designated the Northwestern Hawaiian Islands as a Marine National Monument encompassing nearly 140,000 square miles. This monument includes 4,500 square miles of relatively undisturbed coral reef habitat that is home to more than 7,000 species, a quarter of which do not exist anywhere else on Earth. And for the first time, NOAA will play a leading role in managing a national monument. It is an exciting and important opportunity for NOAA.

We have also increased the security of our nation's folks living around the coastlines. We have a combination of new tsunami buoys and around-the-clock warning capability thanks to support from Congress. NOAA has 23 special buoys around the U.S. coast. Plans call for the U.S. Tsunami Warning Network to include 39 buoy stations by mid-summer 2008 with 32 in the Pacific and seven in the Atlantic. NOAA has also achieved 24–7 operation of the Nation's two Tsunami Warning Centers located in Alaska and Hawaii which provide warnings and alerts to our nation and to the nations in the Pacific rim.

NOAA collaborated with federal partners to place a NOAA weather radio in every public school in America, and the support of this committee has been very important to NOAA weather radio. That is more than 97,000 radios to aid in protecting our children. Our weather radios, All Hazards, provide automatic alerts for severe weather, man-made disasters such as chemical spills and terrorism threats as well as Amber Alerts for missing children.

My written testimony presents the details of the budget. It is aligned in several priority areas. First of all, sustaining critical operations and then supporting our U.S. Ocean Action Plan mentioned previously, improving weather warnings and forecasts and climate monitoring and research are all important to today's society and economy. I will highlight just a few of the key increases in these areas.

The total request is $3.8 billion which represents a $131 million, or 3.4 percent, increase over the fiscal year 2007 request. But as mentioned, it is a $96 million decrease from the fiscal year 2006 enacted level. The budget does provide modest new investments in priority areas while maintaining critical services. Approximately $54 million in net increases will support our workforce which is mentioned again as a critical part of what we provide to the coun-

try and pay for regular inflation costs. Continued implementation of the President's Ocean Action Plan, which follows on the Ocean Policy Commission and the Pew Commission, remains a priority for the Administration. As mentioned, the budget requests $123 million increase to support the plan, $60 million for ocean science and research, $38 million to protect and restore marine and coastal areas, and $25 million to ensure sustainable use of our oceans. And specifically the budget requests $16.4 million for the Integrated Ocean Observing System, or IOOS, for development of regional systems and improved data management and communications. It also includes $8 million for enforcement and management activities in the newly designated Northwestern Hawaiian Islands National Marine Monument.

To improve weather forecast and warnings, our budget requested an increase of $5 million to support operations and maintenance of hurricane data buoys and research on hurricane intensity that will ultimately save lives. More than $23 million in total is requested to continue strengthening the U.S. Tsunami Warning System, which is including an increase of about $2 million for additional deep-ocean buoy stations. Climate monitoring and research increases of $9.4 million will support the development of an integrated drought early warning forecast system that will enhance our nation's food security by providing earlier and more accurate drought forecasts.

I appreciate the efforts again of this committee in passing the NIDIS legislation last year.

Let me conclude briefly by talking briefly about two oversight issues which I know are of importance to this committee and certainly to NOAA. There have been many challenges with our satellite programs and NPOESS in particular. Let me assure the Committee that I am doing everything, along with my organization, to ensure this program stays on track. We have made numerous personnel changes, we are implementing every recommendation from the GAO and the Department of Commerce Inspector General and I meet with the Under Secretary of the Air Force and the NASA Administrator once a quarter and more often, if necessary, to review this program. Satellites are complex and risky tools, but they are vital to all aspects of NOAA's mission.

I also want to assure the Committee that the Department of Commerce is in the final stage of updating its communication policy which will ensure our scientists have, for the foreseeable future, the freedom to speak openly, communicate their science to the media and public. Open and free scientific debate is an important principle that I maintain personally and within the organization.

Again, thank you for this opportunity to present the budget. I look forward to your questions.

[The prepared statement of Vice Admiral Lautenbacher follows:]

PREPARED STATEMENT OF VICE ADMIRAL CONRAD LAUTENBACHER, JR.

Madam Chairwoman and Members of the Subcommittee, before I begin my testimony I would like to thank you for your leadership and the generous support you have shown the National Oceanic and Atmospheric Administration (NOAA). Your continued support for our programs is appreciated as we work to improve our products and services for the American people. Thank you for the opportunity to testify on the President's Fiscal Year (FY) 2008 Budget Request for NOAA.

The FY 2008 President's Budget supports NOAA's priority to advance mission-critical services. The FY 2008 request is $3.815 billion, which represents a $131 million or 3.4 percent increase over the FY 2007 request. This request includes the level of resources necessary to carry out NOAA's mission, which is to understand and predict changes in the Earth's environment, and conserve and manage coastal and marine resources to meet our nation's economic, social and environmental needs. At NOAA we work to protect the lives and livelihoods of Americans, and provide products and services that benefit the economy, environment, and public safety of the Nation. Before I discuss the details of our FY 2008 budget request, I would like to briefly highlight some of NOAA's notable successes from the past fiscal year (2006).

**FY 2006 ACCOMPLISHMENTS**

**President Designates Largest Fully-Protected Marine Area on Earth**

Recognizing the continuing need for resource protection, President Bush designated the Northwestern Hawaiian Islands as a marine national monument on June 15, 2006. Encompassing nearly 140,000 square miles, the monument covers an area larger than all of our national parks put together, including 4,500 square miles of relatively undisturbed coral reef habitat that is home to more than 7,000 species. The creation of the largest fully-protected marine area in the world is an exciting achievement and recognizes the value of marine resources to our nation.

**Successful Launch of NOAA Satellite GOES–13 and New Satellite Operations Facility Ensure Continuity of Improved Data Collection**

On May 24, 2006, officials from NOAA and the National Aeronautics and Space Administration (NASA) confirmed that a new geostationary operational environmental satellite, designed to track hurricanes and other severe weather impacting the Nation, successfully reached orbit. Upon reaching final orbit, the satellite was renamed GOES–13. This is the first in a new series of satellites featuring a more stable platform enabling improved instrument performance. NOAA instruments were also launched on the European MetOp-A polar-orbiting satellite in October 2006. Combined with NOAA and Department of Defense (DOD) operational satellites, MetOp-A will help provide global data for improving forecasts of severe weather, disaster mitigation, and monitoring of the environment. This launch ushered in a new era of U.S.-European cooperation in environmental observing.

In 2006, NOAA satellite operations and data processing groups began moving into the new NOAA Satellite Operations Facility (NSOF). The NSOF will house the NOAA satellite command and control functions and data and distribution activities that are central to NOAA's mission. The NSOF will also house the U.S. Mission Control Center for the Search and Rescue Satellite-Aided Tracking (SARSAT) program and the National Ice Center (NIC), a joint NOAA/DOD mission to track ice floes and issue warnings to the Nation's maritime force. The NSOF will become fully operational in Spring 2007.

**Enhancements to NOAA's Fleet of Ships and Aircraft**

Significant progress is being made in modernizing NOAA's fleet. NOAA took delivery of the Fisheries Survey Vessel (FSV) HENRY B. BIGELOW, the second of four new FSV, on July 25, 2006. The BIGELOW has high-tech capabilities that make it one of the world's most advanced fisheries research ships. These ships will be able to perform hydro-acoustic fish surveys and conduct bottom and mid-water trawls while running physical and biological oceanographic sampling during a single deployment—a combined capability unavailable in the private sector that will enable research and assessment to be carried out with greater accuracy and cost efficiency. NOAA also took delivery from the Navy of a "retired" P–3 aircraft in response to the hurricane supplemental bill attached to the FY 2006 Defense appropriations legislation. Rehabilitation of the P–3 is expected to be completed by the start of the 2008 hurricane season.

**Magnuson-Stevens Fishery Conservation and Management Act Reauthorized**

Congress reauthorized the *Magnuson-Stevens Fishery Conservation and Management Act* (MSA) in December, 2006, and it was signed into law by President Bush on January 12, 2007. The MSA is the guiding legislation that authorizes fishery management activities in federal waters. Enactment of this bill was one of the top priorities of the U.S. Ocean Action Plan. The reauthorized MSA strengthens NOAA's ability to end overfishing, rebuild fish stocks, and work collaboratively on conservation.

**U.S. Tsunami Warning System Improved**

NOAA designed easy to deploy Deep-ocean Assessment and Reporting of Tsunamis (DART)–II technology, which provides two-way communication between the buoys and NOAA facilities. This technology allows engineers to troubleshoot these systems from the lab and repair the systems remotely when possible. This functionality can minimize system downtime and save money by not requiring a ship be deployed to make minor repairs. The U.S. Tsunami Warning Program also created tsunami impact forecast models for nine major coastal communities, providing information for inundation maps. With the December 11, 2006 deployment of DART #23 in the Western Pacific Ocean, NOAA achieved initial operating capability (IOC) of the planned expanded U.S. Tsunami Warning Program. NOAA also achieved full 24/7 operations of the Nation's two Tsunami Warning Centers. Plans call for the U.S. Tsunami Warning Network to total 39 DART–II buoy stations by mid-summer 2008 (32 in the Pacific, seven in the Atlantic).

NOAA also continued to monitor sea height through a network of buoys and tide gauges, collecting information critical to understanding the time of arrival and the height of tsunami waves. In 2006, NOAA completed the installation of eight new National Water Level Observation Network (NWLON) stations to fill gaps in the detection network, bringing the two-year total to 15. The 15 stations were installed in California, Oregon, Washington, Alaska, Puerto Rico, and the Virgin Islands. These and other new stations brought the NWLON to 200 stations by the end of calendar year 2006. In addition, NOAA continued to upgrade the entire NWLON to real-time status by replacing over 50 data collection platforms.

**Red Tide Monitoring Protects Human Health and Coastal Economics in New England**

In the wake of the 2005 New England red tide crisis that forced the closure of most shell fisheries in the region, NOAA provided additional emergency funding in 2006 to provide timely and critical information to state managers to build upon long-term research supported by the Ecology and Oceanography of Harmful Algal Bloom, and Monitoring and Event Response for Harmful Algal Bloom programs at the Woods Hole Oceanographic Institution, as well as other partner institutions. In the spring of 2006, NOAA-sponsored monitoring detected rapid escalations of the bloom, which subsequently closed shell fisheries in Massachusetts, New Hampshire and Maine. Additional NOAA efforts allowed New England managers to make more strategic sampling and shellfish bed closures/openings to protect human health and minimize the economic impacts of harmful algal blooms.

**National Estuarine Research Reserve System Adds 27th Reserve**

On May 6, 2006, Commerce and Congressional officials dedicated the newest site in the National Estuarine Research Reserve System in Port Aransas, TX, bring the total to 27 reserves. This new reserve introduces a new biogeographic area type into the system, and adds 185,708 acres of public and private land and water. The reserves are federal-State partnerships, where NOAA provides national program guidance and operational funding. These reserves serve as living laboratories for scientists and provide science-based educational programs for students and the public.

**Wide Application Potential of Unmanned Aircraft Systems Demonstrated**

In 2006, NOAA worked with federal and private sector partners to successfully demonstrate Unmanned Aircraft Systems (UAS) technology. NOAA is interested in UAS as a tool to explore and gather data to help us reach new heights in our ability to understand and predict the world in which we live. Use of UAS could help NOAA achieve our mission goals and provide cost-effective means to: enforce regulations over NOAA's National Marine Sanctuaries, conduct long endurance flights for weather, conduct research over areas that pose significant risks to pilots, validate satellite measurements, provide counts of marine mammal populations, monitor atmospheric composition and climate, and hover above hurricanes and gather critical data for input into hurricane models. NOAA will continue to examine how UAS can assist in the collection of environmental data.

**Protecting Habitat Essential to Fish**

In 2006, over 500,000 square miles of U.S. Pacific Ocean habitats were protected from damage by fishing practices, particularly bottom-trawling. Combined, these areas are more than three times the size of all U.S. national parks. The historic protections, implemented by NOAA with the support and advice of the regional fishery management councils, fishing industry, and environmental groups, made the protection of essential fish habitat and deep coral and sponge assemblages a significant part of management efforts to conserve fisheries in the Pacific Ocean.

**NOAA Continues Efforts to Assist with Gulf Coast Recovery Following 2005 Hurricanes Katrina and Rita**

In addition to providing the forecasts and immediate response assistance in 2005, following Hurricanes Katrina and Rita, NOAA has continued to assist with Gulf Coast recovery efforts in FY 2006.

NOAA ships and aircraft provided critical response and recovery capabilities in the aftermath of Hurricanes Katrina and Rita. NOAA Ship THOMAS JEFFERSON completed obstruction surveys in the Gulf of Mexico so that busy ports and shipping lanes could be re-opened to traffic. NOAA's Citation aircraft flew post-storm damage assessment surveys along the coasts of the Gulf States. This imagery was downloaded on the NOAA website, enabling emergency managers, local officials and average citizens to inventory damage and prioritize recovery efforts.

NOAA mounted a multi-pronged effort to address fishery-related impacts in the Gulf of Mexico in FY 2006. In August, 2006, NOAA awarded $128 million to the Gulf States Marine Fisheries Commission to reseed and restore oyster beds and conduct fisheries monitoring in the Gulf. In addition, NOAA Ship NANCY FOSTER conducted a seafood contamination survey for NOAA Fisheries near the Mississippi Delta to spot potential safety issues. This research monitored the seafood coming in from the Gulf to ensure it was safe for public consumption (free of PCBs, pesticides, and fossil fuels).

**Collaboration Enables a NOAA Weather Radio to be Placed in Every Public School in America**

NOAA and the Departments of Homeland Security and Education worked to get 97,000 NOAA weather radios placed in every public school in America to aid in protecting our children from hazards, both natural and man-made. In many cases, local Weather Forecast Office staff provided expertise in programming the radios to select specific hazards and geographic areas for which the school wanted to be alerted. This multi-month effort required close collaboration between the Departments of Homeland Security, Education, and Commerce (NOAA). This effort enabled schools to connect to part of the Nation's Emergency Alert System and greatly increases environmental situational awareness and public safety.

**World Ocean Database 2005**

NOAA's National Oceanographic Data Center (NODC) released a major upgrade to its World Ocean Database product. World Ocean Database 2005 (WOD05) is the largest collection of quality-controlled ocean profile data available internationally without restriction. All data are available on-line for public use. Data are available for 29 ocean variables, including plankton data. The database includes an additional 900,000 temperature profiles not available in its predecessor. The database provides the ocean and climate science communities with research-quality ocean profile data sets that will be useful in describing physical, chemical and biological parameters in the ocean, over both time and space. This database is a crucial part of the Integrated Ocean Observing System and the Global Earth Observation System of Systems.

**New Arctic Observatory Established for Long-Term Climate Measurements**

NOAA's Earth System Research Laboratory in Boulder, Colorado, in conjunction with our Canadian counterparts, established a research site located on Ellesmere Island to make long-term climate measurements of Arctic clouds and aerosols. This observatory supports NOAA's activities for the 2007–2008 International Polar Year.

**NOAA Scientists Identify Carbon Dioxide Threats to Marine Life**

A report co-authored by NOAA research scientists documents how carbon dioxide is dramatically altering ocean chemistry and threatening the health of marine organisms. The research also uncovered new evidence of ocean acidification in the North Pacific. The report resulted from a workshop sponsored by NOAA, the National Science Foundation, and the U.S. Geological Survey.

**First Operational Satellite Products for Ocean Biology**

In June, 2006, NOAA began to process and distribute ocean biology products for U.S. coastal waters, using satellite observations. This activity represents a successful transition of NASA research to NOAA operations. These products (e.g., chlorophyll concentration) represent the first satellite-derived biological products generated by NOAA for coastal and open ocean waters. These products are useful in detecting and monitoring harmful algal blooms, assessing regional water quality, and locating suitable habitat for fish and other important marine species. Development of these products prepares NOAA for generating and distributing ocean biology products in the global ocean after 2010.

## FY 2008 BUDGET REQUEST HIGHLIGHTS

### Supporting the U.S. Ocean Action Plan

Coastal and marine waters help support over 28 million jobs, and the value of the ocean economy to the United States is over $115 billion. The commercial and recreational fishing industries alone add over $48 billion to the national economy each year. The FY 2008 President's Budget requests $123 million in increases for NOAA to support the President's U.S. Ocean Action Plan. This oceans initiative includes $38 million to protect and restore marine and coastal areas, $25 million to ensure sustainable use of ocean resources, and $60 million to advance ocean science and research.

New investments in ocean science are aimed at monitoring and better understanding marine ecosystems. Increased funding of $16 million is included for the Integrated Ocean Observing System to enhance models and information products through development of regional systems and improved data management and communications. A total increase of $20 million is provided for NOAA research on four near-term priorities established through the national Ocean Research Priorities Plan. An additional $8 million will support exploring and defining areas of the continental shelf that are adjacent to, but currently outside of, U.S. jurisdiction. This work will enable a U.S. claim to these areas and the potential $1.2 trillion worth of resources they are estimated to contain.

The FY 2008 President's Budget builds on NOAA's strong record of investing in projects that embody the spirit of cooperative conservation. Projects to protect and restore valuable marine and coastal areas include funding of $8 million for enforcement and management activities in the recently designated Northwestern Hawaiian Islands Marine National Monument, and $10 million for a project to restore nearly 1,000 stream miles of habitat for endangered Atlantic salmon and other fish species. A total of $15 million is provided for the Coastal and Estuarine Land Conservation Program, to assist State and local partners in the purchase of high priority coastal or estuarine lands or conservation easements. Increased funding of $3 million is also included to support Klamath River salmon recovery projects. Finally, an increase of $5 million will support competitive grant programs focused on the Gulf of Mexico Alliance coastal resource priorities, as identified in the Governors' Action Plan for Healthy and Resilient Coasts.

