

**Minutes: 25th Meeting of the NOAA Science Advisory Board
The Courtyard by Marriott, Silver Spring, MD
March 8-9, 2006**

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<http://www.sab.noaa.gov/Meetings/2006/2006Marchagenda.html>

Wednesday, March 8

Dr. Michael Uhart, Designated Federal Officer of the NOAA Science Advisory Board (SAB), called the meeting to order. Dr. Len Pietrafesa, Chair of the SAB, made an opening statement and requested that the minutes from the November 2005 meeting be approved. The motion passed unanimously.

Dr. Jim Mahoney, Assistant Secretary of Commerce for Oceans and Atmosphere and NOAA Deputy Administrator, made a statement extending the regrets from Vice Admiral Conrad Lautenbacher, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, that he was not present. Dr. Mahoney also announced his retirement as of March 31. He noted that the first Climate Change Science Program (CCSP) synthesis and assessment report was soon to be complete, and that NOAA has the lead in CCSP and helping to provide the best scientific information available on the topic.

Update and Discussion of the Interim Report of the External Review of NOAA's Ecosystem Research and Science Enterprise – *David Fluharty, Chair, Ecosystem Research and Science Enterprise Review & Professor of Marine Affairs, University of Washington*

Dr. Fluharty discussed the preliminary report from the external Ecosystem Task Team (eETT), noting that it will be posted for public comment soon. The eETT conducted a baseline inventory of NOAA ecosystem activities via organizational structure, location, and the PPBES process. They also tracked activities at the national level regarding regional ocean governance. The guiding consideration was to define what NOAA's ecosystem science must do well to succeed.

Dr. Fluharty noted that an ecosystem approach was not an end in itself but rather “a process of incremental adaptive change”. He discussed questions of research location and provided alternatives. He presented the key findings of the eETT, highlighting the recommendations of strengthening regional coordination across Line Offices and using integrated ecosystem assessments as a framework for coordination. He described the components of an integrated ecosystem assessment that can provide decision support for multiple mandates, as well as core capabilities needed to complete these assessments.

Dr. Fluharty responded to the Research Review Team's questions about whether the mix and organization of research was appropriate. The eETT felt that the mix of research was not optimal; the Ecosystem Goal Team notes multiple deficits. There are opportunities to reorganize and improve efficiency, and there is a need for resources to reduce the deficits.

The distribution of activities along a time continuum was discussed. Dr. Fluharty noted that ecosystem responses to physical and anthropogenic forcing are often non-linear, making it difficult to fit the activities into this kind of a timeline. The eETT cannot

determine an appropriate mix of internal vs. external research activity as this may differ from region to region. The eETT recommends that research have a regional focus centered around core capacities with cooperation between all involved Line Offices. Effective cross-Goal working relationships are key to maintaining connections with non-ecosystem science.

The eETT will seek public comment on the report and revise it prior to its final submission to the SAB at the July 2006 meeting.

Discussion

Ways to better the link research assessment results and a decision-based framework for management was discussed; this being developed and is linked with NEPA implementation and social science. The eETT did not address management responses directly but focused more on integration aspects. It was noted that management must be integrated because its separate pieces cannot be completed in isolation; the process must work from a unified science foundation to assure balanced interpretation. The eETT did not examine the issue of quality control to obtain the best ecosystem science value for management in depth. It could not get consensus on a single structure as there are many quality assurance and review processes already in place as part of separate activities.

If coordination of regional management groups is done structurally within NOAA, a major portion of the agency would have to shift to an ecosystem focus. There are several organizational and coordination challenges to structural change; it is also difficult to justify these shifts to Congress. There is more opportunity to reorganize the NOAA program structure than the Line Office structure and hopefully the eETT report will address such possibilities.

Data archiving and access is critical and involves multiple agencies. Dr. Fluharty stated that the regional approach supports interagency coordination in assessments as well as management. The related need for effective data management architecture was noted, and that NOAA could lead by having a centralized database. It would allow production of fewer products with greater utility rather than many tailor-made products, each with limited applicability. Not all of the capabilities must reside within NOAA; responsible parties for various aspects may vary regionally. It was noted that NOAA must explain the reasons and linkages behind the locations of research in physical, social, and ecosystem topics. The eETT noted several areas that could benefit from an increased emphasis on social science, including the non-market valuation of ecosystems.

