

**50<sup>th</sup> Meeting of the NOAA Science Advisory Board  
Boulder, Colorado  
29-30 July 2014**

Presentations for this meeting have been posted on the Science Advisory Board (SAB) website:  
[http://www.sab.noaa.gov/Meetings/2014/july/july\\_29\\_2014.html](http://www.sab.noaa.gov/Meetings/2014/july/july_29_2014.html).

**SAB members in attendance:**

Ms. P. Lynn Scarlett, Managing Director for Public Policy, The Nature Conservancy (*Chair*); Dr. Susan Avery, Director and President, Woods Hole Oceanographic Institution; Dr. Eric Barron, President, Pennsylvania State University; Dr. Michael Donahue, Vice President, Water Resources and Environmental Services, URS Corporation; Mr. J. Walter Faulconer, President, Strategic Space Solutions; Dr. Jeremy Jackson, Senior Scientist Emeritus, Smithsonian Institution; Dr. Peter Kareiva, Chief Scientist and Director of Science, The Nature Conservancy; Dr. David M. Lodge, Professor, Environmental Change Initiative, University of Notre Dame; Dr. Jennifer A. Logan, Retired (Harvard University); Dr. Molly K. Macauley, Vice President for Research and Senior Fellow, Resources for the Future; Ms. Jean May- Brett, STEM Partnership Coordinator, Louisiana Department of Education; Dr. Jerry Schubel, President and CEO, Aquarium of the Pacific; Mr. Robert S. Winokur, Retired (NOAA, Navy); and Dr. Dawn Wright, Chief Scientist, Environmental Systems Research Institute.

**NOAA senior management and Line Office representatives in attendance:** Dr. Kathryn Sullivan, Under Secretary of Commerce for Oceans and Atmosphere; VADM Michael S. Devany, Deputy Under Secretary of Commerce for Operations; Dr. Rick Spinrad, NOAA Chief Scientist; Dr. Holly Bamford, Assistant Administrator, NOAA National Ocean Service; Dr. Steven Fine, Deputy Assistant Administrator, NOAA Oceanic and Atmospheric Research; Ms. Laura Furgione, Deputy Assistant Administrator, NOAA National Weather Service; Dr. Mark Paese, Deputy Assistant Administrator, National Environmental Satellite, Data, and Information Service; Dr. Richard Merrick, Chief Science Advisor, NOAA National Marine Fisheries Service; Dr. Alexander MacDonald, Chief Science Advisor, NOAA Oceanic and Atmospheric Research; RADM David Score, Director, Office of Marine and Aircraft Operations; Dr. David Hermreck, Senior Program Advisor, National Environmental Satellite, Data, and Information Service.

**Staff for the Science Advisory Board in attendance:** Dr. Cynthia J. Decker, Executive Director; Anna Hermes; and Mary Anne Whitcomb.

**Tuesday, 29 July**

**Opening Statement of the Chair and Self-Introductions by Science Advisory Board (SAB) Members**

Lynn Scarlett, The Nature Conservancy and Chair, NOAA SAB

Lynn Scarlett welcomed the SAB members and other attendees to Boulder, and everyone introduced themselves.

**NOAA Update**

Kathryn Sullivan, Under Secretary of Commerce for Oceans and Atmosphere

**Summary**

Dr. Sullivan opened her statement by thanking the NOAA Earth System Research Lab for hosting the SAB meeting. Her presentation began with several updates since the April 2014 SAB meeting. Lynn Scarlett, Managing Director of Public Policy at The Nature Conservancy is the new Chair of the SAB. Her tremendous background in conservation policy will provide great leadership; Dr. Sullivan thanked her for agreeing to serve. Since the April 2014 meeting, four reports were approved and transmitted to NOAA: The Ecosystem Sciences and Management Working Group (ESMWG) Coastal Habitat Restoration report, the ESMWG Ecosystem-Based Fisheries Management report, the Cooperative Institute for Research in the Atmosphere review report, and the Cooperative Institute for Marine Ecosystems and Climate review report.

NOAA has had a few changes in leadership since the April 2014 SAB meeting. Dr. Rick Spinrad is the NOAA Chief Scientist, and Dr. Dave Kennedy is the Senior Advisor to NOAA on the Arctic. Gary Reisner is the Acting Budget Director, and Zachary Goldstein is the Acting Chief Information Officer and Director of High Performance Computing and Communication. Mark Paese is the Acting Assistant Administrator (AA) for the National Environmental Satellite, Data, and Information Service (NESDIS), and Craig McLean is the Acting AA for Oceanic and Atmospheric Research (OAR).

NOAA continues to prove its excellence through awards. The climate.gov website won two Webby awards, and NOAA's acceptance was a tweet, "Our home, NOAA's mission." NOAA received the Environmental Systems Research Institute's "Making a Difference" award for the use of GIS to map coastal flooding and visualize potential off-shore wind farms. The National Weather Service Cooperative Observer award was given to 101-year-old New York farmer, Richard Hendrickson, who has served for 84 years. Over this time, Hendrickson tallied more than 150,000 individual weather observations. The many other awards that NOAA researchers receive show how NOAA scientists continue to be recognized by the larger scientific community and government.

External reports and assessments provide context for NOAA's work. For example, July 2014 quarterly economic reports highlighted the connection between poor economic performance and the unusually cold winter in 2013. This link between science and society is a key part of what NOAA does. The 3<sup>rd</sup> National Climate Assessment was released in May 2014 and the Bulletin of the American Meteorological Society State of the Climate was released in July 2014. NOAA continues to provide the fundamental research and observations for these and other reports to improve the ability to understand and predict Earth's climate.

NOAA is a science-based services agency. A large part of what NOAA delivers is Environmental Intelligence. NOAA aims to deliver information in a way that people can use it for decision-making. Dr. Sullivan reemphasized NOAA's four priorities that will shape her tenure as Administrator: provide information and services to make communities resilient; evolve the weather service; invest in observational infrastructure; and achieve organizational excellence.