Finally, the FY 2008 NOAA budget provides support to ensure sustainable access to seafood through development of offshore aquaculture and better management of fish harvests. The Administration will propose legislation to establish clear regulatory authority and permitting processes for offshore aquaculture. An increase of $3 million is included to establish the regulatory framework to encourage and facilitate development of environmentally sustainable commercial opportunities. In addition, $20 million in increases are provided to improve management of fish harvests, including $6.5 million in increases to implement the new and expanded requirements of the *Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006,* $3 million for observer programs, and $6 million for market-based approaches to fisheries management. Market-based approaches—such as Limited Access Privilege Programs (LAPPs) that provide exclusive privileges to harvest a quantity of fish—move fisheries management away from cumbersome and inefficient regulatory practices and have been shown to lead to lengthened fishing seasons, improved product quality, and safer conditions for fishermen. The Administration has set a goal of doubling the number of LAPPs in use by the year 2010, and the increased funding of $6 million for LAPPs in this request supports that goal. Finally, an additional $2 million in funding is provided to meet the management challenges of assessing and mitigating the impacts of sound from human activities, such as national defense readiness and energy exploration and development, on marine mammals.

### Sustaining Critical Operations

As always, I support NOAA's employees by requesting adequate funding for our people, infrastructure, and facilities. NOAA's core values are science, service, and stewardship, as well as people, ingenuity, integrity, excellence, and teamwork. Our ability to serve the Nation and accomplish the missions outlined below is determined by the quality of our people and the tools they employ. Our facilities, ships, aircraft, environmental satellites, data-processing systems, computing and communications systems, and our approach to management provide the foundation of support for all of our programs. Approximately $54.6 million in net increases will support our workforce inflation factors, including $44.9 million for salaries and benefits and $6.6 million for non-labor related adjustments such as fuel costs.

This year, we focus on the operations and maintenance of NOAA vessels and necessary enhancements to marine safety, facility repair, and modernization. A funding increase of $8.3 million will be used to support marine operations and equipment, including $5.6 million for new vessel operations and maintenance and $1.7 million to implement a more effective maritime staff rotation and safety enhancements. This funding will support the operations maintenance for the OKEANOS EXPLORER, NOAA's first dedicated Ocean Exploration vessel. Increased funding of $5.5 million will support operations and maintenance for NOAA's third P–3 aircraft. NOAA is also moving forward this year with increases in funding for unmanned vehicles, with $0.7 million in support of Autonomous Underwater Vehicles (AUV) and an increase of $3 million in funding to support the further use of Unmanned Aircraft Systems (UAS). With this increase, NOAA will evaluate the benefits and potential of using UAS to collect data crucial for climate models, weather research, fisheries enforcement, and coastal zone studies.

The backbone of the NOAA infrastructure is our integrated Earth observation effort. NOAA, NASA and the Office of Science and Technology Policy (OSTP) serve as the lead agencies for the Federal Government in developing our U.S. integrated Earth observing strategy. In addition, I serve as one of four intergovernmental cochairs of the effort to develop the Global Earth Observation System of Systems. Building and maintaining state of the art satellite programs is an important component of NOAA's integrated observation efforts. An increase of $25 million in the Polar Operational Environmental Satellite (POES) program continues support for development and acquisition of polar-orbiting weather satellites to improve weather forecasting and our understanding of the climate. This increase will allow NOAA to complete acquisition of this series of polar satellites and install and maintain instruments important to U.S. Government interests on the European MetOp partner satellite. Following the completion of the POES program, it will be replaced by the tri-agency National Polar-orbiting Operational Environmental Satellite System (NPOESS). This transition is expected in 2013. We will continue to partner with the Europeans on their MetOp satellite as NPOESS replaces our current POES satellites.

**Improving Weather Warnings & Forecasts**

Severe weather events cause $11 billion in damages and approximately 7,000 weather-related fatalities yearly in the United States. Nearly one-third of the economy is sensitive to weather and climate. Realizing this, NOAA seeks to provide decision makers with key observations, analyses, predictions, and warnings for a variety of weather and water conditions to help protect the health, lives, and property of the United States and enhance its economy. Increased funding of $2 million will accelerate research to improve hurricane intensity forecasts through targeted research for new models and observations. Another $3 million will support the operations and maintenance of 15 hurricane data buoys in the Caribbean, Gulf of Mexico, and the Atlantic Ocean. Finally, NOAA continues to strengthen the U.S. Tsunami Warning Program with an increase of $1.7 million to deploy additional deep ocean buoy (DART) stations. Strengthening the U.S. Tsunami Warning Program provides effective, community-based tsunami hazard mitigation actions including required inundation flood mapping, modeling, forecasting efforts and evacuation mapping, and community-based public education/awareness/preparedness for all U.S. communities at risk.

**Climate Monitoring & Research**

Society exists in a highly variable climate system, and major climatic events can impose serious consequences on society. The FY 2008 Budget Request contains investments in several programs aimed at increasing our predictive capability, enabling NOAA to provide our customers (farmers, utilities, land managers, weather risk industry, fisheries resource managers and decision makers) with assessments of current and future impacts of climate events such as droughts, floods, and trends in extreme climate events. NOAA is building a suite of information, products and services to enable society to understand, predict, and respond to changing climate conditions. These activities are part of the U.S. Climate Change Science Program and are being conducted in collaboration and coordination with our important interagency partners including NASA, NSF, and the Department of Energy. We will continue to expand and improve access to global oceanic and atmospheric data sets for improved climate prediction and development of climate change indicators. NOAA will support the critical National Integrated Drought Information System with increases of $4.4 million to develop an integrated drought early warning and forecast system to provide earlier and more accurate forecasts of drought conditions. This request also supports the Administration's efforts to create a U.S. Integrated Earth

Observation System. With an increase of $0.9 million, we will support research on water vapor to refine climate models. In support of the Ocean Research Priorities Plan, NOAA will enhance our understanding of the link between ocean currents and rapid climate change with an increase of $5 million in support of research on this topic. Finally, an additional $1 million in funding will provide additional computational support for assessing abrupt climate change.

**Critical Facilities Investments**

The FY 2008 President's Budget Request also includes important increases for critical facilities, necessary to provide a safe and effective working environment for NOAA's employees.

Of particular importance this year is the $3 million funding increase to begin design of a replacement facility at the La Jolla Southwest Fisheries Science Center. NOAA is also requesting $20.3 million for continued construction of the new Pacific Region Center on Ford Island in Honolulu, Hawaii. This increase in funding will allow NOAA to complete the exterior renovation of one of the Ford Island buildings, a crucial next step in the construction process.

**CONCLUSION**

NOAA's FY 2008 Budget Request provides essential new investments in our priority areas while maintaining critical services, reflecting NOAA's vision, mission, and core values. The work NOAA accomplished in 2006 impacted every U.S. citizen. We will build on our successes from last year, and stand ready to meet the challenges that will surface in FY 2008 and beyond. NOAA is dedicated to enhancing economic security and national safety through research and accurate prediction of weather and climate-related events, and to providing environmental stewardship of our nation's coastal and marine resources. That concludes my statement, Madam Chairwoman. Thank you for the opportunity to present NOAA's FY 2008 Budget Request. I am happy to respond to any questions the Committee may have.

BIOGRAPHY FOR VICE ADMIRAL CONRAD C. LAUTENBACHER, JR.

A native of Philadelphia, Pa., retired Navy Vice Admiral Conrad C. Lautenbacher, Ph.D., is serving as the Under Secretary of Commerce for Oceans and Atmosphere. He was appointed Dec. 19, 2001. Along with this title comes the added distinction of serving as the eighth Administrator of the National Oceanic and Atmospheric Administration. He holds an M.S. and Ph.D. from Harvard University in applied mathematics.

Lautenbacher oversees the day-to-day functions of NOAA, as well as laying out its strategic and operational future. The agency manages an annual budget of $4 billion. The agency includes, and is comprised of, the National Environmental Satellite, Data and Information Services; National Marine Fisheries Service; National Ocean Service; National Weather Service; Oceanic and Atmospheric Research; Marine and Aviation Operations; and the NOAA Corps, the Nation's seventh uniformed service. He directed an extensive review and reorganization of the NOAA corporate structure to meet the environmental challenges of the 21st century.

As the NOAA Administrator, Lautenbacher spearheaded the first-ever Earth Observation Summit, which hosted ministerial-level representation from several dozen of the world's nations in Washington July 2003. Through subsequent international summits and working groups, he worked to encourage world scientific and policy leaders to work toward a common goal of building a sustained Global Earth Observation System of Systems (GEOSS) that would collect and disseminate data, information and models to stakeholders and decision-makers for the benefit of all nations individually and the world community collectively. The effort culminated in an agreement for a 10-year implementation plan for GEOSS reached by the 55 member countries of the Group on Earth Observations at the Third Observation Summit held in Brussels February 2005.

He also has headed numerous delegations at international governmental summits and conferences around the world, including the U.S. delegation to 2002 Asia-Pacific Economic Cooperation Ocean Ministerial Meeting in Korea, and 2002 and 2003 meetings of the World Meteorological Organization and Intergovernmental Oceanographic Commission in Switzerland and France, as well as leading the Commerce delegation to the 2002 World Summit on Sustainable Development in South Africa.

Before joining NOAA, Lautenbacher formed his own management consultant business, and worked principally for Technology, Strategies & Alliances Inc. He was president and CEO of the Consortium for Oceanographic Research and Education (CORE). This not-for-profit organization has a membership of 76 institutions of

higher learning and a mission to increase basic knowledge and public support across the spectrum of ocean sciences.

Lautenbacher is a graduate of the U.S. Naval Academy (Class of 1964), and has won accolades for his performance in a broad range of operational, command and staff positions both ashore and afloat. He retired after 40 years of service in the Navy. His military career was marked by skilled fiscal management and significant improvements in operations through performance-based evaluations of processes.

During his time in the Navy, he was selected as a Federal Executive Fellow and served at the Brookings Institution. He served as a guest lecturer on numerous occasions at the Naval War College, the Army War College, the Air War College, The Fletcher School of Diplomacy, and the components of the National Defense University.

His Navy experience includes tours as Commanding Officer of USS HEWITT (DD–966), Commander Naval Station Norfolk; Commander of Cruiser-Destroyer Group Five with additional duties as Commander U.S. Naval Forces Central Command Riyadh during Operations Desert Shield and Desert Storm, where he was in charge of Navy planning and participation in the air campaign. As Commander U.S. Third Fleet, he introduced joint training to the Pacific with the initiation of the first West Coast Joint Task Force Training Exercises (JTFEXs).

A leader in the introduction of cutting-edge information technology, he pioneered the use of information technology to mount large-scale operations using sea-based command and control. As Assistant for Strategy with the Chief of Naval Operations Executive Panel, and Program Planning Branch Head in the Navy Program Planning Directorate, he continued to hone his analytic skills resulting in designation as a specialist both in Operations Analysis and Financial Management. During his final tour of duty, he served as Deputy Chief of Naval Operations (Resources, Warfare Requirements and Assessments) in charge of Navy programs and budget.

Lautenbacher lives in Northern Virginia with his wife Susan who is a life-long high school and middle school science teacher.

Chairman LAMPSON. Thank you, Admiral Lautenbacher. I would now call on Dr. Pietrafesa.

**STATEMENT OF DR. LEN PIETRAFESA, ASSOCIATE DEAN, OFFICE OF EXTERNAL AFFAIRS; PROFESSOR OF OCEAN AND ATMOSPHERIC SCIENCES, COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES, NORTH CAROLINA STATE UNIVERSITY**

Dr. PIETRAFESA Mr. Chairman and Ranking Member Inglis, thank you for this opportunity to participate in this hearing regarding NOAA and its budget proposal for fiscal year 2008.

Today I am appearing on behalf of the Friends of NOAA Coalition consisting of over 40 very diverse entities, all NOAA stakeholders. A copy of a letter sent by the Friends Coalition to this committee in support of an adequate budget for NOAA for fiscal year 2008 is attached to my testimony.

At the $4.5 billion level, which is $15 per American annually, NOAA would be able to better serve our nation. The American people need and deserve the most comprehensive, objective, accurate, and timely environmental information possible. The value of these services to the Nation, save for D–Day, has never been greater.

What is the broad brush economic importance of NOAA to the Nation? Department of Commerce statistics show that weather and climate sensitive industries account for more than one-third of the Nation's GDP. Seventy-five percent of the Nation's gross State product comes from the coastal States, and 50 percent of the Nation's economy derives from the coastal counties where NOAA roles support the significant economic activities. Annually there are 1.5 million highway accidents, and 700,000 deaths that are weather related. $4.5 billion is lost annually just due to weather-related air

traffic delays such as the 3,600 canceled flights this past weekend. Investments in road and aviation, weather infrastructure, and research would greatly reduce these numbers and economic impacts.

Total annual federal spending for weather information is about $25 per household. Aquaculture represents a $1 billion a year industry for U.S. fish farmers and $6 billion per year in retail sales. Yet, we presently import 80 percent of the fish we consume. As the Nation's appetite for seafood grows, the U.S. will need an additional $4.5 billion pounds per year. Here NOAA must lead this effort.

The recently released NRC report, the Decadal Survey, points out that the U.S. Earth integrated observation capability is lacking and puts our nation's global economic competitiveness at risk. Lloyds of London has stated that we cannot afford to deny climate trends that may likely lead to $100 billion individual mega catastrophes in insured losses and that U.S. environmental observing assets and products that should be provided are crucial and critical to avoiding these industry-threatening costs. Long-term sustained aid is needed to quantify climate trends. Here the NOAA National Climatic Data Center's archive of data and information is critical for all federal agencies and for its huge economic worth to industry.

But chronic under funding prevents us from capitalizing on new advances in knowledge, new technology, and innovative ideas; and in this context, disarray and delay in developing our Earth-observing systems makes no sense to me.

The cost of an integrated ocean observing system that builds on the essential federal monitoring backbone in the coastal waters, including the Great Lakes, will be $250 million a year. But the value to the Nation of greatly improved forecasts, including ecological, will be in the many billions, tens of billions of dollars per year.

I, along with the Pew Commission, the U.S. Commission on Ocean Policy and many members of the Friends Coalition, believe that an organic act would significantly strengthen NOAA. A comprehensive NOAA Organic Act should address the following key issues: management; assessment, production, operations and applications; and research with external partners and educational engagement of the public. As this committee knows, the idea of making NOAA into an independent agency is not new and is controversial. But OMB should assess the NOAA budget in the context of other major agencies and departments within its natural resource programs directorate. In this context, the linkages that exist between NOAA and NASA and NSF must be acknowledged and understood. Enactment of a NOAA Organic Act provides a useful forum for the consideration of such a proposal.

In conclusion, the Friends of NOAA Coalition appreciates the severe budgetary constraints under which the Congress is working. However, we believe that the case for the NOAA budget is so compelling that we urge the Congress to support an appropriation of at least $4.5 billion and to support the legislation which would codify and strengthen the agency. The Friends Coalition is deeply grateful for the opportunity to participate in this hearing, and I would be happy to respond to any question you and the Members of the Committee might have.

Thank you.

[The prepared statement of Dr. Pietrafesa follows:]

PREPARED STATEMENT OF LEN PIETRAFESA

Mr. Chairman and Members of the Subcommittee—thank you for this opportunity to participate in this hearing regarding the National Oceanic and Atmospheric Administration (NOAA) and its budget proposal for fiscal year 2008.

My name is Len Pietrafesa. I am a Professor of Ocean and Atmospheric Sciences and an Associate Dean at North Carolina State University. I am the immediate past chair of the NOAA Science Advisory Board, a member of the Board of Trustees of the University Corporation for Atmospheric Research and have been a Governor on the Board of the Consortium for Oceanographic Research and Education, Chair of the National Council on Ocean Affairs and Chair of the National Association of State Universities and Land Grant College Board on Oceans and Atmosphere.

Today, I am appearing on behalf of the Friends of NOAA Coalition. The Coalition consists of over 40 different organizations, institutions, and groups from the academic community, the environmental community and the private sector, including such organizations as the Shipbuilders Council of America, the Consortium for Oceanographic Research and Education, the Reinsurance Association of America, the National Marine Sanctuary Foundation, the Joint Ocean Commission Initiative, the Alliance for Earth Observations, the University Corporation for Atmospheric Research, the National Association of Marine Laboratories, the Red Cross and The Weather Channel—just to name a few. Diverse though they are, each one of these organizations believes strongly in the effectiveness of NOAA and benefits from the products and services provided by the agency. I have attached to my testimony a copy of a recent letter sent by the Friends of NOAA Coalition to this and other Committees in support of an adequate budget for NOAA for FY 2008 (Attachment I).

The Coalition was formed last year to educate and inform policy-makers and the public about the important role NOAA plays as a supplier of environmental data and information products, as the world's greatest environmental data archiving agency, as a provider of environmental stewardship services, and as a leader in facilitating the conduct and integration of scientific research in support of the agency's critical missions. These missions are: to operationally, routinely forecast atmospheric, marine, space, aviation and road weather and climate, to understand and predict changes in the Earth's environment and to conserve and manage hydrologic, coastal and marine resources to meet our nation's economic, social and environmental needs.