Dr. Mahoney thanked the eETT and recommended some thought regarding science location and consolidation, as well ways that physical, social, and ecosystem research and science may work together as a single unit in comprehensive Earth system analysis. There is a strong need for communication and broad appropriate involvement as this management approach proceeds, as well as education and outreach.

Discussion of NOAA's Ecosystem Goal Team: Themes for the Future - Steve Murawski – Acting Ecosystem Goal Team Lead & Director of Scientific Programs and Chief Science Advisor, NOAA Fisheries Service

Dr. Murawski noted that the Programs in the Ecosystem Goal Team (EGT) are seeking to identify goal-wide themes such as regionalization and integration of products as well as inter-Goal themes that connect to Weather and Water and Climate. The purpose of

his presentation was to engage the SAB in a discussion about the strategic direction for the EGT in the context of the eETT report. The EGT would like to incorporate the eETT recommendations into their plans, priorities, activities, and strategies.

The presenter discussed the seven characteristics of Ecosystem Approaches to Management (EAM), one of which is using adaptive management. It was noted that adaptive management is challenging since it makes management seem experimental. This relates to the issue of uncertainty; people should understand that there is a chance that an activity may not work but this knowledge may make it difficult for them to move forward.

The EGT is articulating the meaning of the paradigm shift to EAM as it relates to moving from current mandates to future mandates. Current mandates focus on managing individual ecosystem parts while future mandates may focus on ecosystem processes, relationships, and tradeoffs. NOAA is developing reauthorization strategies for various pieces of legislation which will better incorporate the principles of EAM.

Discussion

Noting NMFS regional advisory boards and broadening authorizing legislation, a member asked if it was possible to broaden inclusion among the Line Offices and Goals in a unified set of regions to make regionalization effective. Dr. Murawski noted that regions for different Line Offices do not completely align, and that a softer governance system and expectations would address this. Broad regional groups could remain at the higher strategic level, and more specific regional groups, for example the Fisheries Advisory Boards, could address details that are part of specific Line Office mandates.

In relation to examining the human effects on coastal environments, Dr. Murawski noted methods in place including sampling that addresses changes in ecosystems and climate stresses. The Planning, Programming, Budgeting, and Execution System (PPBES) also includes some ecosystem effect efforts. An analog could be built on a regional scale. NOAA is also working with EPA to develop tools that coastal managers need to assess impacts.

The best way that NOAA can contribute to local decision making was discussed, since it would create significant concern if a Federal agency attempted to control local decisions. The best approach may be for NOAA to act as a neutral advisor, providing the information needed by coastal zone managers, states, and developers to make informed decisions. This will be a challenge as NOAA has some management authority, particularly related to fisheries, and so must balance both roles to be seen as an honest and unbiased source of information.

Report on the Emerging Strategy for Environmental Literacy - Louisa Koch – Director, NOAA Office of Education

Ms. Koch provided an overview of NOAA's education program and sought input regarding future plans and how best to achieve them, noting in particular the need to maximize the impact of limited NOAA resources available for education activities. Education is referenced in the NOAA Vision as well as in each of the NOAA Goals. NOAA's education program includes both formal and informal components. There are significant investments in education across NOAA, especially in the Ecosystems Goal and the Mission Support Goal, which is where the Office of Education resides. It was noted that there has been a significant drop in total education funding from FY05 to FY06.

The Office of Education serves as the primary point of contact for NOAA on education issues, coordinating with NOAA programs for which education is an important element and administering programs within NOAA whose primary purpose is education. Major NOAA educational activities include the Educational Partnership Program, Environmental Literacy Grants, the Hollings Scholarships, and the Bay Watershed Education and Training (B-WET) Programs. Other education programs across NOAA include activities in the National Marine Sanctuaries, National Estuarine Research Reserves, the National Sea Grant College Program, and Ocean Exploration, as well as the Dr. Nancy Foster Scholarship Program and the Teacher-At-Sea Program. The NOAA Education Council was also discussed.