Societal, economic, and ecosystem resilience are all interwoven, and there have been many recent activities emphasizing resilience. Recently during Capitol Hill Ocean Week, John Podesta, Counselor to President Obama, announced the revitalization of the Sanctuaries Nomination Process, which allows the American people to nominate areas for potential designation as new national marine sanctuaries. The Department of State's Our Oceans conference announced expansions of Pacific marine sanctuaries, and developed a comprehensive program to combat seafood fraud and illegal, unreported, and unregulated (IUU) fishing. Healthy oceans depend on resilient ecosystems, and communities rely

on resilient ecosystems in many ways. Ecosystem-based management is key to economic vitality, and two recent reports (Status of the US Fisheries 2013 and Fisheries Economics of the US 2012) highlight the steady rebuilding of US fisheries. A total of 34 fish stocks have been rebuilt since 2000. NOAA continues to work toward the reauthorization of the Magnuson Stevens Act. NOAA National Marine Fisheries Service (NMFS) and National Ocean Service (NOS) recently developed and applied the first method for assessing vulnerability of fish stocks to climate change and changing ocean conditions on fisheries, using the Northeast as an example.

In addition to increasing ecosystem resilience, NOAA has been providing support for drought management through integrated observations and research in the Western US. In California alone, January through June 2014 was the warmest on record, and the dry heat manifested in large wildfires in southern California. Eighty-one percent of California is considered in extreme drought or worse, and dry conditions are likely to persist over the next several months. The Western Governors' Association was key to driving the reauthorization of the National Integrated Drought Information System (NIDIS) in 2014.

The Climate Resilience Toolkit will soon be launched as part of the President's Climate Action Plan. The goal of the toolkit is to provide information for people to manage their climate related risks and opportunities.

There has already been progress in the priority Evolving the Weather Service. Storm surge inundation graphics were released in time for Hurricane Arthur, and are a product of cross-line office collaborations. Maps are available for eight coastal bays so far. There was much iteration of the wording and coloration in the graphics so that the information was clear to the public. Input from the social sciences helped perfect communication methods. The National Water Center will have initial operating capability May 2015, and is another key component of Evolving the Weather Service. The Center will be jointly occupied by the US Geological Survey, the US Army Corps of Engineers, NOAA, and academic researchers, and will be an integral component of a fully integrated water resources program directed towards consistent products and services from floods to droughts.

There are many activities in observational infrastructure across an array of platforms. The Geostationary Operational Environmental satellite R-series (GOES-R) and Joint Polar Satellite System (JPSS) are on track for their launch dates and the fisheries research vessel *Ruben Lasker* was just commissioned to the NOAA fleet. The NOAA ship *Okeanos Explorer* was in the Gulf of Mexico, and provided live video stream of its entire mission. Dr. Sullivan highlighted the recent installation of a Physical Oceanographic Real-Time System (PORTS) system at the Port of Jacksonville (FL). Eighteen stations with 46 individual sensors were installed with a NOS-NWS collaborative effort. The Jacksonville PORTS is an example of integrating the priorities and Line Offices to deliver science-based services.

NOAA's Big Data Request for Information on how to get NOAA data out to the public received seventy responses from industry and academia. NOAA is working with other agencies to formulate a plan for implementing a new, innovative model of public-private partnership around open governmental data.

Dr. Sullivan closed by stating that she provided the SAB with an array of recent activities that demonstrate how what is happening in the world also shapes NOAA's priorities and mindset.

## Discussion

Lynn Scarlett thanked Dr. Sullivan for her update. The discussion centered on NOAA's role in the international community. Molly Macaulay asked how NOAA is addressing research at home in the US versus abroad. Dr. Sullivan said that NOAA has substantial international activities and responsibilities even though its charter is for the US.

NOAA's international activities are tied to understanding the earth system as a whole. NOAA National Weather Service (NWS) forecasts depend on international data, so the US is part of the World Meteorological Organization (WMO). Laura Furgione, US Representative to the WMO and Deputy Director of the NOAA NWS said that NOAA has responsibility to not only build a "weather-ready nation," but to help build a "weather-ready world." The NWS works closely with the U.S. Department of State, the US Agency for International Development (USAID), and the Federal Emergency Management Agency (FEMA) through the WMO. Dr. Sullivan added that Secretary of Defense Chuck Hagel recently convened ministers of the Association of Southeast Asian Nations (ASEAN) to discuss disaster preparedness and recovery. Pre-event preparation, and post-event disaster support is as, if not more, important than military support in other nations. Fisheries research and management requires work with other countries, especially for migratory species.

Susan Avery added that there is a perceived loss of NOAA and US leadership in the international ocean research arena, because of the lack of the US ability to support the Intergovernmental Oceanographic Commission (IOC). She asked how NOAA plans to continue serving as a leader for oceans as well as for weather. Dr. Sullivan said that Craig McLean, Acting AA for NOAA OAR, has been working on building NOAA's ocean leadership internationally and serves as the US representative to the IOC. Political constraints limit US involvement in the IOC but the constraints have nothing to do with NOAA. Rather, they are tied to the accession of Palestine to the United Nations. Dr. Spinrad added that he was the US Representative to the IOC in his previous work with NOAA. He noted that although there are constraints working with the IOC, there are operating units of the IOC with which NOAA can work. NOAA has been working to identify those access points. Dr. Avery said that there is much frustration with the US lack of involvement in the IOC from her standpoint as Chair of an advisory committee to the IOC.

Richard Merrick, NOAA NMFS Chief Science Advisor said NOAA is involved with international scientific research. There are numerous bilateral agreements with other countries around the world. NOAA is a leader in the Arctic, and leads in other stewardship activities as well. Dr. Sullivan agreed, and said that there are many cases where NOAA is a smaller agency in size relative to others present at discussions, but NOAA is often thought of as a leader. NOAA is also working to continue to drive other countries to have open data for earth observations to help identify weak areas in a global observation network.

Dawn Wright asked about the status of NOAA's Chief Economist; Dr. Sullivan responded that David Yoskowitz has been hired into this position.