The services, products and research results provided by NOAA—from forecasting the weather to predicting coastal hazards to monitoring and anticipating solar disruptions of communications on Earth, to recognizing climate variability and forecasting climate, and from managing drought and wildfires and fisheries, to ensuring safe and healthy seafood, providing access to navigational information and vital community assistance and by facilitating scientific research that improves operations and applications—touch the lives of every American and every facet of our economy. If funded at the $4.5 billion level ($15 per person annually) as recommended by the House Oceans Caucus and this Coalition, NOAA would be able to continue serving the extensive and varied interests and needs of our nation. The American people need and deserve the most comprehensive and timely environmental information possible. The value of objective, timely, and accurate environmental information (save for D–Day) has never been greater.

Significant events in recent years—the devastating tsunami following the Southeast Asian earthquake in 2004, the extent and ferocity of the 2004 and 2005 hurricane seasons, and the persistence and impact of the prolonged drought in the western United States—all underscore the importance of NOAA's mission to the Nation and the world. NOAA's National Weather Service and National Hurricane Center issued its forecast for Hurricane Katrina in a very timely manner—a forecast that probably saved many tens of thousands of lives. Moreover, it is the integration of NOAA's wide range of activities that allowed the agency to deliver such valuable life-saving services and information to our citizens. This integrated system includes satellites in space, buoys at sea, coastal and ocean observatories, weather stations found in every state of the Nation with a national radar network that is the envy of the world, and the people who provide life saving information to those with responsibility for the public's safety at State and local levels.

A wide variety of government agencies, professional and community organizations, and private industry have a vested interest in NOAA's ability to meet its mission. Each has its respective role in being responsive and effective in serving the Nation's needs for economic strength, environmental vitality, and human health and thus relies on services from NOAA. As an agency, NOAA has responsibilities for maintain-

ing and improving the viability of marine and coastal ecosystems, for delivering valuable weather, climate, and water information and services, for understanding the science and consequences of climate change, and for supporting and enhancing the global commerce and transportation upon which we all depend. To do so successfully in today's ever changing world, it must have strong Presidential and Congressional support and work in concert with its partners and stakeholders in Federal, State, and local governments and private organizations.

**The Importance of NOAA to the Nation**

Let me paint a picture of the economic importance of NOAA to the Nation, garnering high returns and greatly reducing losses relative to the overall investment in the agency. According to statistics published by the Department of Commerce last spring, weather and climate sensitive industries, both directly and indirectly, account for about one-third of the Nation's GDP ranging from finance, insurance, and real estate to services, retail and wholesale trade and manufacturing. Industries directly impacted by atmospheric, space and marine weather such as agriculture, construction, air, highway and sea travel, energy distribution, and outdoor recreation account for nearly 10 percent of the Nation's GDP. Six billion dollars is lost annually in economic efficiencies as a result of air traffic delays, of which 70 percent is attributed to weather; such as the 3600 flights canceled this past Saturday due to the ice and snow storm that pummeled the Northeast. Approximately seven thousand five hundred deaths and 1.5 million highway accidents occur annually across the Nation that are weather related. Total annual federal spending for weather information is about $25 per household (including aviation and defense, in addition to NOAA), which produces an annual benefit-cost ratio of 4.4 to one for U.S. households alone or net national benefits of $8.8 billion a year. This does not include benefits in agriculture, transportation, construction or benefits to households in other countries that rely on weather information from the United States.

A report about to be issued (by the Centric Consulting Group of Savoy, IL) documents an assessment on the value of NOAA to various sectors of our society. Using temperature information from the National Climatic Data Center, the Homebuilders Association was able to adjust its building foundation depth code, resulting in an industry savings of $250 M/year. The value of data from GOES–R satellite sensors to the U.S. economy includes such sectors as aviation weather, the power industry, crop irrigation, recreational boating, tropical cyclone forecasting and thus emergency and health and risk management sectors.

NOAA's role as the primary management agency for our oceans and coasts also helps support the significant economic activity in these regions. Seventy-five percent of the Nation's Gross State Product came from the coastal states in 2003. Almost half of the national economy came from the coastal watershed counties, and more than one-third came from those counties in which states operate their Coastal Zone Management programs. The near shore area, which is four percent of the Nation's land, produces more than 11 percent of the Nation's economic output. The portion of the U.S. economy that depends directly on the ocean is also large, with 2.2 million people employed and $197 billion in output (gross state product) in 2003. Aquaculture represents a $1 billion per year industry for fish farmers and produces $6 billion per year in retail food; yet the Nation is presently importing 80 percent of the fish it consumes. Overall, U.S. citizens consume about 16 pounds of seafood per capita per year (half the global average) and, as the population continues to grow, the U.S. will need to find another two million metric tons of high quality seafood each year at a value of about $2–8 billion per year. To address this need, by way of examples, research and outreach supported by the National Sea Grant College Program on Manila clams and blue mussels have resulted in new industries worth $19 million annually and a $25M annual hybrid striped bass aquaculture industry.

Estimates of the economic impacts of harmful algal blooms in the United States average $75 million annually. These impacts are the sum of different kinds of direct output impacts across four categories of effects: public health (divided between fish ciguatera and shellfish poisonings); commercial fishing; recreation and tourism; and monitoring and management costs. However, individual outbreaks can cause economic damage that exceeds the annual average. For example, outbreaks in the Chesapeake Bay in 1997 cost the Maryland seafood and recreational fishing industries almost $50 million in just a few months. Lost sales of shell fish in Maine and Massachusetts due to closures imposed as a consequence of 2005 harmful algal bloom were estimated to be $11 million for the months of May through September. Invasive algal blooms along Maui's Kihei coast cause over $20 million in potential revenue lost each year to the State of Hawaii—including reductions in property value and rental income, and increased clean up costs.

NOAA can help mitigate these losses by funding the research necessary to uncover the conditions responsible for the blooms and then advise on how to eliminate them or how to anticipate them and take the necessary actions to reduce their impacts.

**Integrated Earth Observation Capabilities and Leadership**

Integrated Earth observation capabilities are vital to American competitiveness. The recently released National Research Council (NRC) report, the Decadal Survey, helps us realize that the U.S. Earth observation capability is not keeping up with expectations and needs and puts our nation's global competitiveness is at risk. For example, preliminary estimates of the potential economic benefits from new investments in an Integrated Ocean Observing System (IOOS) in U.S. waters range from $500 million to $1 billion per year, estimated largely in terms of increased economic activity and social surplus realized as a result of improved information about coastal marine conditions.

It is likely that this is a gross underestimate of the potential value of IOOS as the NOAA Science Advisory Board has issued the report Ocean Modeling which claims that interactively coupled atmospheric—ocean models with more real time air—sea data available to be assimilated into the models will greatly improve NOAA's ability to forecast the size, intensity and precipitation content of winter storms; such as dreaded Nor'easters which frequently impact the Nation's Capitol. The cost of an IOOS that builds out the essential federal monitoring backbone in the Nation's coastal waters, including the Great Lakes, could well be $250M/year in equipment, maintenance, ship and personnel costs. But what is the value to the Northeast from Charleston to Nova Scotia of greatly improved forecasts of the timing, amount and type of precipitation or of impending catastrophic storms in Barrow or the Great Lakes? It must be in the tens of billions per annum. Risk management requires investments in national infrastructure.

In a January 12, 2007, speech to the World Affairs Council, Lord Levene, Chairman of Lloyd's, provided a global insurer's perspective on catastrophe trends and climate change. He stated, "We cannot risk being in denial on catastrophe trends. We can expect to see U.S. mega-catastrophes with 100 billion dollars insured losses soon. We urgently need a radical rethink of public policy, and to build the facts into our future planning." He added, "The insurance industry will continue to play a vital role as enabler and rebuilder of the U.S. economy." U.S. environmental observing assets and the products provided are critical to ensuring that insurance and other sectors have accurate and timely information.

Currently, the annual economic return to the U.S. economy associated with NOAA's El Niño Ocean observing and forecast system is between 13 and 26 percent, which is significantly higher than the Office of Management and Budget's 5.8 percent minimum rate of return specified for federal projects. To wit, we must have the global information infrastructure that is critical to our interconnected society. Comprehensive science information ensures that decisions will be made based on evidence rather than anecdotes. Long-term, sustained data is needed to document climate and identify trends. Without U.S. long-term climate data, the IPCC assessment would not have been possible.

Environmental sensors and remote observations improve our understanding and response to climate change and can help build enabling capacity to sustain U.S. competitiveness. Here again, in today's global, flat-Earth economy, innovation is the key to America's ability to prosper. The U.S. must stay at the forefront of Earth observation and geospatial technologies to better forecast and mitigate the impact of climate change, natural disasters and not only lead the competition but leave a more sustainable world for our children and their children. The motivations and aspirations of the next-generation workforce are being shaped today. We should be setting a long-range vision in place to encourage today's youth to pursue science, math, technology and engineering professions to assure future innovation and competitiveness. NOAA can aid and abet that process.

While satellites have been viewed as the panacea they are limited in their applications. As stated in the NRC report "Satellite observations have spatial and temporal resolution limitations and hence do not alone provide a picture of the Earth system that is sufficient for understanding all of the key physical, chemical, and biological processes." Thus, we need a system of space, ground (in-situ), airborne and ocean-based (in-situ) sensors, both public and private, that can gather complementary information and can be integrated with a minimum of duplication. Our commitment today to technology and greater knowledge of the Earth would allow us to better protect life and property and create unprecedented opportunities to promote economic vitality. The right instruments and information systems enable our ability to make forecasts that help anticipate outbreaks of infectious disease, ensure adequate

water availability and quality, or increase agricultural productivity. NOAA can aid and abet the build out of the required infrastructure.

The recommendations by the NRC Decadal Report would enable a global view of issues and activities. But a global view alone is not sufficient to make policy or decisions. We need researchers, geospatial modeling and analysis that integrate NOAA data. We should promote the use of established standards and protocols to assimilate data from multiple sensors and sources-including commercial providers, State and local governments, academia and international partners-and provide the data through user-friendly web portals. The NOAA NESDIS National Climatic Data Center is the Nation's archive of weather, climate, satellite, sea level, radar, precipitation, etc. data that are so critical to planning for all federal agencies, including the Department of Homeland Security and its Federal Emergency Management Agency, and private industry and academia. High quality, scrubbed, reliable data are available and can be used to conduct retrospectives and to develop disaster risk management based on physical, ecological and social sciences diagnostic assessments and prognostications. NOAA data is vital to this process.

The U.S. Commission on Ocean Policy, the Pew Commission, and the NRC Decadal report all call for increased funding to improve our current national Earth monitoring capability. While funding is important, what is also needed is clear federal leadership to address key questions such as: What is our national vision for Earth observations? How are requirements from the federal operational sector such as NOAA, USGS, USDA and EPA reflected in our research and development programs within NASA and NSF? Are requirements from the private sector being addressed? Leadership is essential to: protect these critical assets; develop a national Earth observation strategy to appropriately addresses climate change and other environmental challenges based on evidence over anecdote; assure economy and efficiency in agency plans and budgets; allow a smooth transition from research to operations to applications; improve U.S. land, atmospheric and oceanic -observing capabilities in equal priorities; improve capability and cooperation among government, private sector, academia, and non-governmental organizations; assure the much needed integration of our national and international Earth observation systems; and develop the products needed to make the best decisions for our country and future generations.

The NRC Decadal report recommends that the Office of Science and Technology Policy, in collaboration with the relevant agencies, and in consultation with the scientific community, should develop and implement a plan for achieving and sustaining global Earth observations. Then a single point of contact or lead agency—such as NOAA—should be designated to assure complementary rather than duplicative or fragmented effort for all operational aspects of Earth observation and analysis.

**Climate Change Science**

Through their capacity to absorb and transport heat and carbon dioxide, oceans are key drivers of climate change processes. In addition, they are also undergoing significant short- and long-term change over both large and small areas as evidenced by the increasing acidification of the oceans, climatic shifts associated with El Niño, dramatic changes in the amount of sea ice in the Arctic Ocean, rising sea level rise, and concern about possible abrupt climatic and ecological changes, particularly associated with shifts in ocean circulation.

Unfortunately, chronic under-funding of ocean and atmospheric science has prevented us from capitalizing on new technology and innovative ideas that would help address huge information gaps and significantly advance our understanding of atmospheric and ocean processes. Improved understanding of these processes will greatly enhance our ability to predict the economic and ecological ramifications associated with climate change. This information will be essential as Congress balances competing demands in the development of new national policies to minimize and adapt to climate changes in the coming years and decades.

NOAA can provide critical value to the deliberations concerning climate change by highlighting the importance of significantly improving our knowledge of ocean and atmospheric processes (physical, biological, chemical, geological) to provide decision makers with the information they need to make intelligent, economic and ecologically sound decisions—as well as the capacity to monitor these system to evaluate the effectiveness of any new policy mandates. The need to reduce our carbon emissions/footprint is important but so is the need to improve climate science and to pursue new management approaches to adapt to the inevitable environmental changes that will occur in the coming years and decades.

A recent example of the advances that have been made but of a lack of resources to continue the exceptional research results that have been developed derives form

a NOAA sponsored university cooperative partnership called Climate and Weather Impacts on Society and the Environment (CWISE). One of the many new advances made is the ability to predict in April, the number of hurricanes that will make land fall for an upcoming hurricane season on the U.S. eastern seaboard and the Gulf of Mexico (as was done in 2006), allowing for advanced planning. Unfortunately the program will not be continued, apparently because of a lack of NOAA resources to support the next phase of

research which, within the next year, would have resulted in bi-state level forecasts, from Texas to Maine. How much value would this new information be to federal and State agencies, to offshore and coastal industries, to insurance and risk management companies and to society? This Committee has been out front in leading the fight for meeting the Nation's future scientific and technical workforce needs. But here, the funding for graduate students, who would be skilled in helping NOAA and society deal with future impacts of natural hazards, will be terminated and the students will not be allowed to finish their degrees.

**Stewardship and Environmental Stability**

Beyond the economic benefits that NOAA provides to the Nation, many of its activities and duties help to maintain environmental stability, help to support human health, and help to enhance national security. The conservation and stewardship aspects of NOAA are vital to these many benefits provided by the agency. Some examples include:

- NOAA works to preserve the Nation's living marine resources by managing our fisheries and essential fish habitats for safe and sustainable harvesting and consumption, by protecting marine mammals under its jurisdiction, and by helping to implement the *Endangered Species Act;*
- NOAA protects our underwater treasures through the National Marine Sanctuary System, which maintain, monitor, and enhance the natural biodiversity, historical and cultural heritage, and other unique qualities of these areas, while enhancing public awareness, understanding, and stewardship towards the marine environment; and
- NOAA helps manage the Nation's coastal zones to balance competing demands, maintains a national network of monitoring programs that detect, quantify and forecast changes in coastal environmental quality, and works to protect coastal communities from the occurrence of disastrous oil and hazardous material spills and limiting the effects of spills on coastal resources that are vital to local economies.

**NOAA Organic Act**

Many members of the Friends of NOAA Coalition believe that an organic act would be very useful to guide the continued development of the policies, priorities, and programs of NOAA. I would like to offer some suggestions on the issues to be addressed in the hope that Congress will move to enact an organic act for NOAA.

Both the U.S. Commission on Ocean Policy and the Pew Commission argued strongly for an organic statute for NOAA. I believe such a bill would significantly strengthen the agency by providing a clear mandate from Congress to the Nation's lead civilian agency for oceans and atmosphere. The Joint Ocean Commission Initiative's recent report, From Sea to Shining Sea, also calls on Congress to codify and strengthen NOAA and thereby enhance its missions.

A comprehensive NOAA organic act should address the following key issues—

- Management—including the management of ocean and coastal areas and living and non-living marine resources, including fisheries, ocean and coastal areas, vulnerable species and habitats, and protection from pollution and invasive species;
- Assessment, prediction, and operations for atmospheric, ocean, and coastal atmospheric environments, including mapping and charting, satellite-based and in situ data collection, implementation of the Integrated Ocean Observing System, broadly based data information systems, and climate and weather services and products; and
- Research and education on all aspects of oceanic and atmospheric resources, including a focus on the importance of research and development, the use of scientifically valid technical data throughout the agency and with external partners, and promotion of educational activities at all levels across the agency and with the public.

Within any NOAA organic act, beginning with a strengthened science program and a more service-oriented approach, NOAA should promote inclusiveness and a commitment to meaningful partnerships with other agencies, states, the private sector, and the academic community. Where partnerships are strong, each institution benefits from the strengths of the others and the tendency to duplicate similar expertise and functions are minimized.

Extramural partnerships were stressed in the recommendations from the NOAA Research Review Team's Review of the Organization and Management of Research in NOAA which said, among other things, "NOAA cannot accomplish its goals without the extramural community, specifically the universities and institutions that represent the broad range of expertise and resources across the physical, biological, and social sciences. Moreover, there is the important issue of maintaining a scientific and technologically competent workforce in NOAA and that workforce is another 'product' of the external research community." We urge Congress to provide explicit authority and guidance via a NOAA Organic Act that will emphasize the development of meaningful partnerships with NOAA's stakeholders and partners.

**NOAA, NASA, NSF and the Earth Sciences**

No discussion about the role of NOAA is complete without recognizing the inextricable linkage that exists between NOAA, NASA and NSF. The importance of NOAA research and the unique niche that it fills vis-à-vis both NASA and NSF research is very important and is one of the areas that is always seemingly misunderstood when it comes to the vitally important issue of Earth-observing systems, and of the need for end-to end scientific research in support of operations, applications, and services needed by multiple sectors of society including private industry and society in general.