Noting that responsibility for education in the nation resides primarily at the state and local levels, Ms. Koch described activities outside of NOAA with which the agency and its scientists may collaborate. Environmental and Earth sciences education increases public awareness and knowledge of environmental issues and challenges as well as helps people relate to these issues and helps students meet educational standards.

Several additional education activities are in process. NOAA is working to obtain an overall statutory authority for education. The Office of Education is developing a "One-NOAA" internship program to encompass all NOAA internships. NOAA is also involved in several educational or outreach partnerships and in an Interagency Working Group on Ocean Education that coordinates Federal programs and examines the federal, state, and local relationship to ensure good communication of informal ocean and coastal education.

Discussion

The education program is important to NOAA's future, as the topic goes beyond ocean literacy to embrace NOAA literacy as a whole. In their public outreach, each NOAA center should address the entire NOAA story in addition to its own focus. Though different centers may focus on different aspects depending on the purpose of each, there needs to be some themes that all centers address. NOAA has a training program for field employees that provides information on how to represent all of NOAA. A potential message to the public could be that they "own the data" and that a significant portion of the budget is spent on grants. Methods to assess the success and productivity of educational programs are needed. An SAB working group on extension and education was proposed. Ms. Koch was asked to return in a year with an update and a larger focus on atmosphere and climate in addition to ocean literacy.

Public Comment

Dr. Pietrafesa asked for public statements. There were none.

Announcements

Dr. Mahoney introduced the SAB to Dr. Cynthia Decker, the incoming Executive Director of the Science Advisory Board.

Thursday, March 9, 2006

Dr. Uhart called the meeting to order.

Update and Discussion of the Interim Report of the Hurricane Intensity Research Working Group (HIRWG) - John Snow – Chair, Hurricane Intensity Research Working Group and SAB member

Dr. Snow noted that establishment of the working group was motivated by increases in the intensity of recent hurricanes. Despite improvements in hurricane track forecasts, corresponding improvements in intensity forecasts have been lacking. The charge to the panel is to independently assess activities in NOAA and elsewhere with respect to hurricane intensity and recommend an agenda of research and development activities that leading to improved understanding of the processes determining hurricane intensity and the timely transfer of that understanding to operations. The National Science Board (NSB) is also undertaking a hurricane research review; the two groups are coordinating their activities.

The need for a wiring diagram of hurricane research within and beyond NOAA was noted; NOAA must be able to diagram all of the connections within the agency. Dr. Snow described the cyclical pattern of hurricane research and development, noting that a key recommended activity to improve intensity forecasts is developing a high resolution mesoscale model with both atmospheric and oceanic components. Six interdependent preliminary recommendations were discussed. Immediate investments may have the highest payoff in data assimilation, especially of nontraditional observations (e.g. radar, satellite, dropsonde, etc.) to improve initialization and update the models. Better initialization can improve predictions. Research partnerships are necessary to attain improvements in intensity forecasting. Regarding operations research and socioeconomic impacts, NOAA should explore the development of impact products as opposed to simpler warnings of intensity, though these impact products may not necessarily be provided by NOAA. Impact products would illustrate the social and economic effects of a hurricane on communities rather than information directly about the storm itself. An example product would be a map of effects on the power grid and estimated times to power restoration in different areas. Also noted was the need to accelerate the transfer of research results to operations.

Discussion

Significant investment in weather research in Southeast Asia may provide an area for collaboration. There is also much Asian investment in computing issues in relation to weather and other topics. Though the United States has always had the lead in hurricane research and development, Asia and Australia are developing programs. There will be meetings with the international community at the American Meteorological Society's 27th Conference on Hurricanes and Tropical Meteorology, April 24-28, 2006, in Monterey, California.

The HIRWG was asked if it had considered the need for specific observing systems at particularly beneficial locations. Dr. Snow indicated that the working group did not look at these specifics but more at how those systems and locations can be identified. With respect to data assimilation, the HIRWG feels that NOAA is not taking advantage of all of the data that are available.

Dr. Mahoney thanked the HIRWG, noting that NOAA undertook this focus on intensity long before the 2005 hurricane season. He noted a need to emphasize

understanding of the basic physics and fluid dynamics of hurricanes in the final report so that it will address both operational requirements and underlying phenomena.