**An Overview and Discussion of the Cooperative Institutes Review Process and Review Criteria**  
Philip Hoffman Director, NOAA Cooperative Institute Program Office

## Summary

The purpose of Philip Hoffman's presentation was to provide background information about the Cooperative Institute (CI) review process so that the SAB could discuss improvements to the review process and rating system. Mr. Hoffman emphasized that the CI review process is critical for ensuring compliance with grants management policies and procedures. Additionally, a successful review process is important because the Office of Management and Budget (OMB) will imminently collapse granting circulars to one "super-circular" at the end of FY14, which will increase competition for federal grant funds, and emphasize performance measurement among other things (Federal Register Vol. 78, No. 248, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards).

The current CI review process stems from an SAB report, "Review of the Organization and Management of Research in NOAA," (2004) and NOAA's response to that report, "The Evaluation of NOAA's Response to the Research Review Report," (2005). NOAA's response to the SAB's recommendations was to form the Cooperative Institutes Committee on the NOAA Research Council (RC), which formulated the NOAA Cooperative Institute Policy (NOAA Administrative Order [NAO] 216-207, September 2005) and the CI Policy handbook (written and maintained by the NRC CI Committee, last updated November 2012). The review process has had minor updates since the initial handbook was written, but has remained essentially the same for nearly a decade.

Many parties are involved in the CI Review process. The Research Council approves review guidelines and recommendations for renewal of CIs, and provides general oversight of the CI program. The RC CI Committee ensures compliance with the CI NAO and Handbook, proposes major procedural changes pertaining to the NOAA management of CIs and the policy's implementation, and maintains and approves CI Handbook amendments. Each CI has a responsible Line Office, which manages the CI awards and reviews. The CI Director (Mr. Hoffman) oversees all NOAA-funded CI activities. The SAB is the official reviewing authority for the CI program.

Mr. Hoffman outlined a typical timeline for a CI review, and acknowledged that the review process could be more clearly articulated to the SAB review panel Chair at the beginning of the review preparation process.

Eight elements are assessed during the review, which were identified by the SAB report and NOAA response in 2004-2005: 1) quality, creativity, integrity, and credibility; 2) timeliness, scale, and scope; 3) connection to the application and operational implementation of policy; 4) capacity-building; 5) education; 6) efficiency; 7) social science integration; 8) diversity. The SAB's Portfolio Review Task Force report (2013) identified similar elements for successful cooperative research agreements, suggesting these eight elements for assessment are robust.

The question at hand is whether the review process itself allows the review panel to adequately identify the success of the CI for these eight elements. Somewhat informally, the CI is also reviewed on its relationship to the CIs business plan from its original CI proposal. This has been an issue in past CI reviews, when the actual funding amount is less than that requested in the original proposal (e.g. the Cooperative Institute for Marine Ecosystems and Climate [CIMEC] review, 2014). One solution would be to have better, more focused Federal Funding Opportunities for the CIs; this will be a topic of consideration for CI re-competitions beginning in FY16.

The review panel is asked to review the CIs capabilities in four categories: 1) science plan; 2) recent accomplishments; 3) education and outreach; and 4) science management plan. The eight elements for

assessment and review categories are addressed in a survey of standard review questions the CIs provide to the review panel before the on-site review. The questions in the survey are approximately a decade old, and may need to be updated. Either in the survey questions, or separately, the CI should invest time before and at the beginning of the review communicating what and how their research is accomplished to the review panel.

The ability of the CIs to address the four review categories differs. Of the four review categories, it is most difficult to review the science plan. The CIs find it difficult to have an overarching science plan, because they do not have discretion over how to spend the CI award funds. The second category of recent accomplishments is often the most interesting for the review panels. This provides the CI with the opportunity to report on its recent findings and breakthroughs, and is often an excellent learning experience for the review panels. The education and outreach category is difficult to demonstrate and accomplish well, because the CIs do not receive substantial funding for these activities. Some CIs have adapted excellent education and outreach activities based on funds from their partner universities (e.g. JISAO). CI administrative functions and education and outreach activities are funded through “Task 1” annual payments. The calculation for determining the level of Task 1 funding was recently revised to increase the amount of funding allocated to Task 1 activities, but only ~1% of the funding for research is allocated to outreach and education (Task 1B). Nevertheless, the new Task 1 policy does dedicate more funds to these activities than previously awarded. The management category is also difficult because the CIs can be very different in size and scope. However, the review panel can provide useful suggestions for identifying best practices for management.

The review panel provides an overall rating based on its findings in the four categories. The current CI ratings are:

**Outstanding:** The CI has consistently demonstrated superior achievement of all initially agreed goals, as well as evidence of an on-going resource commitment that enhances NOAA’s resources to support collaborative research. For outstanding performance, NOAA will renew a CI for up to additional 5-years at a funding level, pending availability of funding, commensurate with its level of performance.

**Satisfactory:** CI has achieved some or all of its agreed goals and has demonstrated acceptable performance. Its performance, however, is not considered outstanding and/or the CIs resource commitment provides a limited enhancement of NOAA’s resources. NOAA may opt to renew the CI for less than 5-years at a significantly reduced funding level, pending funding availability.

**Unsatisfactory:** CI has demonstrated a failure to achieve some or all of its agreed goals and its performance is unacceptable and/or the CI has also provided minimal resources to enhance NOAA’s resources to conduct collaborative research. NOAA will not renew the award or, for serious problems, will terminate the current CI award.

In the history of CI reviews, only one CI has received a “Satisfactory” rating. That rating resulted in many changes for that particular CI. The university partners and CIs generally take the ratings quite seriously, as does NOAA.

In addition to the science review, the CI director chairs a one-day Administrative Review. The Administrative review panel consists of members from the NOAA Grants Management Division, the Department of Commerce Federal Assistance Law Division, and the NOAA Federal Program Office. The Administrative Review is not a full legal audit, but assesses whether the CI meets the legal

requirements for the oversight of CI grants. As with the science review, the Administrative Review includes a set of survey of questions for the CI to answer. Mr. Hoffman is working to determine whether the Administrative Review could be incorporated into the Science Reviews.