This committee has already heard from the co-chairs of the National Academy of Sciences panel that prepared the decadal survey entitled, *Earth Science and Applications from Space: Urgent Needs and Opportunities to Serve the Nation.* The panel's interim report made the following observations:

> "The current U.S. civilian Earth observing system centers on the environmental satellites operated by NOAA; the atmosphere-, biosphere-, ocean-, ice-, and land-observation satellites of NASA's Earth Observing System (EOS); and the Landsat satellites, which are operated by a cooperative arrangement involving NASA, NOAA, and the U.S. Geological Survey (USGS). Today, this system of environmental satellites is at risk of collapse. Although NOAA plans to modernize and refresh its weather satellites, NASA has no plan to replace its EOS platforms after their nominal six-year lifetimes end (beginning with the Terra satellite in 2005), and it has canceled, descoped, or delayed at least six planned missions, including the Landsat Data Continuity Mission.
>
> ". . .a substantial reduction in Earth observation programs today will result in a loss of U.S. scientific and technical capacity, which will decrease the competitiveness of the United States internationally for years to come. U.S. leadership in science, technology development, and societal applications depends on sustaining competence across a broad range of disciplines that include the Earth sciences."

In January 2007, the National Academies released the final report of the Decadal Survey panel. In the final report, the panel reiterated the concerns about the Nation's system of environmental satellites being "at risk of collapse." The final report states: "In the short period since the publication of the Interim Report, budgetary constraints and programmatic difficulties at NASA and NOAA have greatly exacerbated this concern. At a time of unprecedented need, the Nation's Earth observation satellite programs, once the envy of the world, are in disarray."

At a time when policy-makers worldwide are grappling with the important issue of climate change and global warming, allowing such disarray to develop in our Earth observing systems makes no sense to me. The Coalition supports the continued vigilance of this committee on this matter and urge the Administration and the Congress to provide the necessary support to move our Earth-observing systems forward rather than backward.

**An Independent NOAA**

As this committee knows well, the idea of making NOAA into an independent agency is not new and remains a controversial proposal. At the very least, however, the Office of Management and Budget (OMB) could consider reviewing NOAA's budget within its natural resource programs directorate, rather than the general government programs directorate. This change would make it easier to reconcile NOAA's budget with those of the other major resource-oriented departments and

agencies, all of which are reviewed as natural resource programs at OMB. Enactment of a NOAA Organic Act provides a useful forum for the consideration of such a proposal.

**Conclusion**

The members of the Friends of NOAA Coalition appreciate the severe budgetary constraints under which the Congress is working. However, we also believe that NOAA and its partners directly contribute to the health, safety, and continued economic competitiveness of our country. Therefore, the Coalition urges the Congress to recognize the importance of NOAA—and the information it produces and services it provides—by fully supporting an appropriation of at least $4.5 billion (again, only about $15/American annually) and legislation to codify and strengthen the agency as the legislative and congressional budget processes go forward over the coming months.

On behalf of the dozens of organizations, companies, and universities that make up the Friends of NOAA Coalition, we are grateful for the opportunity to participate in this hearing. I would be happy to try to answer any questions you and the Members of the Committee might have.

Thank you.

Attachment I

# FRIENDS OF NOAA COALITION

http://www.friendsofnoaa.org/

March 16, 2007

Honorable Bart Gordon
Chairman
Committee on Science and Technology
Technology
Washington, D.C. 20515

Honorable Ralph Hall
Ranking Minority Member
Committee on Science and

Washington, D.C. 20515

Dear Chairman Gordon and Ranking Member Hall:

The undersigned organizations are supporters, stakeholders, unionized employees and partners of the National Oceanic and Atmospheric Administration (NOAA). Collectively we make up the Friends of NOAA Coalition and we are writing to strongly encourage you to provide the agency with a budget of $4.5 billion in fiscal year 2008 – the same level as recommended by the Senate for fiscal years 2006 and 2007 and the same amount currently being recommended by the House Oceans Caucus.

NOAA is critical to protecting our ocean, coastal and Great Lakes resources, coastal communities, and the economy. In fact, weather and climate sensitive industries account for about one-third of the Nation's GDP. An investment of $4.5 billion averages out to $15 per person annually. For that small amount, each American receives weather forecasting, hurricane tracking, tsunami warnings, navigational information, fisheries management, hazard mitigation, scientific research, and local community assistance. NOAA affects and provides important services to all Americans and it is time for Congress to demonstrate its commitment to the NOAA programs that are vital to our economy and to the health and well being of every resident.

NOAA is also one of the premier science agencies in the Federal Government, providing decision makers with critically important data, products and services that promote and enhance the nation's economy, security, environment, and quality of life. For example, it was NOAA -- and its underlying science enterprise -- that enabled the delivery of accurate and timely information regarding the impending landfall of Hurricane Katrina in 2005, a forecast that saved tens of thousands of lives. A better understanding of the oceans and improvements in forecasting not only benefits coastal communities – it benefits us all. For example, economists have estimated that altering planting decisions based on improved El Niño and La Niña forecasts would save U.S. farmers $265-$300 million.

The $4.5 billion we are recommending for NOAA would fully fund the President's fiscal year 2008 budget request, including the priorities and initiatives contained in the interagency ocean research priorities plan and implementation strategy; restore funding for core programs, rebuild vital observation programs, and enable NOAA to address other issues germane to their mission that have traditionally been supported by Congress. It would allow enhancements in the development of an integrated ocean and atmospheric observing system; increased research and education activities, expand ocean conservation and management programs; and provide critical improvements in infrastructure (satellites, ships, high performance computers, facilities), and data management. Such an increase would represent significant progress toward addressing recommendations contained in

the reports of the U.S. Commission on Ocean Policy and the Pew Oceans Commission, the recent report card issued by the Joint Ocean Commission Initiative and the interagency Ocean Research Priorities Plan and Implementation Strategy.

We fully appreciate the very tight fiscal constraints facing the nation and the difficult decisions associated with allocating limited financial resources. Given NOAA's role as the lead federal agency for our oceans and atmosphere, and our increasing appreciation and understanding of the human health, national security, and economic impacts associated with the oceanic and atmospheric physical and biological processes, we firmly believe that an increased investment in NOAA is needed now. We appreciate your consideration of our collective views and recommendations for NOAA as you and your colleagues continue the development of the fiscal year 2008 budget.

Sincerely,

University Corporation for Atmospheric Research
Consortium for Oceanographic Research & Education
Reinsurance Association of America
American Red Cross
Commercial Weather Services Association
Shipbuilders Council of America
The Weather Channel, Inc.
WeatherBank, Inc.
United Fishermen's Marketing Association, Inc.
Fugro Pelagos, Inc.
Raytheon Company
National Weather Service Employees Organization
The Weather Coalition
National Association of State Universities and Land Grant Colleges
University of Oklahoma
National Association of Marine Laboratories
Sea Grant Association
Campaign for Environmental Literacy
Connecticut Sea Grant
American Society of Limnology and Oceanography
National Marine Sanctuary Foundation
Marine Technology Society
Council of Environmental Deans and Directors
National Council for Science and the Environment
Joint Ocean Commission Initiative
Coastal States Organization
West Marine, Inc.
National Estuarine Research Reserve Association
The Ocean Foundation
North Carolina Sea Grant
Maine Sea Grant
Maryland Sea Grant
Skidaway Institute of Oceanography
Rhode Island Sea Grant
Annis Water Resources Institute, Grand Valley State University
Minnesota Sea Grant
Moss Landing Marine Laboratories
Scripps Institution of Oceanography

Association of Zoos and Aquariums
National Marine Manufacturers Association
Woods Hole Oceanographic Institution
New York Sea Grant
University of New Hampshire
Hatfield Marine Science Center
University of Texas Marine Science Institute
The Ohio State University
Ohio Sea Grant College Program
F.T. Stone Laboratory
Center for Lake Erie Area Research
Great Lakes Aquatic Ecosystem Research Consortium
North Carolina State University
University of Illinois Department of Atmospheric Sciences
University of North Carolina Wilmington
Purdue University
Vaisala Inc.
Michigan Sea Grant
New Hampshire Sea Grant
Institute for Exploration
Delaware Sea Grant
Columbia University
University of North Carolina Chapel Hill
National Fisheries Institute
Natural Resources Defense Council
Humboldt State University Marine Laboratory
Center of Marine Biotechnology, University of Maryland Biotechnology Institute
Shoals Marine Laboratory, Cornell University
Wrigley Institute for Environmental Studies, University of Southern California
UCLA Institute of the Environment
Old Dominion University
Cooperative Institute for Limnology and Ecosystems Research
Cooperative Institute for Research in Environmental Sciences
University of Maryland Center for Environmental Science
American Rivers
Fish for the Future Foundation
Stony Brook University
Rutgers Institute of Marine and Coastal Sciences
Great Lakes WATER Institute, University of Wisconsin – Milwaukee
Oceanic Institute
Texas A&M University - Galveston
Center for Coastal Studies, Texas A&M University – Corpus Christi
Harte Institute for Gulf of Mexico Studies
University of Miami - Rosenstiel School of Marine & Atmospheric Science
University of Rhode Island
Florida Sea Grant
Environmental Defense
Bigelow Laboratory for Ocean Sciences
Florida State University Coastal and Marine Laboratory
Alliance for Earth Observations
Pennsylvania Sea Grant
The University of Texas Marine Science Institute

Management Association for Private Photogrammetric Surveyors
Oregon State University
Regional Science Consortium at the Tom Ridge Environmental Center
Oceana
South Carolina Sea Grant Consortium

BIOGRAPHY FOR LEN PIETRAFESA

After receiving his Ph.D. in Geophysical Fluid Dynamics in 1973 from the University of Washington, Dr. Len Pietrafesa joined the faculty at North Carolina State University and was made Full Professor (of Ocean & Atmospheric Sciences) in 1980. He served as the Head of the Department of Marine, Earth and Atmospheric Sciences for over 10 years and is presently the Associate Dean for External Affairs at the College of Physical and Mathematical Science. Dr. Pietrafesa's research and publications are diverse and include: estuary plume dynamics; coastal storm induced surge, flood and inundation forecasts; the interaction between the atmosphere and ocean in coastal storm genesis and intensification; interactive wave-current coupled modeling; the climatology of the frequency of occurrence and tracks of tropical; and the role of science in public policy. Recent foci are on the linkages between weather and climate and human disease, end to end modeling of physical through human systems and building a real time reporting coastal air-sea observing network offshore of the Carolinas in which data is assessed on the fly and assimilated into interactively coupled atmospheric-ocean models. He also discovered the mechanisms for the topographic deflection of the Gulf Stream at the Charleston Bump and the creation of the Charleston Trough, which he discovered and named, and coined the air-sea interaction term "buoyancy stress."

Dr. Pietrafesa is widely published (more than 180 publications) and his community service includes being Chair of the NOAA Science Advisory Board (eight years total on the Board, five years as the Chair); a member of the Board of Trustees of the University Corporation for Atmospheric Research (for six years); former Chair of the USA–Peoples Republic of China Steering Committee on Virtual Co-Laboratories; former Chair of the National Association of State Universities and Land Grant Colleges Board on Oceans and Atmosphere and Vice Chair of the Commission on Environment, Food and Renewable Resource. He was also former Chair of the Council on Ocean Affairs, the precursor to the Consortium for Oceanographic Research and Education (an organization he helped form). As well as former Chair of the American Meteorology Society Educational Advisory Committee, and a member of the American Geophysical Union Committee on Public Affairs. He has chaired 25 Ph.D. and 25 M.Sc. committees and mentored 15 post-doctoral students. He has given written and oral testimony on capitol Hill to committees on science in both the House and the Senate regarding such topics as: "are we prepared as a nation for severe weather"; "what were the three most important recommendations in the COPS report"; and "is the academic community in support of the American Competitiveness Initiative."

## DISCUSSION

### NATIONAL WEATHER SERVICE OPERATIONS

Chairman LAMPSON. Thank you very much. Let us start in with the questioning. As I said before, we will go back and forth between each of the sides as normal. There is an old saying that we all know. If something is not broken, do not fix it.

With that thought in mind, what is the current status of NOAA's concept of operations plan for change in the configuration of local weather forecasting offices of the National Weather Service, Admiral?

Vice Admiral LAUTENBACHER. For the past couple of years, obviously to try to be as efficient as you possibly can with the taxpayer resources, we are looking for ways to be more efficient with services from our forecast offices. We have not fully fleshed out all of the ideas that I think are relevant in that area. We are looking at ways to deal with that, and basically the current idea is on hold while we look at ways to modify it or change it. But we are going to continue with the service that we have today and not make any changes until new ideas can be tested and be thoroughly vetted with our unions and our personnel.

Chairman LAMPSON. Are you looking at trying to achieve a cost savings in the Weather Service operations?

Vice Admiral LAUTENBACHER. We need to involve building new products. So when I talk about saving money, we are trying to figure out how to take care of some of the needs that we have that are not covered today by being able to be more efficient in the way we do business. I would like to prefer to say it that way.

Chairman LAMPSON. And I assume that is a yes?

Vice Admiral LAUTENBACHER. Well, we have a lot of need to provide climate forecasting, ecosystem forecasting, and extensions of our hazardous weather forecasts. So there is more that can be done, that needs to be done, as the Nation grows; and we need ways to be able to accommodate that within our program. So looking for ways to deliver that service in a more efficient way is one of the things that we are trying to work on.

Chairman LAMPSON. Has there been any effort to try to look at in terms of a percentage or dollar terms as to what kind of savings you might be interested in trying to achieve?

Vice Admiral LAUTENBACHER. Our target is to be more efficient but maintain the service that we have to date with room for more service. There is no target. There is no, you must save five percent, you must save 10 percent. We have found that in an area where you are providing 24–7 emergency coverage for the Nation is not the right way to go about delivering those services. Arbitrary cuts generally don't work.

Chairman LAMPSON. In the agency briefing to staff in January on the Concept of Operations (CONOPS) plan, General Johnson indicated that NOAA would "demonstrate operability, performance, and effectiveness before committing to changes." What activities are you planning to demonstrate operability, performance, and effectiveness?

Vice Admiral LAUTENBACHER. Well, right now they are looking at ways to set up a testing process. I haven't approved the final testing process yet, so I can't sit here and tell you exactly how that will be done, but we have to do a test in a way that is fair, that doesn't eliminate any service, and that goes along with the congressional advice on indications on what we should do with our spending. So we intend to honor those indications that we have from Congress.

Chairman LAMPSON. Is the agency planning to obtain comments from the outside community of the National Weather Service stakeholders', State and local emergency managers, for example, who rely on local forecasting office personnel for information and assistance?

Vice Admiral LAUTENBACHER. Absolutely. I run an active forum with our stakeholders as well as General Johnson, and any changes we make are always discussed with our stakeholders.

Chairman LAMPSON. Are NOAA's employees fully informed of the agency's plans and are they being included in the planning and demonstration of the proposed changes?

Vice Admiral LAUTENBACHER. Yes, they are and they will be.

## NATIONAL POLAR ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM (NPOESS)

Chairman LAMPSON. This committee has been following the NPOESS program closely for years now, and it is well over budget and behind schedule.

The risk of a gap in our weather data is still quite high. The estimate for the procurement of the new geostationary satellite series is well-above the previous estimate, but there is no indication in this budget or in any recent budgets that the Administration has presented to this Congress that any adjustments are being made to accommodate the budget realities associated with the true cost of your satellite procurement programs. It looks like the administration's plan is to pass the bill for all of this onto the next administration. Even a small cost overrun by satellite procurement standards translates into significant amounts of money where NOAA's other programs are concerned.

Where are the additional funds that are needed to continue support for the existing essential programs at NOAA?

Vice Admiral LAUTENBACHER. The funding that is in our budget and that is projected, which we provided as Congress asked for the next five years, is the restructured NPOESS program. That represents a fully funded program that will deliver the Nunn-McCurdy Review Program which was briefed to the Committee. The numbers for this year that are there is 100 percent of the funding that is needed to maintain this program on track and to minimize the risk, and the numbers that we have in the out years, 2009, 2010, are the projections. We intend to work hard to ensure that the funding remains on track and that the program that we brief to you will be delivered at this point on track; and I will fight for the funds to try to do that.

Chairman LAMPSON. Even in the outyears?

Vice Admiral LAUTENBACHER. Even in the outyears. I am a shameless advocate of these programs, and I will continue to fight to get what I think is right, sir.

Chairman LAMPSON. Thank you very much. I will now recognize the Ranking Member, Mr. Inglis, for five minutes.

## WILDFIRE AND DROUGHT WARNINGS

Mr. INGLIS. Thank you, Mr. Chairman. We were talking about a number of things recently when you and I had an opportunity to get together, and I am particularly interested in wildfires and planning for droughts and how NOAA might be helpful in that way. Is that something that you currently do?

Vice Admiral LAUTENBACHER. Yes, we do. We are involved in providing warnings for wildfires. We use satellites to help us get the information where wildfires might be starting and then we use the atmospheric information that we get from the satellites as well as ground-based information to plot smoke plumes, and we provide tailored forecasts to firefighters on scene. And when there is a significant fire, we deploy what we call an I–MET, a well-trained meteorologist with a field computer receiving station right to the command post on-site in the firefighting to provide, which is the most important thing you can do for firefighters is to give them an idea

what is happening locally with winds and precipitation and temperatures. That is what we do, and that is a normal service and we intend to try to make it better.

We are looking at doing better models, we are looking at improving the links with our satellites and the use of more information and working with the Department of Agriculture, the Forestry Service, and the other folks, the states and the local emergency managers. It is an important part of our mission.

Mr. INGLIS. How about the long-range aspects of that? Any ability to predict a drought in this planting season, for example, such that it wouldn't be wise to plant somewhere because we see that this is coming? Are we that good or is that a ways away still?