The Environmental Impact of Hurricane Katrina – Assessment of Environmental Impacts, Ongoing Monitoring, and Science in Support of Rebuilding Efforts - *Steve Murawski – Acting Ecosystem Goal Team Lead & Director of Scientific Programs and Chief Science Advisor, NOAA Fisheries Service*

This presentation was a follow-up to the hurricane panel at the November 2005 SAB meeting, and focused on intermediate response and rebuilding activities. There has been substantial ongoing activity in recovery efforts and a significant challenge exists in rebuilding fisheries. NOAA has created an agency-wide Disaster Recovery Checklist and will provide it to the SAB. In addition to internal NOAA studies, NOAA's draft Review of Operations and Services during Hurricanes Katrina and Rita is complete and under review.

NOAA is being tasked by FEMA to update the V-Datum water level information to provide levee rebuilding support. V-Datum is a software tool that converts among different vertical datums, which is crucial for examining the geospatial characteristics of the coastal zone. Information was noted as lacking regarding elevation data along the coastline that can support storm surge forecasts; members asked about the scale of resolution available and the results of long-term subsidence in Louisiana. The SAB Chair will be provided with more information on land elevation data.

Dr. Murawski described ongoing operations and studies, including weekly reporting to the White House Gulf restoration working group, continuing contaminants monitoring, fisheries abundance, regional information delivery, and debris removal. Extensive wetlands loss and coastal inundation after the storms was also discussed.

Rebuilding fisheries is a major recovery activity supported by NOAA, especially because of the agency's unique mandate in that area. Sampling has been undertaken to address pollution issues. There have not been contaminant surveys in deeper water to see if pollutants are being moved outward by the storms. It was noted that several finfish species have seen increases in abundance following the hurricanes. Due to reduced fishing effort, the shrimp growth response has increased. Those who can fish have increased catch rates and there is a market for these larger shrimp. It was noted that bringing the fishing fleet to its pre-hurricanes size would cause the fishery to again be not profitable. Social and economic impacts of the hurricanes are also under review.

Discussion

One could expect money to resolve the problems of Gulf Coast recovery, but this is not entirely true since, for example, infrastructure recovery is complicated due to labor and material constraints. NOAA has been working with the Gulf of Mexico Council on the recapitalization strategy to address these and many other issues.

A member asked if there is some broader context for response and recovery other than political pressure, as the context and coherent national response and its overall objective was not clear. NOAA is looking at its existing mandates as well as at what the government needs to do as a whole. It was noted that the White House group on Gulf Coast rebuilding led by Chairman Donald Powell is active. Lessons from this disaster that can help prepare for others are included in the Disaster Recovery Checklist, which is

not site specific. Also, VADM Lautenbacher is attempting to help develop a vision for coordination and cooperation across the government on such disasters in the future.

Another major hurricane could occur this year or next, which could strain NOAA human resources since limited employee surge capacity is available. It is currently unknown what the total cost to NOAA physical plant, supplies, and people is from the hurricanes. The integrated response effort was applauded as a good model of “One-NOAA” activities.

Status of Social Science at NOAA - Rodney Weiher – NOAA Chief Economist, NOAA Office of Program Planning and Integration

Dr. Weiher stated that the purpose of his presentation was to report on the state of social science in NOAA and the implementation of the SAB Social Science Review Panel’s 2003 recommendations, as well as to identify key challenges and next steps. The key recommendations were to improve social science literacy at all levels in NOAA, develop and support research strategies, plans, and programs, and integrate social science into NOAA’s management structure. Dr. Weiher noted that social science contributes to improved decision-making in each of NOAA’s Mission Goals and is embedded in NOAA’s corporate objectives.

It was noted that NOAA social scientists perform both programmatic and organizational research, though the vast majority of the research is programmatic. Examples of this research were provided. Several NOAA components have social science research plans, but constraints exist in implementation and budget.

Four additional beneficial future focus areas of effort were listed. These were 1) incorporate more social science into the 5-Year Research Plan and 20-Year Research Vision; 2) support an enhanced Ecosystems social science effort (consistent with eETT findings) to further integrate the natural and social sciences at the Goal level; 3) further integration of social sciences into Planning and Programming; and 4) explore an internal and external social science training and education program. In all, the efforts seek continued use and growth of programmatic research & analysis to support specific requirements and demonstrate value, and seek organizational research & analysis to inform corporate planning and programming decisions in order to improve how NOAA meets corporate objectives.