For comparison, Mr. Hoffman noted that NOAA OAR also executes reviews for some of its other programs. For example, the OAR Laboratories are reviewed every five years and are assessed on their Quality, Relevance and Performance in designated research areas. The on-site reviews are similar to the CI reviews, but have additional time for stakeholder feedback, Line Office representative feedback, and meetings with students and other researchers. The Lab Reviews have a new four-tiered rating system, which relates to a defined “Satisfactory” level for the various review criteria:

Highest Performance: Laboratory greatly exceeds the Satisfactory level and is outstanding in almost all areas.

Exceeds Expectations: Laboratory goes well beyond the Satisfactory level and is outstanding in many areas.

Satisfactory: Laboratory meets expectations and the criteria for a Satisfactory rating.

Needs Improvement: Laboratory does not reach expectations and does not meet the criteria for a Satisfactory rating. The reviewer will identify specific problem areas that need to be addressed.

After the review, the laboratories complete a response plan, and submit a final report one year from the receipt of their review report. While the outcomes of the lab reviews are different than the CI reviews, both look for excellent research and best practices to achieve excellence. They also provide the lab with an opportunity for self-reflection and change.

The NOAA OAR Sea Grant programs are also reviewed, though the Sea Grant statutory authorities are somewhat more constrained than the CIs. The Sea Grant reviews include a significantly more quantitative review scale that directly links to a Sea Grant program’s eligibility for merit funding. While it is unlikely the CI review process necessitates such a quantitative approach, there may be quantitative scales that would enhance the CI review process and outcomes and would also inform the Office of Management and Budget requirements.

While NOAA has an enforceable mechanism for implementing CI review recommendations, recommendations to NOAA regarding CI policies and procedures have not been rigorously addressed. Over the years, a few recommendations to NOAA have recurred. NOAA should be more proactive in engaging with CIs in long-term planning and building relationships with CI university partners. Co-location, workshops, and information sharing are examples of increased communication, but the question of how to involve CIs in long-term strategic planning has not been consistently addressed. For example, the CIs could play a role in addressing all of Dr. Sullivan’s priorities for NOAA, but how should this be done? This discussion should include input from the CIs themselves.

Mr. Hoffman concluded his presentation with guiding issues for SAB discussion, including: SAB ideas on the outcome of the CI Reviews, the structure or format of the CI Reviews to achieve that outcome, and the SAB’s role in the CI review process moving forward.

## Discussion

Lynn Scarlett thanked Mr. Hoffman for his presentation and said that the recent Joint Institute for the Study of Atmosphere and Ocean (JISAO) review demonstrated that there are issues and questions that have arisen pertaining to the actual review process itself, the robustness of the evaluation elements, and the review metrics. The JISAO review also highlighted questions about the overall structure and nimbleness of the CIs to adapt and change.

Eric Barron had two comments. First, he said that there are not enough review rating categories. The current categories are similar to academic grades of “C” and “A+” for “Satisfactory” and “Outstanding,” respectively. The Sea Grant rating system provides more flexibility for the reviewers and also allows for continued full funding with some recommendations for improvements. Secondly, a recent National Academies of Science report on metrics from the Global Change Research Program (National Research Council. *Thinking Strategically: The Appropriate Use of Metrics for the Climate Change Science Program*. Washington, DC: The National Academies Press, 2005). The report said that there is a heavy emphasis on program outcomes (e.g. publications, products, etc.), but there are whole categories of metrics that pertain to program inputs (e.g. funding). Providing more flexibility in the review ratings and providing input metrics to the reviewers would greatly enhance the success of the review process.

Jeremy Jackson responded that the review is really directed toward NOAA rather than the CIs. It is essential that NOAA provides an information sheet or briefing on the role of the CI in NOAA to the review panel before the review. The review panel is chosen because the panelists are external to NOAA, which is valuable for reviewing the quality of the research and other things, but the panelists lack knowledge on some of the details within NOAA that would be useful context for the review. The CIs are locked into responding to a formulaic procedure that prevents them from providing information about projects that they are really proud of, exhibit high expertise in, or are concerned about. Regarding the science planning, a strategic plan of sorts needs to be able to incorporate adaptive management; the evaluation of the science planning should not resort to checking boxes in a checklist for the review. The reviews are an opportunity for the CIs to have their science plans assessed by external experts. Lastly, Dr. Jackson thought the three-tiered rating system is quite inadequate for the reviews. For federal employee evaluations, employees receive “Satisfactory” if s/he is doing everything correctly, and are only awarded an “Outstanding” if s/he goes far beyond the job description. The CI reviews are experiencing grade inflation under the current system.

Susan Avery said that she was struck by how formulaic the review process is for such a diverse set of institutes. For example, when she was the Director of Cooperative Institute for Research in Environmental Sciences (CIRES), there were conflicting opinions between the CI and NOAA as to whether the CI should include non-NOAA research in its portfolio for the review. In Dr. Avery’s opinion, non-NOAA funded research should be included. Also, she believes the review should highlight overall accomplishments, and how the CI serves the NOAA strategic plan, but also its other activities. However, this gets to a different question, which is what NOAA really wants from the reviews. Most of the reviews note excellent research, accomplishments, and alignment with NOAA’s strategic plans, but there is never consideration about what the future should look like. From Dr. Avery’s experience as a leader, she would like to have this input from a review. In summary, NOAA needs to determine what the desired outcome of the reviews is and should be more flexible in the review process to accommodate different CI structures, recognizing that diversity among CIs is a strength.



Dawn Wright agreed with the comment regarding the diversity of the CIs, and said the CIMEC review that she chaired considered both findings and recommendations to NOAA and for the CI to help them with forward planning and to ensure continued support. CIMEC's rating was chosen because the review panel did not want to compromise the CIs funding. Dr. Wright proposed four new review rating categories: continued support with no conditions, continued support with conditions, hold support for a designated period, or remove support.