Vice Admiral LAUTENBACHER. It is not far away, and thanks to the bill in Congress that you all helped pass last year, the NIDIS Bill, the Integrated Drought Information System is going to create a network that uses the federal networks as well as local networks, private networks, to build a much finer scale of information that can be brought in to produce models that will give us a much better handle on predicting the future. We believe that with the integrated ocean observing system that was just talked about in addition to the new sensors on satellites, that we will be able to do things like accurately forecasting seasonal conditions so that planting and crop rotation and management of livestock can be done on a much more economically sound basis taking into account environmental conditions. I believe that we are at the threshold of being able to do that.

## INSUFFICIENT FUNDING LEVELS

Mr. INGLIS. Dr. Pietrafesa, you testified I believe that the funding level you would recommend is $4.5 billion. As I understand it we are at $3.8 billion in this request. And climate change is obviously a significant topic around here. Do you think that the $3.8 billion is sufficient to have NOAA be gathering the information that we need or how do you think we will fare at the $3.8 billion level?

Dr. PIETRAFESA. I don't believe we will fare very well and the reason is in various parts of NOAA, there are activities that will contribute to our better understanding of climate, but for lack of the distributed observing network, the global observing network that is required, let alone the observing network in the coastal areas of the United States, the Great Lakes, and even over land, we are lacking the data that is needed and the precision of the data, the resolution of the data that is really required to really detect climate signals. That said, our ability to archive and store the data and to scrub that data and make that data available in near-real time or real time to industry, to university, researchers, and to federal agency researchers and information providers is compromised because the budgets are so tight.

One of the issues that really challenged the Science Advisory Board was the fact that NOAA simply can't afford to invest as much money as we believe it could or it should rather into the data activity. And NOAA has made every effort to improve its data archiving and access facilities and capabilities, but they are just under capitalized in that area. Also, the assessments of those data

require different kinds of mathematical methodologies, both deterministic and statistical and empirical. And that requires an investment not only in the computers to be able to analyze those massive data sets but to integrate those data sets with each other; and these are diverse, different but complementary data sets that need to be integrated if one is going to truly resolve what the relationships are between different climate factors and the weather delivery systems that evolve from these climate conditions. That takes people, it takes personnel, that takes extramural engagement, that is engagement of the extramural community, the university community, private industry, along with the NOAA scientists. And that is a considerable enterprise.

So just in the data area, if we saw another $25 to $50 million that would go a long way towards improving the capability of the agency to deliver more timely climate information and better climate information, more advance climate information, and in fact to get into the downscaling and upscaling of the climate to weather models and vice versa. And these are not just weather models—it doesn't end with the weather models. It actually could move into the ecological area.

So one could anticipate ecological impacts from various climate conditions, along with socioeconomic impacts. The Science Advisory Board believes that it is entirely possible to go from physical phenomenon to socioeconomic impacts in a seamless way through some complex mathematics and assimilation of the data that NOAA has in its archives or should be and could be collecting in its archives were it not undercapitalized.

Chairman LAMPSON. The gentleman from Washington, the Chairman of the Research and Science Education Committee I'll recognize for five minutes.

## LAW ENFORCEMENT CAPABILITY

Mr. BAIRD. I thank the Chair. Thank you, Gentlemen. Being from Washington State we are obviously interested in NOAA's activities. Particularly I want to ask a question about the resources available. Almost by its nature, NOAA is going to have to spend a lot of time in the water. Do you have adequate resources and what sorts of resources do you need for two main missions, both enforcement and research?

Vice Admiral LAUTENBACHER. Those are fully loaded questions.

Mr. BAIRD. They are not meant to be loaded. I know they are broad.

Vice Admiral LAUTENBACHER. No, no, they are broad. But enforcement, I believe that we have the right amount of money in our budget to be able to deal with enforcement, and what is important about our enforcement budget is that it leverages State assets and resources. Part of our budget is designed to have cooperative agreements with each of the States that bring their Department of Fisheries and Wildlife and DNR people in so we have seamless enforcement of our rules between the State waters and between the federal waters.

Mr. BAIRD. I have been told that some of your vessels are kind of aging to say the least and not up to the task of tracking down people who are violating our maritime laws. And that is really, on

the enforcement side, that is the nature of my concern. We have got these wonderful sanctuaries or other zones of protection or just natural interest. Do you guys have the folks who can track somebody as an intruder? They spend time out in the region themselves, in the real world in the region, and then if somebody does intrude or violate laws, track them down. That is the essence what I am after.

Vice Admiral LAUTENBACHER. I understand your question. The sanctuaries have small boats that they do use for enforcement activities inside the marine sanctuaries, which of course, there is a number on the West Coast. We try to recapitalize those boats with what we have. Obviously the fleet is aging, but we are able to each year replace a few and try to move on. We also use the cooperative agreements again. Fish and Wildlife helps us in places where we have adjoining types of preserves and national monument areas and national management areas. And the states help us as well. But in fact, it is difficult at times to maintain full coverage of all of our national marine sanctuaries. They have their large areas, and that is true.

## RESEARCH CAPABILITY

Mr. BAIRD. The second question, in particular, Doctor, the research side, do we have the kinds of vessels we need. I remember talking to somebody a couple years ago, and the nature of the vessel—if they wanted to study an area, they weren't equipped to go overnight for a couple of days. And so they were having to go out, study during the day, and come back; and sort of common sense says, one, that is not the most economical way. If you have the seakeeping capacity and the berths and whatnot to spend a couple days there, you could save all that transit time, plus you are in the environment longer. You can do real-time continuous observation versus—anyway, any thoughts on that?

Dr. PIETRAFESA. We have been able to in the last couple of years with some congressional help to provide some larger vessels. There is a new one now at the Monterey Bay Sanctuary that allows us to go overnight for several days and do the kinds of research activities that you've mentioned. I think this new boat is a good prototype for the future. We are looking as we can build the capital budgets to be able to put more of these in our sanctuaries, but they are an important adjunct to research.

Mr. BAIRD. Thank you. Admiral, Doctor, any comments on that?

Vice Admiral LAUTENBACHER. Yeah, I mentioned earlier the integrated ocean observing system, part of the deploying and maintaining and recovering and keeping the system alive is actually a research activity because the kinds of systems that have been deployed in the past are not necessarily real time but all of the NOAA assets have been real time. But some of the new observing systems are capable of observing for example wave spectra, that is, the propagation of waves and also tell you not just the amplitude of the waves but which way they are moving. And getting that data back in real time is a challenge because, you know, you are collecting data every half-second; and so you need wide band widths and you need to be able to talk to the instruments out in the ocean, so it has to be two-way communication.

But those sensors are still in developmental stages, and NOAA is going to have to develop a strategy to maintain those systems once they are shown to be very valuable, particularly in predicting things like riptides for example which take so many lives per year. And once they get into that game, they are going to have to be able to get back out there to service these instruments. It is not going to be an annual servicing but rather it may have to be every six months.

Mr. BAIRD. So that will need to be in the budget?

Vice Admiral LAUTENBACHER. That needs to be in the budget as well.

NATIONAL MARINE FISHERIES SERVICE (NMFS)

Mr. BAIRD. Admiral, educate me. NMFS is part of your budget, correct?

Vice Admiral LAUTENBACHER. Yes, it is.

Mr. BAIRD. One of the challenges we face in the northwest has been with the listing of salmon steelhead, and those species. Permitting times are extraordinarily costly to our economy. I recognize the importance of your job in trying to do the environmental review process, but when we don't have enough personnel to move permits quickly, literally hundreds of millions of dollars and significant opportunity costs result.

So I would be interested first of all in your comments on your budget as it relates to personnel to process permits. Secondly I want to commend some of your folks in the district. We have really initiated, at my request, some collaborative efforts where NMFS works with Fish and Wildlife, Corps of Engineers works with EPA, as needed, and with State agencies to do simultaneous parallel processing of permits, to work on programmatic kinds of permits. Any comments either on that approach and/or personnel would be much appreciated.

Vice Admiral LAUTENBACHER. Yes, sir. Thank you very much with recognizing the issues that we have with permitting. We have some additional money, not a lot, in this budget to help improve the permitting system and get a few more people on it. It is one of the issues that generally is not recognized as important in my view as it ought to be. I am a strong advocate for increasing resources in that area. Each year I try to do as much as I can to improve both in the marine mammal protection area as well as in the fishery permits and the consultations that we have to do for various other licensing that occurs for power dams and all that other thing.

I am a big fan of the streamlining and of simultaneous processes. We have tried to make strong bridging agreements with the Interior Department and local areas so we can do things simultaneously and try to improve, and EPA as well to try to improve it. I strongly support all efforts to make that a collaborative effort.

Mr. BAIRD. I appreciate that. I know my time has expired. The last comment I would make is I personally believe that investing in additional permitting personnel would vastly pay back the taxpayers in terms of expedited review process.

Chairman LAMPSON. I want to continue a little bit of what Mr. Baird was talking about, because while he is having a problem

with salmon in one place, I am having a problem with red fish at another place. And I know how important rebuilding stocks are and it is a priority of the administration, but what has been requested, $3.96 billion is about 2.7 percent below the fiscal year 2006 appropriated funding including $795.9 million for the National Marine Fishery Service, nearly $8 million less than what was appropriated in fiscal year 2006.

So for the past year, I have been literally beaten up over concerns from the Texas Gulf Coast regarding stock assessments, especially like when it comes to red snapper. Now, there are commercial interest, there are recreational anglers which is a significant part of the economy there. In my district and in surrounding districts, along with commercial shrimpers, both shrimpers and commercial boats have experienced losses in recent years with some being literally forced out of business. One of the largest and most popular snapper fishing party boats just recently announced that he could no longer stay in business because of seasons and size restrictions. Anglers have to throw back catch that is deemed too small, and one of the problems with catching red snapper, which is a fish that goes at a very deep water, and if you pull a fish up very quickly as one does in fishing and you find out that it is not the right size and you have to release it, it is dead.

And so we are drawing a good resource. And that means that I get to catch more of those fish and pull them up and kill them as well. And if they are not the right size, then we throw them overboard as well.

So we got some serious problems here that have been discussed for a long time but don't seem to be reaching the point of solution. It results in higher mortality rates and consequently, lower stocks. And they are being forced to comply with shorter and shorter seasons which is supposed to help in rebuilding the stock but I am not convinced that it is.

Same question, is this budget request sufficient to perform the real research necessary to provide adequate stock assessment and management?

Vice Admiral LAUTENBACHER. A couple of comments. The Magnuson-Stevens Bill under which we manage fishery was just reauthorized by Congress last year. So it is a bill that includes actually stronger provisions in it to prevent over-fishing. The Administration has added another $6.5 million to try to accommodate the work that goes on. Some of that is to improve the amount of effort that goes into the science so that we don't have the debates on what is the right science for this.

Chairman LAMPSON. How does that fit with this which has been decreased?

Vice Admiral LAUTENBACHER. You were talking about the section of the National Marine Fishery Service budget, and I will point out to you that that is the area that was shall we say least reduced from the enacted level. It is almost at the same level as Congress had left it in fiscal year 2006. That area is not a big change. There are changes if you look across——

Chairman LAMPSON. $8 million?

Vice Admiral LAUTENBACHER. $8 million out of——

Chairman LAMPSON. $8 million less.

Vice Admiral LAUTENBACHER.—$800. $8 million out of $800, roughly. I mean that is the numbers you are looking at, I think, right? Around $790-something, $804? I haven't got it in front of me. The Fishery Service of all of our areas is closer to being what Congress authorized in previous years. None of our areas are up to the level as been pointed out by all of you, that we are roughly $100 million down from the enacted levels that we are working on this year with the continuing resolution, but these are increases over what the administration asked for last year. Again, I come before Congress with continued offers to work with Congress to make sure that the money is put in the right places, that together the Nation uses it as well as we can.

But we have added more money to help us with Magnuson-Stevens which is what you are——

Chairman LAMPSON. Okay.

Vice Admiral LAUTENBACHER.—commenting on.

Chairman LAMPSON. What about in working with other agencies, for example, Texas Parks and Wildlife Department, other States' agencies to increase the data collection efforts, especially when it comes to licensing of recreational anglers and tracking of charter boats. Additional work——

Vice Admiral LAUTENBACHER. There is $3 million to try to improve that effort. We recognize that in the National Academy, we asked for a National Academy Report, that we need to have better information for recreational anglers, that it is obviously a major part of our economy and our coastal management issues.

Chairman LAMPSON. Would you like to make a comment on this, Dr. Pietrafesa? My time is expired, but I think it would be——

Dr. PIETRAFESA. Sure. This is an area where I believe that investments would really be wise and would be very productive. As I said in my testimony, the U.S. appetite for seafood is such that we are going to need an additional 4.5 billion pounds to appear in our supermarkets over the very short term in the future. And I see that there are two approaches that could be taken. One is that we need to be investing in research that looks at the stocks, the strength of the stocks, also the year-class strengths of the recruits as relates to climate factors and weather conditions, you know, changes in precipitation, river discharge and the like, changes in how the loop current in your part of the world, how the transport of the loop current changes from year to year or even season to season. So that is how the wild stock varies as a function of naturally occurring phenomenon.

On the other side, we need research on creating new agricultural industries, and so if you are going to invest $3 million a year in regulation, it seems to me that centers of excellence could be created at least on the order of $6 million. At least initially that could be located at some key locations around the country where agriculture research could be done along with climatological weather, ecological research that could be done.

So one could take a look at the agriculture approach as well as the wild stock approach to better understand the natural system as well as growing and raising new stocks.

Chairman LAMPSON. I have a personal request, Admiral Lautenbacher, and that is you help me find some way that I can

personally work with the folks in NMFS and see if we can't get them to better listen to the tens of thousands of sports fishermen who really know particularly the Western Gulf. My guess is that many know other areas of the Gulf of Mexico as well. But these people truly feel that they are not being heard or listened to by this agency. That is a personal request on my part, and I would be honored if you would work with me on that.

And at this time I will recognize Mr. Inglis.

## SATELLITE CAPABILITY

Mr. INGLIS. I thought you were going to ask him to help you identify where the big ones were, or that is what I thought. Admiral Lautenbacher, back to the climate change issue. Help me understand NOAA's role in all that the Federal Government is doing about climate change. I take it you have a fair amount of the responsibility for the work that is going on, right? NASA is also involved and spends a lot of money on satellites. How does that break down? Describe the role of NOAA as compared to other agencies that are doing other things?

Vice Admiral LAUTENBACHER. We have a very strong interest and a strong talent and skills to deal with climate issues. We are part of the government-wide Climate Change Science Program. In fact, one of our people is the leader of that program, Dr. Bill Brennan. We contribute across the full spectrum of climate services in general, from research up through products that our Weather Service puts out regularly for people which was mentioned a little earlier in our experimentation to be more efficient.

So we have the laboratories to do the modeling. The Princeton Geophysical Fluid Dynamics Laboratory's model is ranked in the top of the models that was used in the IPCC Report which just came out earlier in February. We have the satellites that are—some of the data is climate quality, a lot of it is not. We are at the verge of an era where we need to build more climate satellite instruments that provide the right kinds of accuracy for climate variables, but what we have NOAA provides and uses. We maintain the depository for all of our climate information at the Climate Data Center. Basically the Library of Congress for Scientific Information on Climate is maintained inside NOAA. We have the delivery service, weather forecast offices, to provide the products to the people, to the public, to emergency managers. So we have a, you might say, sort of a full-service range of activities that we are engaged in.

We also do assessments because of the impact of climate change on living marine resources and coastal resources where we have, you know, the legislation that requires us to maintain activities in those areas for fisheries as we just mentioned.

So we are a full-service climate organization. It is one of our strategic goals, climate change and planning and reacting to climate change for the future. I have organized the whole NOAA enterprise into four themes. We have one manager that manages climate services and deals with that whole arena. So we are very much engaged in it from A to Z.

Mr. INGLIS. So for example in the satellites, do you pay for the satellites that you just mentioned?

Vice Admiral LAUTENBACHER. Yeah, we pay—I forgot to mention the NASA role. NASA builds the research satellites and really most of our climate satellites today are research satellites. And so they are a one-of-a-kind research instrument that has been put into place, and they are being used to further our climate records. NOAA operates and maintains the operational satellites. So we have a constellation of satellites that ranges from two in a geostationary orbit that are constantly looking at both coasts of the United States. That is good for hurricanes and severe weather.

And then we have polar orbiting satellites that have an orbit of 90-some minutes that circle the Earth and provide—they are much lower orbit. They are not 23,000, 22,000 miles, they are down at 500 miles or so; and they provide much of the data that goes into our models. So those are operational satellites. And the NPOESS program, which I talked about, is sort of the next generation polar orbiting satellite.

We are trying to move climate instruments from the research into operational, and that is part of the issue of the difficulty of building the NPOESS program, the risk involved in doing that. We have had to stretch out the movement of those instruments from NASA satellites to NOAA operational satellites.

Let me stop. Does that help?

Mr. INGLIS. Who pays for the delivery of the satellites into space? Does NASA do that or do you have to pay them to do that?

Vice Admiral LAUTENBACHER. My part of the Commerce Department budget contains the money for the operational satellites. The research satellites—and we also use that data for weather forecasting—are operated and funded by NASA. So we feed off and need the Earth-observing part of NASA's budget to help us with our climate services and weather services delivery.

Mr. INGLIS. Absent the plus-ups that you hope to get I guess as this goes through the process, without those, you do all right on the things you have just been describing or do those get tight as well as—I know the overhead is particularly tight without—in other words, the ability to pay staff is particularly difficult without those plus-ups, right?

Vice Admiral LAUTENBACHER. It is but let me say I support the President's budget, so we have tried to craft a budget which includes enough money for payroll raises for all of our people. And so my plea generally to Congress and certainly to the House has been support the President's budget. We generally have been reduced. The House mark has generally been reduced for NOAA, not increased. So that has been part of the dynamic that shapes our operating from year to year.