Discussion

With respect to the level of investment needed to achieve social science goals, it was noted that NMFS is on track and that NOS is making progress following the completion of their plan. Though the NWS investment in social science research is relatively smaller, it is supportive of social science research, and it also employs customer surveys to improve its products and services. Ward Seguin mentioned that there will be an American Meteorological Society (AMS) Bulletin article that reports the results of a workshop on hurricane social science research; he will provide the draft article to the SAB. Social science research could be combined into new and ongoing ecosystem efforts, for example, in the development of a backbone data management system for ecosystem operations. The group also discussed how the NOAA social scientists and economists are positioned to address the American Competitiveness Initiative (ACI) and provide information on the oceans to the White House. Dr. Weiher described some general areas

of NOAA coastal and ocean programs that support the ACI. Also noted was the May 2005 Economic Statistics for NOAA pamphlet, which will be forwarded to the SAB.

A SAB working group was proposed to review the status of implementation, resource needs, and make recommendations on how to move forward in social sciences. This motion was seconded and unanimously approved.

Bob Ryan, Chief Meteorologist at NBC Channel 4, asked what the involvement of NOAA social scientists was in the area of product generation in the National Weather Service (NWS). John Jones, NWS Deputy Assistant Administrator, responded that input from stakeholders was continuing to come in, but that the involvement of social science could be more extensive. He noted that this along with programmatic and organizational investments would be a good area to evaluate as part of the charge of the working group.

Update on the Great Lakes Executive Order - Stephen Brandt – Acting Deputy Assistant Administrator, NOAA Research

Dr. Brandt provided an informational update on the approach to regional and interagency coordination in the Great Lakes, focusing on the area as a model for EAM as well as implementation lessons learned. EAM requires the involvement of individuals at all levels. Dr. Brandt listed background information and requirements of the President’s Executive Order 13340 entitled “Establishment of Great Lakes Interagency Task Force and Promotion of a Regional Collaboration of National Significance for the Great Lakes,” information on the large scale implementation of the activity, as well as issues of interest to NOAA. Dr. Brandt discussed the goals of the Great Lakes Regional Collaboration as well as activities in eight topic areas. The report includes 52 near-term action items at the Federal level, twelve of which are directed to NOAA as lead or co-lead.

There is strong support at the highest levels of NOAA for these regional activities, but there is little funding available for them. The total cost to address all priorities is approximately \$20 billion. A positive aspect of this effort was establishment of regional consensus on priorities and forming a plan. However, this effort has also raised expectations that likely will not be met given the mismatch in timeline between the process endpoint and the federal capability to respond to the recommendations. There is a need to assess NOAA responsibilities, roles and leadership within the context of the ecosystem approach relative to other agencies. Also, coordination/communication within NOAA and across matrices/goals is critical given that Regional or constituent priorities may not match NOAA Goals or Programs. Other issues are how NOAA can best respond to priorities defined by these regional processes and the consideration of time delays in the federal budget process.

Discussion

The SAB asked whether the \$20 billion, which is spread over 10 years and is not all federal funding, is a plus-up and what is the investment so far. All of the federal expenditures have been calculated, and NOAA contributes about \$100 million annually to all of its Great Lakes programs.

In Gratitude of the Efforts of Drs. James Mahoney and Michael Uhart to the Science Advisory Board – Dr. Len Pietrafesa, Chair of the Science Advisory Board

On behalf of the Science Advisory Board, Dr. Pietrafesa made a statement thanking Dr. Mahoney for his service and attention to the Science Advisory Board over his tenure at NOAA. Dr. Pietrafesa also thanked Dr. Uhart for his efforts as Executive Director of the Science Advisory Board.