Bob Winokur said that the review process is hampered by the review ratings. He is struck by the fact that all of the reviews have had either "Satisfactory" or "Outstanding" ratings, and that the "Satisfactory" rating was essentially considered a "fail," symbolizing rating inflation. Dr. Winokur's key point is that there are shades of gray for ratings, which can be better reflected with a more quantitative rating approach.

Peter Kareiva was surprised that the review process does not highlight research leveraged by NOAA's investment in the CIs, which he thinks is a vital asset the CIs provide to NOAA. Dr. Barron agreed, and added that language like "meets expectations" allows for opportunities to improve and adds flexibility.

Lynn Scarlett said that this links to the observation that NOAA should clarify its expectations of the CIs. If leveraging is a primary goal for the CIs, the review process should emphasize this aspect of the CIs.

Dr. Jackson said it would be useful for the review panel to receive a prepared document that outlines the projects, the decisions behind beginning them, how they link to the NOAA mission, and what should be considered by the review.

Tom Ackerman, Director of JISAO (recognized by Lynn Scarlett to address the SAB), agreed that there is not a recognition of what is expected from NOAA and whether the CI has met these expectations. Further, the expectations must be consistent with the CIs resources. If a strategic plan is expected, support to conduct a strategic planning process should also be provided. There is simply not enough funding for activities related to future planning. The CIs can tell the reviewers what they would like to do, but there isn't support for the proposed work's execution.

Susan Avery agreed with Dr. Ackerman's comments. There is not enough discretionary funding for forward planning, and there are no operating principles. There cannot be a "one-size-fits-all" approach to the CIs and their review. The Administrative Review is an additional burden. Most institutions have full federal audits, so the Administrative Reviews seem duplicative.

Mike Donahue summarized the discussion, stating that there seems to be agreement on the issue of the rating system and grade inflation. He proposed that the SAB should identify a subgroup to draft a scope of work in order to: review and update the decade-old review survey questions, provide a thorough and objective review of the rating criteria, provide examples of quantitative protocols, incorporate a set of actionable items, and provide recommendations to NOAA. The subgroup could provide NOAA a general review template, subject to modifications based on the CI being reviewed.

Dr. Kathryn Sullivan thanked Mr. Hoffman and the SAB members for their comments and concerns and acknowledged that this is a very timely discussion. She is highly sympathetic to the "grade

inflation” ratings the CI reviews have received. The review process should bring useful information to light for both NOAA and the CI. The formulaic and rigid review process approach needs to be addressed. NOAA is ready to examine the CIs overall to determine what their virtues, benefits, and values are to NOAA now and in the future.

Rick Spinrad added a couple of perspectives. He was on the team that wrote the SAB’s recommendations a decade ago. Just one month ago, he managed two CIs at Oregon State University and was also struck by the diversity of the CIs. If Dr. Spinrad had not previously worked for NOAA, he would have had difficulty identifying how some of aspects of the CIs research aligned with NOAA. He recognizes that the CIs are an unparalleled tool, but NOAA should think about how to use them as a leveraging tool with a 5-year agreement to do specific things that cannot be accomplished otherwise. He also wondered if there are other roles that the CIs can play for NOAA. Dr. Spinrad’s overall concern was how to fit the CIs into NOAA’s long term goals and research portfolio.

Mr. Hoffman highlighted the CIs response to the Disaster Relief Appropriations Act (Sandy Supplemental) as an example of how the CIs could be used. When the Sandy Supplemental bill was drafted, the CI Directors had 48 hours to come up with two-page research proposals for projects that would meet congressional intent, NOAA goals, and their CI plan. As a result, the CIs are now responsible for managing a significant amount of Sandy Supplemental funding. This example illustrates the point that CI Directors have tremendous creative capacities and can meet NOAA’s needs quickly. The CI Program Office also looks forward to hearing more about proposed performance metrics for the CI reviews.

Susan Avery said that the discussion never addressed the role of the SAB in the CI reviews. Dr. Avery would also like to discuss the SAB’s role in OAR Laboratory and Sea Grant reviews. Dr. Sullivan said that these concepts could be discussed further during the SAB’s working session the next day.

Lynn Scarlett said that the SAB would not take action on the CI review process yet, but would wait until after the working session the next day to move forward. (Note: the SAB did not have a discussion about the CI reviews the following day so action on this topic will be addressed at a later SAB meeting.)

Action 1: NOAA will take action to review the ideas discussed on changes in the Cooperative Institute review process. For the next meeting, NOAA will provide the SAB with a synthesis of this discussion and identify possible changes in the review process for discussion with the SAB.

### **Review of the Cooperative Institute for Meteorological Satellite Studies (CIMSS)**

Len Pietrafesa, North Carolina State University and Chair, CIMSS Review Panel

#### Summary

Dr. Pietrafesa led a panel of five members who conducted a review of the Cooperative Institute for Meteorological Satellite Studies on December 16-17, 2013 in Madison, Wisconsin. NOAA established CIMSS at the University of Wisconsin (UW) Space Science and Engineering Center (SSEC) in 1980. The scientific vision of CIMSS is to conduct interdisciplinary research in atmospheric sciences focusing on using satellite observations and mathematical models to better understand the behavior of the Earth system.

## Summary of External Review

The review panel found CIMSS science to be impressive with clear paths from research to operations and operations to research related to the NOAA mission and clear, strong, connections to the four CIMSS research themes: Satellite Meteorology, Research and Applications; Satellite Sensors and Techniques; Environmental Models and Data Assimilation; and Outreach and Education.