But the President's budget has been crafted. We have tried to craft a budget that will maintain the services with the right amount of inflation that funds this year's increment for these satellites at exactly what is needed, 100 percent; and again, I will fight for the money for next year and the next year, and I will keep going until we get these things in place.

We have also included, which I think is very important for this committee, in the 2007 budget, we have included $19 million to help return climate sensors to the NPOESS program that we have had to stretch. Let us not say to the program itself but to find al-

ternative ways if necessary, put them on other satellites, free-flying satellites, have other agreements with our international partners that launch satellites, commercial industries. So we are looking very hard, and there is money there to ensure that we don't lose any data continuity from the sensors that we have had to stretch out because of the NPOESS development difficulties.

INTERNATIONAL COLLABORATION

Mr. INGLIS. You just mentioned something interesting, that is the international cooperation. I take it a fair amount of the information that you gather is shared with folks around the world? So actually it is in effect assistance to the rest of the world that we are providing with weather, is that right? I mean, do we freely share this information or is it available to the world-wide community?

Vice Admiral LAUTENBACHER. We do. We share the information and we have worked through the World Meteorological Organization for some 80 years to build a network around the world. It is an example for what I use for a global Earth-observing system of systems which we are also working on for more areas to be able to share the information because our weather comes from China and the Pacific Ocean. In fact, a number of years ago, the Europeans loaned us a satellite when we had one that had difficulty. We have helped the Japanese when their satellite went down with one of our older ones that was in orbit. So there is an international group that looks at trying to maintain a continuous constellation and weather information because everyone needs it, and we all benefit from it.

Mr. INGLIS. How dominant are we in that area? I mean, in other words, does the world depend on us or are we depending on them or is it mutual or are we the big players or——

Vice Admiral LAUTENBACHER. We are big players, obviously, because the United States is big player on everything. And so NOAA is a unique concept. The rest of the world has not caught up with the NOAA idea, yet which is bringing together Earth, atmospheric and ocean organizations together to provide the interdisciplinary information for climate change, for ecosystem management, for improving warnings, weather and warnings, and that sort of thing. But we are dominant in the sense that we are a large agency that brings together scientific disciplines in a way that other nations have not done yet. But quite frankly, we need other nations because we can't observe the weather over Russia the same way they can or with their geostationary satellite. So that international collaboration is very important and actually existed through the Cold War.

Mr. INGLIS. So that is a constant updating kind of thing where we are constantly getting and sharing information, getting it and sharing it?

Vice Admiral LAUTENBACHER. It is constantly being sent to our data centers and then being made available through internet and high-speed lines. You can go and look at our center, and you can look at a composite of all the satellites, and I invite any of the Members to come over to our operations center. It is in Suitland. It is not far to go. It is an easy trip. You can look at a composite

of all the geostationary satellite data in one shot, you can go to Europe at EUMETSAT and look at it in their headquarters, you can go to Japan, Meteorological in JAXA, their science space agency and see similar things. This is an extraordinary—when you look at all the other international problems we have, this is one that is very importantly consummated in the right direction.

Mr. INGLIS. Thank you, Mr. Chairman.

Chairman LAMPSON. You are welcome. Mr. Baird.

## MORE ON THE NATIONAL MARINE FISHERIES SERVICE (NMFS)

Mr. BAIRD. Thank you. I want to go back if I may, Admiral, and I am not trying to put you on the spot, I am just trying to get some numbers actually. Do you have available the numbers in terms of where your budget for permitting personnel will be if it is broken down that way for this year versus the last couple——

Vice Admiral LAUTENBACHER. We have line items that have that in there. I don't have that off the top of my head. I will be happy to provide you——

Mr. BAIRD. Could you?

Vice Admiral LAUTENBACHER.—the sections where we do permitting and what the, you know, our budget loading is in those areas.

Mr. BAIRD. Right. That would be helpful. And related to that, how is that line item determined? I mean, does someone look and say, look, here is what an average human being—not an average but you have got exceptional people working for you—so an exceptional human being who is processing permits. This is what they can do, this is the permitting load as we see it now, this is the shortfall, this is the waiting list, this is the cost. Does somebody look at that?

Vice Admiral LAUTENBACHER. We do that and at the end, given the allocations that we have we have to make decisions on how much we can put in each of the areas that are worthwhile spending money on, and usually this area comes up each year as being one that needs and I add money to it.

Mr. BAIRD. That was part of my question. How important is this? I can tell you, back home it is very important and I am right there with you. I agree that money spent in this area is well worth the effort.

But my friend from Texas was talking about the issue of fish. We have some interesting harvest dynamics in our State. We spend hundreds of millions of dollars a year trying to restore enlisted salmon. And on their way back they get nailed by a host of harvest activities, some human, some non-human; but we have actually been working with NMFS on the issue of sea lion predation.

So we have got a marine mammal, which is not in danger in the case of California, the Sea Lion eating two to three percent, maybe more, of the return of one dam alone. Three percent of the returning endangered listed species, and we are working actually with NMFS out in the district to try to address that. We are also working with our sports fishermen back—I don't know if this applies to your species but there is a thing called survival boxes that net fisheries use so that when you bring a fish in and it is one of the listed fish, we actually clip the fins of the hatchery fish so we can distin-

guish a hatchery fish from a listed natural fish. And if you have caught a natural fish in your net—really, we don't use a net on the commercial or the troll fishery. If you caught a listed fish, you put it in a little box and the box has circulating cold oxygenated water and though they look dead when you put them in, they rally and have a remarkable survival rate after that. And I do not know if it would apply down where you are at, but it is a pretty astonishing thing to see.

Anyway, I just want to commend NMFS for working on that. I think this harvest issue in the Pacific Northwest as we look at salmon recovery, we are talking about the four H's as you know, Admiral.

Vice Admiral LAUTENBACHER. Yes, sir.

Mr. BAIRD. We talk about habitat, hydro, hatcheries, and harvest. I think harvest has not been looked at enough, not to say that it hasn't been looked at, but common sense says if these fish have managed to survive the rigors of the ocean and they are coming back and they are laden with 2,000 or 3,000 eggs and they are the ones that are going to reproduce and that is when we kill them or we let sea lions kill them, that is a pretty counterintuitive strategy. It would be like building a neonatal intensive care unit and putting snipers on the roof so nobody can get in.

If we do all these things to restore habitat, and we ask landowners and farmers and foresters and cities and governments to improve the cleanliness of our water, the temperature of our water, the quality of habitat which we do, and then we are not as discriminating as we can be in the harvest, then we are making a mistake. And I would like to work with you further on that. I hear folks out there have been very good to work with, but I just wanted to put that marker down. Anything you can do to continue to increase the personnel so that we have a—I guess at some point I don't expect you to do it here, I would like some target in mind of how long we think the average reasonable project from application to permit approval should we take and then ask the staffing levels of your entity, the Corps of Engineers predominantly, because it is really you two folks who tend to be—Fish and Wildlife a little bit—but to have some reasonable timeframe that we think we can tell our consumers this is how long it is going to take to get a permit so you can plan that and then hire staff and train staff and deploy staff accordingly. That is what I would like us to do, and then maybe we can have a dialogue about that.

Vice Admiral LAUTENBACHER. I hear you and I will work with you, sir.

Mr. BAIRD. Thank you, Admiral.

## CLIMATE CHANGE

Dr. PIETRAFESA. Mr. Chairman, if I could actually respond to or make a comment about Mr. Inglis' question about climate. The Friends Coalition, which includes the Red Cross by the way, believes that greater investments in climate really need to be made. For example, the outbreak and spread of infectious diseases that affect human health is of great interest to the Friends Coalition. And this is an area where climate and weather delivery systems can play a very important role both in natural systems like out-

break of mosquitoes and the migration of birds that can carry diseases and the like. And NOAA is the agency that not only has the data archive that can be mined to look for some of these relationships, but NOAA has the national radar network that can actually track, you know, the migrations of birds and insects, believe it or not. That is data that actually contaminates the data that they need to use for winds and precipitation, but it actually may be useful for health and spreads of diseases.

So these are areas where NOAA has the capability and the capacity to actually contribute to climate, weather, human health but for which there is no funding presently. And you know, an investment of $25 to $50 million a year would begin that process. And NOAA is the agency that the Friends Coalition looks to for climate information, for climate data and information.

For example, I will turn to another area, sea level. NOAA has the repositories, and in fact, NOAA is the agency that has maintained the continuous time series of sea level back to the early 1900s around the coastal waters of the United States including the Great Lakes. And so those data really do establish the sea level rise, the sea level trend, and the sea level variability record which, believe it or not, if you don't know what those overall trends are and you don't know how changes in sea level occur from season to season, you can't even initialize a surge and inundation model properly, either off the North Carolina coast when a hurricane is bearing down or on the Texas coast.

So these climate activities that could be occurring within the agency are not because once again, the Friends Coalition believes that the agency is under capitalized.

Mr. INGLIS. Or figure out whether a ship can make it under a bridge as we were talking the other day. By the way, I assure you that there are mosquitoes large enough in South Carolina to show up on radar.

Chairman LAMPSON. I can assure you they are in Texas as well. Before Mr. Baird left, I was going to make an offer to him that we each do a little research. He could come down and find out some of the problems that we face with some of the red snapper problems if he would in turn invite me to come out and find out what some of the problems are with those steelhead salmon.

Dr. PIETRAFESA. We will be happy to do that, Mr. Chairman.

## MORE ON THE NPOESS

Chairman LAMPSON. He might even enlist Mr. Diaz-Balart to prove that there are differences between Eastern Gulf and Western Gulf in the quality of fish. Let me go back if I may to a question about the restriction of NPOESS program. As a result of the Nunn-McCurdy restructuring, many sensors vital to monitoring weather and climate were eliminated. The weather quality data that will be collected from the remaining NPOESS sensors won't be precise enough to meet the needs of climate change monitoring and science.

You provided us with the January 2007 White Paper that NASA and NOAA prepared at the direction of Dr. Marburger, the Director of the Office of Science and Technology Policy. And you told the Committee last year that NPOESS would be built with the capacity

to house all the sensors. The January 2007 White Paper recommended that three sensors be restored to NPOESS. Are these sensors going to be restored?

Vice Admiral LAUTENBACHER. We have been able to, as I mentioned, the allocation within the 2007 budget to put one of the sensors back on the OMPS limb sensor, we believe we can put that back on right now. We have money to look at how to get the others on, but at this point we are still doing cost estimates and doing alternatives to be able to handle the replacement or the sustainment of the sensors that are mentioned in the study that you have that we turned in to Dr. Marburger.

Chairman LAMPSON. What level of funding is required to develop it?

Vice Admiral LAUTENBACHER. I don't have a precise number at this point for it.

Chairman LAMPSON. Could you speculate? Just give me an approximate.

Vice Admiral LAUTENBACHER. But over a period of five or six years, it is probably a total of $300 or $400 million. I mean we are talking—and maybe more. But it is in the hundreds of millions, okay, to deal with this over a longer period, not in one budget, but it is cost-streamed over a period of time to get all of them back into some position, either on NPOESS or on another bus.

Chairman LAMPSON. Why would we not include a request for that in the 2008 budget, knowing that Congress has really pushed for this and wanted it to be done?

Vice Admiral LAUTENBACHER. I don't believe we have the fidelity to come up here and support nickel by nickel how that money would be spend and give you an honest plan that we would stand up and say this is going to work. We need to do the work we are doing now which is to provide alternatives and look at the cost of various—and have a good estimate, an independent cost estimate of what it would take to do this.

Chairman LAMPSON. Waiting three, four, five years? Think we will be able to have it?

Vice Admiral LAUTENBACHER. I plan to do it this year. We plan to have assets of alternatives in the next few months.

Chairman LAMPSON. But would we be able to have it almost certainly in the fiscal year 2009 budget?

Vice Admiral LAUTENBACHER. It is my goal to try to do that, yes.

Chairman LAMPSON. As we wait longer, what kind of estimate might you guess that it is going to cost additional because of the time differential and can we speed it up and save money? And would that be wise for us to do?

Vice Admiral LAUTENBACHER. I am all for speeding it up as quickly as possible. Part of the issue is to not incur the risk. The reason they are not on there today is not because we do not want the sensors or the data, it is because of the risk in building a satellite and having something that will work, that will pass the test, and will be launched on time.

So we have the issue of ensuring that we don't increase the risk to the program in terms of cost and schedule, and given that we meet that, then I absolutely agree that we should do it as effi-

ciently and as rapidly as technically feasible. We should do it efficiently. I am all for it.

### WATER MONITORING PROGRAMS

Chairman LAMPSON. Okay. Let me just squeeze one more question in, and then I am going to turn this over to the Ranking Member on the Science Committee. Recently, and it has probably been two years, maybe two-and-a-half years ago, a tragic event occurred down in southeast Texas when a dentist was launching a boat I think in Galveston Bay and fell, scraped his leg and it got infected by an organism called *Vibrio vulnificus.* It is a bacteria. Lumped in together with other organisms, we consider it to be harmful algal bloom organisms and he died from that infection within about seven or eight days.

With respect to our water monitoring programs, are coastal waters monitored year round or are the monitoring programs restricted to particular times of the year, fishing seasons, peak recreation seasons when people are swimming?

Vice Admiral LAUTENBACHER. A lot of those monitoring systems are operated or connected to an EPA network, and I am really not the right guy to tell you exactly how that goes. But we, in NOAA, worry continuously about the health generally of harmful algal blooms and potentially other life-threatening organisms that live in the water. So we use satellites to help monitor the color, we have used our radars and our weather information, and we actually now put out harmful algal bloom forecasts for the Gulf of Mexico, for Florida, and we are looking to move that into the Texas area in this next year. We believe it is a very important area. There is $9 million for harmful algal blooms in our request, and we look to expand our ability to provide early warning and actually try to in the future pinpoint where they come from and do something to help mitigate them.

Chairman LAMPSON. It would be hugely——

Vice Admiral LAUTENBACHER. Very important.

Chairman LAMPSON. A life-threatening situation.

Vice Admiral LAUTENBACHER. It goes to what Dr. Pietrafesa mentioned about health and the atmosphere and the ocean. They are directly related.

Chairman LAMPSON. Very good. I will recognize Mr. Hall, the Ranking Member on the Science Committee. My friend from Texas.

Mr. HALL. That is the way it is when you are in the minority, nothing works.

Chairman LAMPSON. I knew that. I knew all about that.

### NEW PROGRAMS

Mr. HALL. I thank you for working with us last year on the *National Integrated Drought Information System Act.* The NIDIS program authorized by that law is going to lessen the economic and environmental devastation caused by drought by equipping our farmers and water resource managers with the tools they need to prepare for and respond to drought situations. With improved monitoring and forecasting, our economy is going to be spared what we think to be billions of dollars in drought-related damages every

day. NIDIS was a result of a close collaboration between NOAA and university scientists and State and natural resource managers. It is an excellent example how small investment in environmental monitoring and prediction, I think it is around $4 million in your fiscal year 2008 budget request, can have an enormous benefit to the Nation.

Do you have similar programs in the pipeline that would address other pressing needs? If so, describe a few of them.

Vice Admiral LAUTENBACHER. First of all, let me thank you for your help and your work in passing the NIDIS bill. It was extremely valuable to us because we have been working with the western governors for a number of years on trying to build the kind of a program that would be very useful for the Federal Government and the States. We also have worked hard locally with air quality monitoring.

Air quality is very important. We now have been able to provide air quality forecasting for the whole country, and that began in the similar partnerships with our research universities, with support from this committee, and work with the EPA and local jurisdictions. We are working from ozone forecasts now into particulate forecasts, or aerosols. That is very important for asthma and other types of respiratory issues that people have. It will also help us manage our air quality in various places because we will be able to tell where it is coming from, where it is going, and what the concentrations might be. So air quality is very important to us.

I mentioned the harmful algal bloom issue, looking at health along our coasts. We have, for the first time, the Administration did put some money in the Human Health Initiative for oceans which the Congress has been a strong supporter of and we look forward to working with Congress this year with that program.

We are looking at improving our ability to monitor wildfires and provide better information to the people who fight those fires. We are looking at a better carbon network, and we just put something called a carbon tracker on our website built out in Boulder which will allow everyone to take a look at where is the carbon in our air. It is experimental. We haven't got a full network yet, but we are building the tools to help provide information to individual citizens as well as policy-makers.

So those are a few of the things we are working on, sir.

Mr. HALL. I am sure they help you in monitoring and forecasting and helping to plan that can really be meaningful. We went through just a terrible drought there in East Texas this last time, the worst certainly in my memory and my memory is longer than anybody's in here. We were very pleased to finally get this bill through, finally to get the President to sign it. The one farmer called me and said, "Well, now, can you make it rain?" This bill does everything short of that, but it plans for it.

You know, no woman in here and very few of you men remember the '30s, but in the '30s during the—from '30 to '40, I was a paperboy and I delivered papers. But I read my papers, and I read about the weather. It seemed like I was always concerned about the weather. I watched radio then a lot. I watched WRR radio, it was all we had. But we had a professor on there, I think Dr. Archer, but I am not sure what his name was; but he would tell us what

the weather was every day because he had a new breakthrough. He had, of all things and nobody else in the world I guess had one, a sling cyclometer. And man, that was up to date. And he would say what the weather was going to be at 6:00 every morning. I would be back in after delivering my papers, and I would watch him on radio. And I would listen to him. And there was a guy up in Paris, Texas, about 80 miles on up northeast or 60 miles, something like that, he would listen to him and predict just the opposite every year, and he was right about 80 percent of the time.