Stakeholder Input and NOAA's AGM for FY 2009-2013 - Paul Doremus – Acting Deputy Assistant Administrator & Director of Strategic Planning, NOAA Office of Program Planning and Integration (PPI)

Dr. Doremus briefed the SAB on the development of NOAA's Annual Guidance Memorandum (AGM) and how it contributes to NOAA's planning. The purpose of the presentation was to review the role of the AGM at NOAA, discuss major external environmental, programmatic and policy developments that may affect NOAA's corporate priorities, review NOAA's current AGM, and obtain SAB guidance and input for NOAA's FY 2009 – FY 2013 planning priorities. The AGM identifies a limited number of high-level, high-impact, high visibility, NOAA-wide program priorities that require significant and sustained financial or managerial resources and effort.

Dr. Doremus noted that the planning process is changing in NOAA. Last year the AGM was the culmination of the planning period while this year the AGM is composed at the start of the planning calendar to provide guidance during planning. PPI solicits broad stakeholder input through many channels to help develop the AGM, and Dr. Doremus discussed external demands as well as departmental and NOAA leadership priorities contributing to the AGM. With respect to how the competitiveness and innovation (e.g. return on investment) priorities are evaluated, it was noted that the process is difficult because the agency does not currently have return on investment performance measures.

The fiscal environment impacts the AGM, especially as there will be less discretionary spending through 2014 and infrastructure costs are high. The research and development funding for NOAA is expected to decline by 6.3% from FY06 to FY07. Dr. Doremus solicited the SAB views on external trends and potential issues for the AGM.

Discussion

A SAB member suggested that high performance computing could be a limiting factor to meeting Mission Goal objectives. Dr. Mahoney noted that a priority is also to guard against budget cuts. Gen. Jack Kelly, Deputy Undersecretary for Oceans and Atmosphere, noted that NOAA has difficulty stating what will not be accomplished under budget cuts and articulating what must change to meet the highest priority needs. He noted that the AGM should allow NOAA to be more efficient. It was noted that to do this there needs to be ways to place value on investments.

With respect to how PPI handles all of the various stakeholder groups it was noted that the office looks for patterns in responses to find overall themes. The corporate perspective of the AGM limits single issue items and creates focus on the scale and frequency of ideas that cross Goals. A member observed that when an agency listens to a broad group it may improve yesterday's product rather than developing new, so placing more weight on forward-thinking ideas may be more beneficial than focusing on incremental improvement of the past. Another member observed that NOAA should look

at alternatives, asking questions such as “is the hurricane forecast good enough?” to seek significant benefits. Dr. Doremus requested comments from the SAB.

Presentation on NOAA Research & Development Computing / High Performance Computing - *Carl Staton – NOAA Chief Information Officer*

Mr. Staton opened his presentation by stating his desire for NOAA should be the “go-to agency” for environmental forecasts. His presentation provided information on High Performance Computing (HPC) to prepare the SAB for an upcoming request for advice. The issue noted was that NOAA’s HPC requirements far outstrip its resources. Mr. Staton defined HPC as including computing as well as data management, communications, analysis and other linked activities. He noted that NOAA’s Mission requires significant modeling capabilities; these requirements, if fulfilled, would put NOAA in the top five of the world for computing ability. NOAA uses HPC for both operations and research and development; both require faster throughput as there is a high degree of correlation between new computing capabilities and forecast skill scores as well as in improved climate dynamics and predictions. Mr. Staton discussed a list of unmet HPC requirements and the benefits it brings to the Mission Goals as well as factors driving HPC architecture changes. He also pointed out that there was an approximately \$6 million cut in FY06 to Network and Information Technology Research and Development (NITRD), which is the current format of the High Performance Computing and Communications program. There were several impacts of this cut, including deliveries of hardware being delayed a year. The FY07 President’s Budget Request restores the cut. The HPC architecture is undergoing significant alterations and moving from a stovepiped set of systems to a cohesive aggregate. This creates a single set of requirements and hopefully yields more flexibility and a larger pool of shared resources and capabilities.

In a follow-up presentation to the SAB in July 2006, Mr. Staton intends to provide information on HPC utilization and the requirements for HPC resources. On behalf of the NOAA HPC community, he will seek advice on how to address the gap that exists between available HPC resources and requirements.

Discussion

NOAA does not have the organization needed to facilitate the identification of necessary technologies and architectures. However, it would be helpful to have a technology futures group focused on technologies that might be of value to NOAA; the National Center for Atmospheric Research has such a group.