The review panel made 30 findings and 21 general recommendations; there were six major recommendations. These are:

- 1) The UW Chancellor and the National Weather Service (NWS) Director should work to affect the transfer of the regional Weather Forecast Office (WFO) to be collocated with CIMSS on the UW-Madison Campus;
- 2) CIMSS should vigorously advance its recently-initiated collaborative research and development work on the potential for the combined use of satellite and radar data in the weather analysis and forecasting context, which could extend across the storm meso-synoptic scale spectrum;
- 3) CIMSS should capitalize and leverage its Data Assimilation – Operational Modeling capabilities to expand partnerships with the UW Department of Atmospheric & Oceanic Sciences (AOS) faculty, faculty and investigators from other NOAA CIs and Universities and with the International Community, especially those countries that have launched environmental satellites and sensors;
- 4) CIMSS should work more closely with AOS for mutual benefit, greater participation with the National Science Foundation (NSF) and new AOS faculty-CIMSS scientist partnerships. As such, the combined CIMSS-SSEC-AOS leadership should seriously address the problem of the weak-to-little AOS faculty engagement with CIMSS. The UW Administration should be made aware of this problem, since the current situation could start to undermine CIMSS-SSEC, which would be to the long-term disadvantage of UW;
- 5) The Office of Education and Outreach should be supported by a to-be-determined level of ongoing base funding, thus allowing the Director to be a catalyst for education and outreach within the institute and to develop robust programmatic elements;
- 6) The value to NOAA of the internal cost-sharing provided to CIMSS by the UW Administration (through SSEC) should be strongly acknowledged; other universities could consider this approach as a model for new or improving existing CI performance.

The review panel unanimously agreed to an “Outstanding” performance rating for CIMSS.

## Discussion

CIMSS Director, Steve Ackerman, thanked the review panel for a strong group of recommendations.

Eric Barron said CIMSS is an excellent Cooperative Institute (CI) and an example for others in leveraging. Dr. Barron asked if every recommendation has its basis in a finding; he noted that several recommendations don't appear to have findings and is not sure if that is important or not. Aside from

this observation, Dr. Barron was comfortable that the review panel did a good job and that the Outstanding rating is justified for CIMSS.

Molly Macaulay asked about the terms “uniquely positioned” and other superlatives and wondered to what degree these superlatives reflect third party assessments or “the usual suspects” in NOAA or the CI. Science results and findings are integrated into NOAA mission but how does this CI balance risky and risk-averse science? How has the risk trade-off been done? Len Pietrafesa responded that there is a vetting process which includes solicitation for new ideas from faculty, staff and other in the CI not only with PhDs but also those with Master’s degrees. One criterion in vetting is whether the research is going to further capabilities, given the CIMSS mission. To date, there is no information on failures but the successes are quite impressive. CIMSS staff attends national meetings and looks for post-doctoral candidates to invest in them. In terms of third person assessments, Dr. Pietrafesa stated that at North Carolina State University, scientists go directly to CIMSS to download products; they use CIMSS as repository of data and products that have been quality-controlled. He reported that, during the review, Peter Lamb said the faculty at University of Oklahoma also used CIMSS data and image archives. What CIMSS does will help evolve the National Weather Service to next level through data assimilation and modeling efforts?

On the topic of risk-averse research, Steve Ackerman said most of NOAA funds are directed and principal investigators (PIs) work with NOAA on defining what they will do in a research area. This is in contrast to competitive research grants from NASA which are considered basic research. CIMSS balances the basic research funds from NASA and the applied research funds from NOAA. Students are mostly funded by NASA rather than NOAA because the NOAA funds are more directed. Dr. Ackerman further clarified this statement for Dr. Sullivan by noting that, for example, 50% of the Geostationary Operational Environmental Satellite (GOES) algorithms are developed at CIMSS; this work is engineering and task-oriented and therefore not good for graduate student projects.

Dr. Sullivan asked if there was a statement of rationale for why CIMSS should apply an additional focus in climate. Len Pietrafesa responded that CIMSS maintains a data archive that extends over several decades. The assimilation methodology could be focused on meso- and synoptic scale forecasts but given this archive, one could apply that to longer-term monthly, seasonal or annual outlooks. Dr. Pietrafesa said what weather and climate definitions are on a spectrum and moving from one the other is not clear. He said during the review, Peter Lamb agreed that from the perspective of advancing the state of knowledge that data archives could help in moving to the climate arena. Kathy Sullivan stated that a finding could have stated there is an untapped value in the 30-year archive. Steve Ackerman agreed; over last 30 years there has been rapid climate change. The GOES archive goes back to 1978 and CIMSS could do longer-term studies, which they have done to some extent. Kathy Sullivan noted that there is a driving need for 30 day-year-plus so there could be a finding that there is an untapped scientific opportunity in the long-term archive. There is advancing skill from the weather domain and increasing improvement of climate models to get down to the weather scale; 30 days to several year time frame as a critical time frame.

Eric Barron made a motion to approve the report but asked the Chair to go back and make sure each recommendation is supported by one or more findings. Jean May-Brett seconded the motion and it was approved unanimously.

Action 2: The Science Advisory Board accepts the Report from the Review Panel for the Cooperative Institute for Meteorological Satellite Studies (CIMSS) with the caveat that the Review Panel Chair, Len Pietrafesa, edit the report to ensure each recommendation is supported by appropriate findings from the review. After revisions, SAB will transmit the report to NOAA.

Action 3: Dr. Len Pietrafesa, Chair of the CIMSS Review Panel, will revise the Review Report to ensure each recommendation is supported by appropriate Findings and submit back to the SAB Office to manage the process for the final transmittal to NOAA.