So I don't know if getting all this equipment is good or bad, but it is great to have that information and it is great to see the years ahead and see how much it is going to benefit them. And I thank both of you for your work and your report and for being here today, and I thank this Chairman for calling this meeting. I yield back.

Vice Admiral LAUTENBACHER. Thank you, sir.

Mr. HALL. I don't have to turn it off.

## HURRICANE FORECASTING

Chairman LAMPSON. Thank you, Mr. Hall. It is always a pleasure. I certainly did not mean to slight you along the way, Dr. Pietrafesa, with all my questions seem to be going to Admiral Lautenbacher. But I certainly appreciate both of you participating, and I did have a question about the role that NOAA's National Hurricane Center played that I would like to ask of you. Obviously it has played a critical role during the devastating '05 hurricane season, but how can hurricane forecasting be improved to better warn the public of such disasters? Obviously it is not going to be that piece of equipment that Mr. Hall was just referring to, but can we make it better and is the budget adequate to achieve the improvements in hurricane forecasting that we would all like to see happen?

Dr. PIETRAFESA. I do not think the budget is adequate, but NOAA, I would have to compliment the agency and the Admiral for the efforts that the agency has put forward. For example, the new P3 that is coming on line will allow another degree of freedom in terms of being able to make more measurements. It turns out the stepped microwave frequency sensor that has been deployed over the last year or last several hurricane seasons has shown that the winds that are blowing just above the surface of the ocean are in fact very different than the winds aloft. And those winds are the winds that are actually driving the wave field and also driving the surface currents. And if one is going to do an adequate job well in advance four to three to two days to one day out of a hurricane making landfall, one really must know what the wind field is like and the wave field that it is driving along with the current field. And you have to know not only the speeds and directions of the wind, but you have to understand the asymmetries that are built into each one of these vortices, these hurricane vortexes. There is no symmetric hurricane. They are antisymmetric which means that they have a very unusual configuration around their eye and beyond where the radius of maximum winds occurs. And that is an advance that has occurred through NOAA efforts.

Now, that data then needs to be assimilated into the hurricane weather research forecast model and into the surge and inundation

and flood models that ensue. So that is an activity that NOAA is moving towards, but once again, we believe that they are undercapitalized in that area. The observing network that is out there, once again, NOAA is building out. It is still in the process of building that system out, but that system has to be more complicated than it was in the past. We now understand that the water and the air, the atmosphere and the ocean and the gulf waters and the loop current and the eddies that are shed, the warm core rings, and on the east coast of the United States it is the filaments, the Gulf Stream filaments, those systems exchange heat, mass, and momentum, between the two. They are interactively coupled in real time. For example, Katrina went through nine stages of change. She went from a zero to a one up to a five and back down to a three when she finally beached herself.

So if you are an emergency manager or if you are in charge of evacuating folks, the models now are capable of actually getting down to resolution of 100 feet special resolution on land in terms of where and when the inundation is going to occur; but if you don't have the forcing, the wind fields, correct and you don't know that that event is going to de-intensify, you are going to get it wrong. You know, if you are going to evacuate areas and put everybody on the highway at the same time going in one direction, and you have got four lanes and you have to station highway patrol at the on and off ramps to make sure that nobody is getting on in the wrong direction, you have to have the best information possible, and NOAA can provide that but not yet.

So the mathematical architectures are there, the new hurricane weather research forecast model is there, the interactive coupling with the ocean system models has advanced to the point where we are actually running one in my own shop. But it requires more investment and research, and so the short answer is NOAA is still undercapitalized in this area, but it is moving in that direction.

Chairman LAMPSON. Excellent. I think those are more examples of just how we do get a return on the monies that we do invest. I think it is critically important that we push ourselves to make those things happen.

I know what kind of money was expended in life just in evacuating some towns that ultimately didn't have to evacuate. Probably the people who were best off were those who got frustrated, unfortunately, and went back home and sat the storm out. But then that is the wrong message to send to other people. Many stories that we have read about people who couldn't make the trip from wherever they started to wherever they were going ended up dying in the process or at the end of it and very tragically so.

So it is a great opportunity for us to push as hard as we can possibly push to make some of these things happen when we know that the technology exists.

Mr. Diaz-Balart, you have been awfully quiet over there. Can we impose upon you for some words of wisdom or questions? Push it and it will come on. Now try.

Mr. DIAZ-BALART. Thank you, Mr. Chairman. Actually, I was going to follow up on your question, Mr. Chairman. Doctor, you gave a very good explanation. I represent parts of Miami and Dade County and parts of Collier, so the ratings for the National Hurri-

cane Center broadcast during hurricane season in the part of the State that I represent far exceed the NFL's. It is the thing to watch. There has been incredible progress on the accuracy of where a hurricane is going to strike. But as far as the strength of the hurricane, obviously, that is where we have some weakness.

Doctor, when you were giving this explanation, how far are we? We have the same type of really significant advances in the ability to track where a hurricane is going to land, and the advances there have been just incredible. How far are we to be able to really be able to forecast, you know, the strength of a hurricane when it is going to land? Is it just a funding issue, is it a technology issue, is it a little bit of both?

Dr. PIETRAFESA. It is both. As I said, the new stepped microwave system is really an important new technological advance that has been introduced into the capabilities area, and NOAA is now flying that in real time.

Mr. DIAZ-BALART. I know it is not a fair question but is there a——

Dr. PIETRAFESA. Well——

Mr. DIAZ-BALART. Can we say within two years, five years we are going to have—is there any way to do that, any guess?

Dr. PIETRAFESA. Yeah, actually the NOAA Science Advisory Board actually put together at the request of the Admiral an external review panel that looked into that issue specifically about could we make advances in hurricane intensity forecasting, and what kind of time period are we looking at. And we are looking at a five-year period of time with significant investments in that area. You know, it is a half-decade. The mathematical tools are on the shelf. But it takes people once again and it takes putting together partnerships, both from NOAA itself, from within the agency, and from without the agency. So you have got to join the expertise. You have got to leverage the expertise of the academic community that is external to the agency. And it turns out there are not a lot of hurricane modelers and hurricane technologists in the United States. It is a very small community of scientists and engineers. But they are capable and are willing to work together to create this capability and really looking at the order of a half-decade which is a very short time. But it is going to take, you know, the several tens of millions of dollars per year of investment to get this done.

Mr. DIAZ-BALART. Also, Mr. Chairman, on a separate note I represent, as you know, the Everglades; so with all due respect, my mosquitoes are bigger than yours.

## MORE ON INSUFFICIENT FUNDING

Chairman LAMPSON. I don't know if I would know the difference. I have been chewed on by them too many times in my lifetime. Even Mr. Hall can remember some big mosquitoes in East Texas. Last question I will ask, unless others have some desire to wrap up, the impact of NOAA's tight budget. It has got to have some impact on the ability to fund both extramural research and to do some of the in-house research that is necessary to really do the kinds of things that are necessary.

Would you comment on the impact of that, Dr. Pietrafesa?

Dr. PIETRAFESA. Well, given NOAA's present budget from the perspective of the external community, NOAA is doing the best job it can to maintain the services that it provides presently. But in the face of, you know, increases in salaries and having to pay for turning lights on and off, you know, it is really stretched. And so we understand that when push comes to shove, it is the external activities that are most likely to be cut. So while we understand that, it is difficult for us to accept that, the external community, because if you look at the leveraged assets, both intellectual and physical assets that the external community brings to the table, there is an enormous amount of people power and intellectual power and compute power and technological power that the external community brings to the table. And the external community has got a long and rich tradition of partnering with the agency which has, in fact, led to many of the advances from research to operations to applications that we have experienced.

But in fact when the Weather Forecast Office at the Raleigh/Durham Airport—I come from Raleigh, North Carolina—was moved to the NC State Campus, within two years, NOAA headquarters gave that Weather Forecast Office an award called a NOAA Unit Citation Award; and that Citation Award recognizes outstanding research and then transitioned from creating new research tools to moving them to new operational forecast tools. Papers were published, papers were given at conferences, but the point was that the forecasts that were emanating from that office improved so dramatically that NOAA headquarters gave that forecast office this award. And that is an award for advances for research and operations which is very unusual. It was the first forecast office to ever receive that award.

It shows what can be done if you put NOAA scientists and staff together with the external community and you leverage the assets. You challenge the external community, you become engaged, you engage them in interesting problems, and you bring students to the table. And in fact, that ensures that NOAA will have the workforce that it is going to need for the future when you engage students. And that is one issue we are seriously concerned about is that when external funds are cut, the first to go are the students. And so you compromise the future of this agency, the scientific and technological excellence of the agency because the workforce that could become engaged, that would become engaged is lost. And so that is a serious issue.

Chairman LAMPSON. Thank you. Mr. Hall.

## WATER CONSERVATION

Mr. HALL. I want to talk about the future and conservation, and this may be wild and crazy but it has been something that has been on my mind for a long time and maybe you could give us some advice on it or guidance. But we have to start conserving our water. If we are not going to get the rain as we predict them or as we expect them where over the last 50 years or something. How unreasonable is it to think that we ought to be studying, create some kind of a study today, maybe not a paid study but a study of maybe two people from your agency, two from some other, that would be unpaid that would meet maybe four times a year or quar-

terly to talk about the future; and I am thinking in terms of—Texas is a typical State, I guess. Every state has its own variances of mountains and hills and tributaries and all that. But Texas has mountains that get water. It goes down, trickles down, gets finally to one of the tributaries and then to the ocean and washes away. How unreasonable is it to think in terms of one day, when I say this as a good bottle of water costs as much as a good bottle of beer now and you got to go to really thinking about the value of water, but how unreasonable is it to have a million-dollar subterranean tanks in the desert at the foot of the hills or in strategic places to capture this water and not let it go all the way down to the sea? Too expensive now to do it but there was a time when it was too expensive to put an escape module in the NASA vehicle, but we are going to put one in there now with the deaths and the losses we have. If we have a different day and time and the rains come at a different time or they don't come or they do come but not with more time between them, why not capture that water and keep it? Think about it and have somebody study it, and I won't be here and none of us in this room will be here when you will ever need something like that; but someone is going to be here to think in terms of studying and maybe have huge underground tanks to collect that water and not let it go off to the sea. How impractical is that?

Vice Admiral LAUTENBACHER. I agree——

Mr. HALL. I don't want to get put away for recommending something like that or people getting a net after me.

Vice Admiral LAUTENBACHER. I would have to go with you if you got put away because I think you are right on.

Mr. HALL. But somebody ought to be studying that.

Vice Admiral LAUTENBACHER. And I agree. I asked my staff when I took over to give me their top 10 problems for the environment for the future. Forget what we do, forget our budget, tell me what are problems are. And when I tabulated that, water. And so that is why we have in NOAA now, weather and water. Water is one of our four major themes, and we are trying to work the problem you talked about, the watershed management down to the ocean. How do we deal with that? And my crazy idea is that we are going to need a water distribution system at some point. So that would include tanks, it would include pipes, it would include pumps. I mean, we are going to need water. I agree with you, and I think we all need to start thinking about the future and how we deal with water. It is a precious commodity.

Mr. HALL. I have even thought about it at my home. I put a 2,000 gallon tank at the back of my home at the end of my series of garages there, and you would be surprised at how much water comes off of your roof. It goes into that tank, and then for the swimming pool in front, I have a 450-gallon tank, it catches it. It will save about $100 a month there with filling it up with evaporation things for the pool. It makes sense, and I think some day everybody will have that.

I had a little guy come out from the city about three weeks ago. I was watering on a day when it wasn't my day to water, and that is kind of embarrassing, you know. But one of my neighbors, and I got a few Democratic neighbors there that will call in on me every

now and then; and you know, my wife and I are fighting too loud or we are having arguments or something. But I was watering out there on Friday, and that guy's calendar said it was Monday, you know. And he came up to me and said, "Congressman, I sure hate to come out there;" and I said, "Well, what is the problem?" He said, "Well, you are not supposed to be watering." I said, "Well, I think I have a right to be watering." He said, "Congressman, you don't have a right to be watering, and my dad is going to kill me if I have to give you a ticket." Anyway, he went on and on like that a little bit. Pretty soon I said, "I tell you I am different than other people." He said, "Congressman, you are not any different to us, now. You are just Ralph Hall down here but you have to comply the same rules that everybody else does." I said, "Well, here." I handed him my hose. He wouldn't take it. And I made him take it, and I said, "Now, come on, follow this hose." He followed it back around the house and got up to the tank there where it was my tank, my water that I was watering with. He said, "God, I was never so glad to see anything. I thought I was going to have to go home and tell my dad I had given you a ticket."

I think everybody is going to—I am thinking about going into that business of putting those in and let people pay them out. The Chairman and I may put that together.

Chairman LAMPSON. Is that——

Mr. HALL. Need a bunch of money, but I have got the idea, he ought to furnish the money for it.

Chairman LAMPSON. Would that be considered new technology?

Mr. HALL. Well, not terribly new but it makes sense and keeps you from getting a ticket, too. I probably would have been watering whether it was my day or not.

Dr. PIETRAFESA. Mr. Hall, you raise a very interesting point. You are a man of deep wisdom. Of every quart of water on this planet, if you just take all the water on this planet and fit it into a quart, there are only four drops of that water that is available for our use, fresh water, only four drops. And of those four drops, only one is available on land, on the surface of land. So that is how precious that supply of water actually is. So you know, if you would use that analogy. So you have really hit on a key, key issue, availability of fresh water in the future. So we must manage our water resources, you know, in a very, very careful way.

So when we alter the environment and we pave the natural environment, particularly the coastal environment over, and we go from having a system that can absorb the water at a 100 percent level and retain the fresh water as fresh water lenses under the Barrier Island, and we allow it then—once we pave it over, we go from a 100 percent capability of retaining the water to down to a five percent. And we give it up, and we shouldn't do that. We need to have better management of our water systems, our coastal systems and our land-based systems, and we must pay more attention to the availability of fresh water.

Mr. HALL. The Chairman and I may set up a study for something, to look at it and study it for a while and then maybe get some people from different agencies that would give some times quarterly to start a plan and start thinking in terms of that because I think it is important.

I yield back my time. Thank you.

Chairman LAMPSON. Thank you, Mr. Hall. I think it is tremendous. And I remember as a kid the cistern that was at my grandparents' house, and I know that my grandmother would never wash her hair with anything other than rainwater that had been captured.

Mr. HALL. You know, out front there we had that same cistern. We had a stock tied around the faucet there. That was to catch the wiggle worms that came through there. And we finally wised up and just poured a little coal oil on top and that killed the mosquitoes when they laid the eggs. So we were innovative even back in 1910.

Chairman LAMPSON. Well, see, there we could be. Thank you. I think this has been fascinating. Thank you both for coming to us today, and before I close I want to say that obviously your testimonies have been very thoughtful and insightful and most helpful.

If there is no objection, the record will remain open for additional statements from Members and for answers to any follow-up questions the Committee may ask of the witnesses.

Without objection, it is so ordered. This hearing is now adjourned. Thank you all.

[Whereupon, at 3:48 p.m., the Subcommittee was adjourned.]

# Appendix 1:

## Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

*Responses by Vice Admiral Conrad Lautenbacher, Jr. (U.S. Navy, Ret.), Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, National Oceanic and Atmospheric Administration, U.S. Department of Commerce*

**Questions submitted by Chairman Nick Lampson**

*Q1. There are increasingly problems associated with harmful algal blooms (HABs) in our coastal areas including more events of greater duration and intensity. In the FY 2008 budget, the Administration's requested funding for this program is less than current appropriated levels. What specific activities that are now funded will be eliminated if the HAB program is funded at the requested level?*

*A1.* The President's FY 2008 budget provides approximately $8.9M on research related to harmful algal blooms (HABs) and hypoxia. This $8.9M provides the tools necessary for managers to respond and predict HAB and hypoxia events such as those affecting the New England, Florida, Pacific NW and California coasts as well as the Great Lakes every year. HAB and hypoxia events threaten human health, kill marine animals, impact fisheries, and cost millions of dollars each year.

In addition, the FY 2008 President's budget provides $20M for near-term priorities projects included in the report *Charting the Course for Ocean Science in the United States in the Next Decade: An Ocean Research Priorities Plan and Implementation Strategy.* These funds will be used in part to develop *in situ* sensors for rapid detection of pathogens, harmful algae and their toxins in coastal areas. Also, an increase is requested for Gulf of Mexico Partnerships. This funding may be used to support coastal communities in their efforts to address harmful algal blooms and hypoxia events through competitive grants.

*Q2. NASA develops sensors that generate new data streams that NOAA begins to incorporate into their operational missions. Some of the current examples of NASA satellites that are improving our forecasting abilities are the Tropical Rainfall Measuring Mission (TRMM) and the Quick Scatterometer (QuickSCAT) satellite used in tropical storm forecasting. However, there is still a serious problem providing a smooth transition from research to operations for instrumentation that proves useful in improving weather forecasting and climate monitoring. What is being done to address this problem?*

*A2.* NOAA and NASA have a long history of collaborating on Earth observation systems. Many of the sensors that fly on NOAA's geostationary and polar-orbiting operational environmental satellites are based on technology developed by NASA to satisfy NOAA operational requirements.

NASA and NOAA mission coordination was further strengthened with the December 2005 formation of the NASA–NOAA Joint Working Group on Research and Operations (JWG). This team, formed in response to Section 306(a) of the *NASA Authorization Act of 2005,* provides strategic oversight of NASA–NOAA collaborative activities and facilitates the formation of specific mission transition teams.