Much of the responsibility for setting priorities under the condition of demand not being met by supply rests with the Environmental Modeling Program Manager, in whose Program HPC resides. There are currently no decision criteria for the process; these criteria are under development. It was noted that scarcity in the organizational structure will force NOAA back into the computational stovepipes. Gen. Kelly observed that it is a complicated structure that is starting out with unmet demand. Beyond the research community, it must address the operational forecasting demands of NWS. This challenge is similar to that of ship time in NOAA. Human and technological resources must be optimized to meet demand.

The SAB asked whether the computers exist that could provide the additional capability. They do, and several models for obtaining computing resources were given.

NOAA does not need to own the computers, but can use time on computers located elsewhere.

Discussion of NOAA's Activities regarding Invasive Species - Dorn Carlson – NOAA Invasive Species Program Manager

The purpose of Mr. Carlson's presentation was to solicit advice and input on the research priorities and approach related to Aquatic Invasive Species (AIS). AIS are a threat to achievement of NOAA's ecosystem goal of healthy and productive coastal and marine ecosystems that benefit society. Prevention is the most preferred option to control the effects of AIS; a predictive capability is needed to help address this problem. Mr. Carlson discussed the components of the Invasive Species program (ISP). Although it is not a research program, research underpins the entire ISP; this research is needed across NOAA components, between agencies, from national to local levels. The ISP is attempting to provide scope to invasives research while looking at related roles, priorities, and the balance between science and applications. A significant limiting factor, however, is the budget. For example, the FY06 budget request of 2.5M was increased to 6.25M in the appropriation. However, 5.25M of that amount is in specific earmarks, leaving \$1M to address the issues and priorities described in the President's request. Mr. Carlson asked the SAB for its reaction and advice on NOAA's approach and process to establish, set, and execute research priorities.

Discussion

In regards to whether invasive species can enhance an ecosystem, it was noted that an enhancing species does not fit under the definition of invasive species, which instead are disruptive. Introduced species can sometimes be considered as beneficial or eventually become invasive. Mr. Carlson noted that research needs to be done on their societal benefits and risks.

It was asked whether, with the given budget and the earmarks, the program had considered the budgets outside of the earmarks for working with extension programs and other structures to educate rather than monitor or research invasives. Mr. Carlson responded that the ISP does emphasize issues most likely to be helped by other programs, though they may not be key issues. However, these may be the best ways to gain benefit for the funds available. Outreach and education are being utilized in cases where it is appropriate, such as in collaboration with the National Sea Grant College Program.

There is a basic list in development and available for use of species of interest to NOAA, but insufficient funds exist to keep it complete and updated. Sea Grant, the Aquatic Nuisance Species Task Force, and other organizations provide information included on this.

Recap of Meeting Decisions and Actions - Michael Uhart – Executive Director, NOAA Science Advisory Board

Dr. Uhart provided a list of the meeting decisions and actions based on draft meeting minutes. The list below was revised by the SAB members and was then approved by them.

1. The SAB approved the Preliminary Minutes of the November 2005 SAB meeting,

with corrections as stipulated by Frank Kudrna.

2. The SAB recommends that NOAA establish a short-term Extension, Outreach, and Education working group of the SAB.
The purpose of the working group will be to support the SAB in providing advice to NOAA to strengthen, coordinate, organize, and improve its extension, outreach, and education activities to fully engage its constituents.
3. The SAB recommends that NOAA charter a working group of the SAB to review the status of implementation of the SAB's Social Science Research Review, social science research resource needs, and make recommendations on how NOAA can move its social science research programs forward.
4. NOAA will solicit the SAB for comments on the AGM priorities.
5. Schedule High Performance Computing for the summer 2006 SAB meeting.
6. NOAA will make the hurricane recovery checklist available to the SAB.
7. NOAA will provide information to the SAB Chair on elevation data, the source of the data, and how the data are made available to the community.
8. NOAA will provide the SAB with a preprint of the AMS Bulletin article describing the outcomes of last year's hurricane social science research workshop in Pomona, CA.
9. NOAA will send the SAB members the April 2006 "Economic Statistics for NOAA."