### **Review of the Joint Institute for the Study of the Atmosphere and the Ocean**

Jeremy Jackson, Smithsonian Institution, Member, SAB and Chair, JISAO Review Committee

#### Summary

Jeremy Jackson provided background information on JISAO which was created in 1977 and is a single-institution Cooperative Institute at the University of Washington. The NOAA sponsors for JISAO are the Pacific Marine Environmental Laboratory, the Northwest Fisheries Science Center, and the Alaska Fisheries Science Center. The JISAO research themes are:

1. Climate research and impacts
2. Environmental chemistry
3. Marine ecosystems
4. Ocean and Coastal observations
5. Protection and restoration of marine resources
6. Seafloor processes
7. Tsunami observations and modeling

Recommendations were provided in four areas:

1. Strategic Plan:
  - NOAA should encourage JISAO to review its research themes and consider amalgamating or reducing them.
  - JISAO should track productivity within themes for reevaluation of comparative strengths.
  - JISAO should capture more discretionary funds to exploit new opportunities and developments.
2. Science Review:
  - Theme leaders and JISAO science administrators should expand, consolidate, or phase out efforts in less productive themes.
  - JISAO and NOAA need to maintain, enhance, and ensure the continuation of long-term observational capabilities.
3. Education and Outreach:
  - JISAO needs to reach out more to people based at PMEL and bring them to the university campus to facilitate interactions for collaborations.
  - JISAO needs to continue to press for more Task I funding from NOAA. (Task I activities are related to the overall management of the Cooperative Institute, as well as general education and outreach activities.)
4. Science Management:
  - JISAO should further encourage and enable partnerships and side projects among postdocs and researchers.

- JISAO needs to improve its relationships with the Fisheries Centers (NWFSC and AFSC) to identify opportunities.

The Review Panel had the following comments and recommendations for NOAA:

- NOAA should provide reviewers with a concise document outlining NOAA's vision of the role of the CI within NOAA's research program in advance of the on-site meeting.
- The strict formats of the review reports inhibit the CI Director from providing information in ways that would be valuable to the review process. In essence, the present review format discourages input for adaptive management.
- Task I funding for education and outreach is absurdly underfunded.

The Review panel found that the JISAO science overall was excellent and very collaborative and found many examples of good work in the Institute. JISAO also works to sustain long-term measurements and JISAO's work is essential to NOAA's mission.

Based on the review, the panel recommends a rating of Outstanding for JISAO.

### Discussion

Thomas Ackerman, JISAO Director, said he appreciated the review panel's work. He noted that JISAO has a different working relationship with the Pacific Marine Environmental Laboratory (PMEL) and the Fisheries Science Centers; JISAO is working to develop better relationships with the Fisheries Science Centers. On the issue of themes, JISAO used to have four and NOAA defined seven in the latest cooperative agreement; requirements associated with NOAA funding are responsible for changes in activities in each theme. Dr. Ackerman noted that his colleagues on the Cooperative Institute Director's board are aware of the Task 1 funding issue. A decade ago, the review of the JISAO indicated that Task 1 was underfunded then and needed to be increased or redefined; since then there has been no increase in Task 1 funding. JISAO puts aside funding that pays for post-doctoral students for two years; two former post-docs are now staff scientists.

Eric Barron said this was a good report with good recommendations. On the idea of phasing out themes, he noted that nothing in the review report describes which themes are weaker and why. He understands that seven themes are what the Institute had to bid for but work on these goes up and down due to funding. It would be good to have more context on this issue, however. Jeremy Jackson responded that the review panel was not able to look in depth at the seven research areas because there was not enough time during the review. This was the reason the panel left that comment somewhat vague. It would have been helpful in reviewing the themes to have more detailed materials prior to the review. Jeremy Jackson said he would add wording to the report on the science themes.

Richard Merrick said that NMFS has a long history of work with the University of Washington; it is the longest-running relationship with any university. NMFS funds multiple positions and students there. Jeremy Jackson noted it was clear there is a relationship between the CI and the School of Fisheries and Aquatic Sciences (SAFS) but it was not clear there is a lot of interaction between the NOAA Fisheries Science Centers and JISAO. The relationship with JISAO is strong at the individual scientist level but maybe directors are not clear on this. The meeting with the Fisheries Science Centers seemed "thrown together" and the review team did not get a lot out of it.

Tom Ackerman noted there is a triangular relationship between SAFS, Fisheries Science Centers and JISAO. In PMEL there are a lot of interactions between scientists. In the Fisheries Science Centers there is less work between scientists. JISAO needs to work on not just being a conduit of money between MFS and SAFS.

Kathy Sullivan asked NMFS to please be sure NMFS is actively working to improve the relationship with JISAO.

Jean May-Brett was excited to see that the education and outreach is good and is getting better. She asked if there were any K-12 education efforts and if there were any publications in the K-12 education domain. Tom Ackerman responded that JISAO does some things in the K-12 education area and can send a list of those. These are primarily summer programs, including a summer camp; there is also a variety of programs on the campus for disadvantaged students but there are no formal publications. These activities are carried out by people working on their own time.

Steve Fine added that NOAA is working on Task 1 funding and will be getting the money out in the coming fiscal year.

Eric Barron made a motion to accept the report, with a paragraph to be added on themes as agreed to by Jeremy Jackson. Susan Avery seconded the motion and it was approved unanimously.

Action 4: The Science Advisory Board accepts the Report from the Review Panel of the Joint Institute for Studies of the Atmosphere and Ocean (JISAO) with the addition of a paragraph by Jeremy Jackson, Chair of the Review Panel that provides more details on the specifics of the recommendation for JISAO to reduce the number of research themes. After revisions, the SAB will transmit the report to NOAA.

Action 5: Jeremy Jackson, Chair of the JISAO Review Panel, and Tom Ackerman, Director of JISAO, will work together to develop language to be added language to the Review Report that provides more details on the recommendation for JISAO to reduce the number of research themes. The revised report will be submitted back to the SAB Office to manage the process for the final transmittal to NOAA.

### **A Retrospective Look at Two Colorado Flash Floods: Big Thompson 1976 and Front Range 2013**

Panel Discussion:

Alexander MacDonald, Director, NOAA Earth System Research Laboratory

Nezette Rydell, NWS Denver Meteorologist-in-Charge (during 2013 event)

Michael Chard, Director, Boulder Office of Emergency Management

Eve Grunfest, Director, Social Science Woven into Meteorology Project, National Weather Center, Norman, Oklahoma

#### Summary

Sandy MacDonald expressed his appreciation for the opportunity to discuss two floods that greatly impacted Colorado: the Big Thompson Flood of 1976, and the Front Range Flood of 2013. The goal of the flood panel presentation was to demonstrate how NOAA advanced its emergency management capabilities after the Big Thompson Flood of 1976. The Big Thompson Flood in July 1976 killed 144 people, whereas the Front Range Flood in September 2013 only killed 9. The success story was due to long term commitments to relationship building and coordination between NOAA Line Offices (LOs).