NOAA and NASA have other collaborative interactions such as:

- NASA–NOAA Executive Roundtable: At the Executive level, a program of conducting "Roundtable" meetings has been reinstituted. These meetings are jointly led by the NOAA Assistant Administrator for Satellite and Information Services and the Director of the NASA Earth Science Division.
- Program Management Councils: Both NASA and NOAA have executive-level Program Management Councils (PMCs). These councils provide a regular forum for senior management review of major satellite development activities. NOAA has formally included NASA as members of its Program Management Council. NASA has similarly asked senior NOAA individuals to participate in relevant NASA Program Management Council meetings.
- Data Assimilation: NOAA and NASA currently collaborate on algorithm development commensurate with hardware development through the Joint Center for Satellite Data Assimilation.
- Staff Rotations: Ongoing coordination between NASA and NOAA is being facilitated by the exchange of staff.

NOAA acknowledges the value of collaboration with NASA, to more efficiently transition appropriate research capabilities into operations. NOAA has requested the National Academy of Sciences to provide additional scientific recommendations on how best to approach this issue, in response to the February 2007 report from the National Academy of Sciences' National Research Council entitled "Earth

Science and Applications from Space: National Imperatives for the next Decade and Beyond."

**Question submitted by Representative Brian Baird**

*Q1. Please provide the proportion of full time equivalents (FTEs) devoted to permitting at the National Marine Fisheries Service for the proposed FY 2008 budget, as well as for the previous four years.*

*A1.* National Marine Fisheries Service issues many different types of permits (e.g., commercial fishing, MMPA, ESA) from offices around the country. Within NFMS there is not a specific group of employees that exclusively issues permits. Of those employees working to issue permits, that task only represents a portion of their time and job responsibilities, making explicitly answering this question difficult. NMFS may be better able to address this question regarding a specific type of permit, please let us know.

**Questions submitted by Representative Bob Inglis**

*Q1. Your budget request includes an increase of $2 million for research to improve predictions of hurricane intensity. What type of work will that money support? When could we expect to see that research translate into changes in operational hurricane forecasting and warnings? In the past, NOAA has had a hard time translating research findings into operational advances. Does NOAA have a plan for using the results of this research effort to improve operational hurricane forecast products?*

*A1.* In the past 10 years NOAA has made major strides in improving (reducing) its hurricane track forecast errors—but has made less progress in improving its hurricane intensity and related inundation forecast skill. The $2.0M increase will be used to support research aimed at improving NOAA's ability to forecast hurricane intensity and provide better information for emergency managers and the public. Specifically, the money will be used to research physics of intensity change in tropical cyclones, flux and sea spray, and to develop applications for tropical cyclone forecasting.

NOAA is committed to maximizing the value of its research and ensuring successful transition of research to application. We have taken and continue to take steps to ensure the bridge between research and operations is appropriately identified and resourced. This commitment is demonstrated by NOAA's adoption of a Transition of Research to Application policy and implementation procedures, the development of an inter-agency Tropical Cyclone Research Plan *(www.ofcm.gov),* and a Hurricane and Related Inundation Plan. NOAA research is annually reviewed to assess readiness for transition. A Joint Hurricane Testbed already in place at the National Weather Service's National Hurricane Center evaluates competitively chosen candidate technology of deemed value to hurricane forecasting. After research produces results, NOAA's process for transitioning them into forecast operations requires multiple steps to ensure the value and quality of changes. This usually takes a minimum of two years.

Examples of NOAA research successfully transitioned into forecast operations include a statistical-dynamical intensity model, Rapid Intensification Index statistical models for the Atlantic and Northeast Pacific, improvements to the Geophysical Fluid Dynamics Laboratory model that significantly increased its track and intensity forecast skill, and radiometrically-derived surface wind speed data (i.e., the Stepped Frequency Microwave Radiometer) taken from hurricane hunter aircraft.

ANSWERS TO POST-HEARING QUESTIONS

*Responses by Len Pietrafesa, Associate Dean, Office of External Affairs; Professor of Ocean and Atmospheric Sciences, College of Physical and Mathematical Sciences, North Carolina State University*

**Questions submitted by Chairman Nick Lampson**

*Q1. In your testimony you describe the Friends of NOAA coalition as comprised of a diverse group of organizations that all benefit from NOAA's products and services. The coalition is relatively recent in its formation. Please provide a few examples to illustrate the breadth of membership in the coalition with a few examples of the services and applications of NOAA's work that are important to this community. What do the diversity of the coalition and the NOAA services they utilize tell us about the future workforce the agency needs to provide these services?*

*A1.* The Friends of NOAA Coalition was formed in 2006 in an effort to bring together a cross section of the diverse communities supported and benefited by the products, services and resources provided by the National Oceanic and Atmospheric Administration (NOAA). The coalition's purpose is to inform policy-makers about the importance of NOAA to the health and well-being of this nation on a variety of levels. Today, this ad hoc coalition consists of over 40 different organizations including the Shipbuilders Council of America, the Consortium for Oceanographic Research and Education, the Reinsurance Association of America, the National Marine Sanctuary Foundation, the Joint Ocean Commission Initiative, the Alliance for Earth Observations, the University Corporation for Atmospheric Research, the National Association of Marine Laboratories, the Red Cross and The Weather Channel. A complete list of members of the coalition can be found at its website: *http://www.friendsofnoaa.org.*

Let me provide a few examples that demonstrate the value of NOAA's outcomes that ultimately benefit the Nation and its citizens. The data and forecasts provided by the National Weather Service provide lifesaving information to assist State and local officials prepare for and respond to severe weather events such as tornadoes and hurricanes. Hundreds of thousands of residents of the gulf coast are alive today due to the accuracy of the NOAA's National Weather Service forecast for Hurricane Katrina. This forecast was based on the transitioned results of prior research conducted over several decades. For NOAA to continue to develop ever more precise and accurate life saving forecasts will require a strong and continuing investment in the Nation's weather enterprise, which includes among other issues: applied research; technology development; high performance computing; applications; and education and training, including public education and outreach.

According to the Department of Commerce, preliminary estimates of the potential economic benefits from new investments in regional coastal ocean observing systems in U.S. waters are in the billions per year, estimated largely in terms of increased economic activity and social surplus realized as a result of improved information about coastal marine conditions. Albeit, it is my opinion that more and better observations of both the atmosphere and the coastal ocean at every observing site will greatly improve weather forecasts not only over the coastal ocean but also over land. For example, the forecasts of the spawning or further intensification of extra-tropical cyclones, also known as nor'easters, and the amounts and types of precipitation, could be greatly improved by the availability of air-sea data from a more ambitious observing network along the eastern seaboard from Charleston to Lewes. The data would be assimilated in real time into interactively coupled ocean-atmosphere models. How much in savings to the economy would this advanced capability result in? The savings would likely be in the many tens of billions per year as commerce and transportation and other societal benefits are derived. Both NOAA and its regional coastal partners are heavily invested in the continued development of this network of coastal observing systems that will, over time, contribute enormous economic benefits and better information to mitigate against the loss of lives and property.

Finally, the kinds of data, forecasts, and environmental predictions provided by NOAA such as long-term weather forecasts and regional climate change projections—are of vital importance to the insurance industry as they routinely assess risk and provide financial protection against future unplanned events to private citizens, State and local governments, and industry.

NOAA must continue to provide ever more accurate environmental information to meet the needs of its stakeholders, such as those in this coalition. To do so will require the development of an ever more sophisticated and technically trained work-

force, a workforce capable of integrating a vast and diverse amount of data and information and turning it into a form that can be readily used and depended upon by federal, State and local policy officials.

**Ouestions submitted by Representative Bob Inglis**

*Q1. In your testimony you state that there is a need for both public and private support of Earth observations. What would you recommend the balance should be between publicly and privately funded Earth observing efforts? What types of observations should be public, what type private?*

*A1.* Basic, raw observations of Earth are a "common good" that support many efforts for the public good, including education, research, and protection of life and property. They also support a great many industries and commercial efforts. Thus the government has a valid responsibility to provide these basic observations. More specialized observations for particular applications could be supported by the private sector, but they will understandably want to make a profit and hence will hold the observations proprietary.

In practice, the private sector can perform all of the measurement functions currently undertaken by the public sector, and in many cases the private sector can do these more effectively than the public sector. That said NOAA should take the lead on weather and climate observations. But private industry might implement the measurements according to NOAA, for example NWS, criteria and standards; because industry may be able to make such observations at reduced cost to the government at no sacrifice in quality (examples of existing practices include lightning data). Of course, these data that private industry might collect cannot be proprietary and must be publicly available in real time.

Improvements in our Earth observing system required to support higher-resolution modeling and warnings might best be implemented by public-private consortia for at least two reasons. The public sector does not have the financial or personnel resources to go it alone, and those dense/more comprehensive (e.g., finer scale land or coastal ocean observing networks) will serve many applications apart from public safety and so should the costs should be shared among the private and public sectors.

Freeing the public sector from all of the responsibilities of observations (by including industry) will enable the public sector to focus greater effort on its core activities (e.g., data assimilation and nowcasting in support of forecasts, watches and warnings and of climate). The Oklahoma Mesonet is an example of a very successful public-private observing network. The coastal areas are ripe with like opportunities.

# Appendix 2:

## Additional Material for the Record

STATEMENT OF DR. BRAXTON C. DAVIS
DIRECTOR, SCIENCE AND POLICY DIVISION
OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT
SOUTH CAROLINA DEPT. OF HEALTH
AND ENVIRONMENTAL CONTROL

Mr. Chairman and Members of the Committee: As Director of the Science and Policy Division of the South Carolina Coastal Zone Management Program, which is carried out by the Office of Ocean and Coastal Resource Management in the SC Department of Health and Environmental Control (SCDHEC–OCRM), I appreciate the opportunity to provide testimony on the importance of the National Oceanic and Atmospheric Administration (NOAA) in South Carolina. Having formerly held a research faculty position at the University of South Carolina, I hope that I can offer some insights on the support that NOAA provides in both coastal research and coastal management settings.

As you may know, South Carolina's eight coastal counties have a substantial impact on the economy of the State and the lives of its citizens. The resident population of the eight coastal counties in 2005 was approximately one million (nearly a quarter of the State's total). These counties support over $40 billion in economic output annually. Tourism and related industries lead the economic markets in coastal South Carolina, and are supported by significant and accessible natural resources, including over 150 miles of sandy beaches, 500,000 acres of salt marsh, and substantial local fisheries. Commercial shipping and port activities add more than $9.4 billion annually in statewide personal income.

South Carolina's coastal areas are experiencing rapid population and economic growth. The Myrtle Beach area experienced a 36.5 percent population growth in the 1990s and was recently ranked the 13th fastest growing area in the Nation. In the Charleston region, the population is expected to grow by almost 50 percent over the next two decades with the development of 113,000 new homes in planning stages and/or under construction. Since 1990, Beaufort and Jasper Counties grew at a rate of 40 and 35 percent, respectively, and are expected to continue to expand at this pace based on approved developments. Tourism and other industries along the coast are also expected to increase substantially.

Recognizing the importance of the Nation's coast, in 1972, Congress enacted the *Coastal Zone Management Act* (CZMA). The Act establishes a voluntary federal-State partnership to encourage states to develop and implement programs to manage their coastal communities and resources in a comprehensive and balanced manner. The CZMA provides both monetary and other incentives for participating states. South Carolina entered into the CZMA partnership thirty years ago when the state enacted the *SC Coastal Zone Management Act of 1977* to establish a comprehensive program "to protect and enhance the State's coastal resources by preserving sensitive and fragile areas while promoting responsible development in the eight coastal counties of the State."

The SCDHEC–OCRM accomplishes this mission through direct regulation of developments and alterations in marine and intertidal areas of the coast, including estuaries, marshes and beach/dune systems; and through certification of other State and federal permits for consistency with approved coastal policies. The agency also assists local governments with coastal planning issues and improvement projects. Our new Science and Policy Division seeks to better integrate coastal science into management decisions and policies, and works very closely with other NOAA-funded state partners, including the South Carolina Sea Grant Consortium, North Inlet-Winyah Bay National Estuarine Research Reserve (NERR), and the ACE Basin NERR.

**Priority Coastal Management Issues**

To demonstrate how our state and NOAA are working together on coastal and marine issues, I would like to share with you several on-the-ground experiences and examples.

Some of the most pressing issues associated with the rapid growth along South Carolina's coast are the associated impacts on coastal water quality. As watersheds become increasingly developed, fresh groundwater supplies are declining, and wastewater and surface runoff are delivering increased nutrient loads, bacteria, pesticides, herbicides, and even pharmaceuticals to rivers, estuaries, and near-shore waters. NOAA plays a key role in our ability to understand, predict, and respond to these water quality concerns. Our program has interacted closely with the NOAA Hollings Marine Laboratory (HML) in Charleston, where tools are developed to protect coastal ecosystems by understanding environmental indicators and how they re-

late to human health issues. For example, HML has examined the impacts of increased urbanization on water quality in tidal creek systems in SC. In addition, the NOAA Center for Coastal Environmental Health and Biomolecular Research (CCEHBR), also based in Charleston, is testing emerging environmental contaminants in our region, including new pesticides, herbicides, and pharmaceuticals to predict their effects on marine life and habitats.

Emerging regional components of the Integrated Ocean Observing System (the Carolinas Coastal Ocean Observing and Prediction System, Caro-COOPS; the Coastal Ocean Research and Monitoring Program, CORMP; and the Southeast Atlantic Coastal Ocean Observing System, SEACOOS), have also assisted SC researchers and managers in responding to an unusual water quality event along the Myrtle Beach Grand Strand that occurred in 2004. By partnering with the NOAA-funded IOOS community in our state, we now have real-time, continuous monitoring of water quality conditions at several piers along the Grand Strand, and we are beginning to understand the conditions that led to an unprecedented, large-scale fish stranding that year.

South Carolina is also vulnerable to the impacts of major hurricanes, which have impacted our coast on the order of once every twelve years. As evidenced by the 2005 hurricane season, these storms can be devastating in terms of lives lost and economic impacts. As a researcher with the University of South Carolina, I collaborated with a research team who, with NOAA funding, worked to develop improved information products for SC emergency managers based on state-of-the-art storm surge modeling. These refined model projections for the SC coast demonstrate that significant flooding will occur even in Category 3 hurricane scenarios, and are now being tied to community vulnerability studies. Also with NOAA support, our research team partnered with local Weather Forecast Offices (WFOs) to integrate real-time offshore observations from our subregional IOOS components with the latest observations, forecasts, and warnings of the NOAA National Weather Service (*www.weather.gov/carolinascoast*).

South Carolina is beginning to view many of the issues facing our coast through the lens of climate change, given the serious implications of the potential for an increase in the rate of sea level rise and changes in our regional climate. NOAA provides data that are critical to understanding climate variability and change, and the NOAA Climate Change Program has increased its focus toward providing data and research support for coastal states seeking to adapt to changing coastal climates and sea level rise. In South Carolina, the Charleston-based NOAA Coastal Services Center (CSC) is providing our coastal management program with critical spatial data and technical support in our initial efforts to address ongoing and future shoreline changes. We also appreciate the leadership that NOAA's CSC is providing to enhance community "resiliency" to potential impacts of climate change.

**Research and Information Needs**

In addition to the support described above, we have continuing science needs related to NOAA's future planned activities. First, a wide variety of marine and coastal data collection efforts have been undertaken over the past several decades, but they are sometimes difficult to discover, access and/or merge for a comprehensive understanding of environmental health and resource trends. In attempting to manage the cumulative impacts of often small-scale developments and alterations, it is critical that state resource agencies have integrated, synthesis products from NOAA that are easy to use and clearly define data limitations, changes in methodologies or scales, and ongoing data gaps. In particular, the ecological histories of specific coastal areas are often not well documented; and spatial data such as coastal topography, bathymetry, and habitat maps are at times disconnected or available at irregular intervals.

In a related matter, it is often difficult to fund and maintain basic environmental monitoring at appropriate spatial and temporal scales for resource planning and management. For example, little is known about short- and long-term water quality trends in near-shore marine and coastal waters outside the boundaries of our National Estuarine Research Reserves. Some of the basic questions about the status and trends of our coastal resources remain difficult to assess. The development of the Integrated Ocean Observing System promises an increased density of marine observations, and the potential for integration and expansion of existing local, State, and federal monitoring programs, which we feel are equally important.

**NOAA's FY 2008 Budget Proposal**

Sustained and robust funding for NOAA is critical to South Carolina's coasts. The President's budget requests $3.8 billion, an increase of $131 million over last year's budget. The budget proposes increases for numerous programs important to South

Carolina and other states, including regional ocean observing systems, mapping and charting, implementation of the Ocean Research Priorities Plan, regional ocean partnerships, and the Coastal and Estuarine Land Conservation Program. While I applaud this increase in funding, particularly given these tight fiscal times, the President's budget still falls short of what Congress appropriates to NOAA each year. The shortfall puts programs at risk and hampers the ability of current programs to keep pace with emerging priorities and inflation.

**Conclusion**

State coastal zone management programs play a key role in the coordination of federal, State, and local activities that affect our coast. We are striving to leverage existing funds and programs through new partnerships, but we have considerable and ongoing responsibilities for managing coastal resources and protecting the public from coastal storms and other hazards. NOAA currently supports nearly half of SCDHEC–OCRM's annual operating budget, and this funding, along with the science and technical support that NOAA provides, is vital to our coastal program and to those of many other coastal states and territories. State coastal programs should not be considered as stakeholders of NOAA—we consider ourselves part of NOAA and look forward to continued support from Congress for the priority areas identified in NOAA's FY 2008 budget proposal.

Thank you again for the opportunity to help inform the Committee about NOAA's vital role is assisting our state in managing natural resources and reducing the impacts of coastal hazards. I would be happy to respond to any additional questions that you may have.

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