The Big Thompson Flood started July 31, 1976, during the peak of the Colorado summer monsoon season. As a result of technology and communication failures between National Weather Service (NWS) offices and local emergency managers, most individuals were not warned about the nature of the event and risks of flooding. A NOAA Natural Disaster Survey Report to the Administrator on this event was blunt about the failures of NWS and galvanized NOAA to do better in its emergency management capabilities. The goal was to integrate observations, forecasts, and public warnings so that the poor response to another event like Big Thompson could never happen again.

In 20 years since the flood, the NWS forecast system was modernized considerably. Modernization was a combined effort across LOs and included regular meetings among the Assistant Administrators of three LOs (OAR, NWS, and NESDIS). This attention to the problem has resulted in a reduction in severe weather deaths by approximately 40%.

On September 11, 2013, there were numerous warnings for the Front Range Flood, and the predictions and warnings were much better communicated. Even so, the outcomes of warnings were difficult to predict in that well-informed individuals still made decisions that stalled their evacuation and led to harm.

NOAA has a huge responsibility to protect the Nation's people, but it cannot do this important work alone. Dr. MacDonald introduced the panel which included individuals with different roles in emergency management that all play crucial roles in predicting and communicating weather and extreme events. Each panel member provided his/her perspectives of the two Boulder flood events.

The first panelist, Nezette Rydell, was the NWS Denver Meteorologist-in-Charge during the 2013 Front Range event. She said that there are flash flood events every year, and every few years, there are significant events, particularly after fires. Across seventeen counties, there were only nine fatalities, and over 5,950 people were evacuated. Improved success came from building relationships, improved forecast capabilities, teamwork, and decision support services. It was important to deliver something other than just a forecast or warning; the communication needed interpretation and explanation. Improved capabilities included a network of 2,600 rain gages monitoring the event and real-time data assimilation into the NWS Advanced Weather Interactive Processing System (AWIPS). Even though there were still unknowns about the scale and details of the storm features, warnings from forecasters, television weather reporters, and emergency responders, and messaging from social media and web pages (Facebook, Twitter, instant messengers) five days in advance of the storm saved lives. Also essential was long-term post-storm support from NWS, local communities, and the Federal Emergency Management Agency (FEMA).

The second panelist was Michael Chard, Director of the Boulder Office of Emergency Management. He said that the impacts of the Front Range Flood were wide: there were nine fatalities, three of which were in vehicle accidents. Over 15,000 homes were impacted, greater than 1,000 homes were devastated, and 200 miles of road were damaged or destroyed. When roads were lost, so were evacuation routes; the public had to escape vertically. For three and a half nights, 2,000-3,000 people took shelter in the mountains above Boulder. Infrastructure (sewer, water, etc.) was lost as stream flows changed, taking people by surprise. For flash floods, there is only one hour between when a storm begins and when homes are destroyed.



Mr. Chard said the relationship with the NOAA NWS was critical; communication was essential at all times. The Office of Emergency Management needed to use all available means to inform its people. The challenge was to shift between messaging and warning, and to maintain evolving warnings as the event progressed. Over three days of flooding, warning messaging was constant, but as flooding progressed, people needed intelligence about how to evacuate and where to go. The NWS played a huge role in the successful messaging during the event.

A critical part of the messaging included the messenger. Mr. Chard frequently meets face-to-face with his local communities. He has their trust, and so when he has quality information from the NWS, people trust his warnings and will take action. All of these relationships are critical.

The third panelist, Dr. Eve Gruntfest, Director, Social Science Woven into Meteorology, Trauma, Health and Hazards Center, University of Colorado, Colorado Springs, did her Master's thesis project on the response to the Big Thompson Flood event. Her research showed that those who survived gained elevation. Dr. Gruntfest reinforced the message of other panelists that the forecast and warning system for the 2013 Front Range flood were a great success when considered in terms of the low death toll. This was particularly true given the size of the storm and breadth of flooding. The low death toll was primarily due to the fact that people were not caught on roads as they were washed out. In contrast, the Big Thompson flood in 1976 was much smaller but resulted in many more deaths.

Last year's success in preventing disaster in the Front Range Flood was a product of collaboration and observation in combination with improved forecasting tools, and was transformative compared to past incidents. There will continue to be events similar in scale to this flood, but agencies, governments, academics, and communities are changing the way they communicate and observe events in their surroundings. There are new tools and technologies for collecting data in real-time and for warnings and information to emphasize people's behaviors rather than perceptions. Still, there is more work to be done, and NOAA needs to build its social science capacity to better evaluate how successful messages are constructed and relayed.

### Discussion

Dr. MacDonald said that one message from the panelists is clear: everyone needs to be connected. The Boulder County microcosm is a great example, but success in the aftermath of natural disasters is really defined by zero deaths.

Dawn Wright asked Dr. Gruntfest where the next generation of individuals with the capability to be collaborative and research-oriented is occurring, i.e. the next "sociohydrometeorologists." Dr. Gruntfest said that there are many students and researchers who want to bridge the gap between meteorology and social science, but unfortunately, there are only a few institutions where students can actually study this hybrid. The University of Oklahoma briefly supported the Social Sciences Woven into Meteorology (SSWM) program that she led; the NWS had the Weather and Science Integrated Studies (WASIS) program funded by NSF, but it lost its funding after 10 years in 2010.

Jerry Schubel said that it is clear that the tools are much better now than they were in the 1970's but he wanted to know whether improved information services influenced where people choose to live. Mr. Chard replied that some citizens have been influenced by zoning and insurance policies, but others have not. This is a problem that citizens face across the U.S. Ms. Rydell said the problem is the earth system is dynamic, and does not adhere to zoning lines, housing developments, or county borders.

Though this is known philosophically, it is now just becoming more of a lesson in reality. For example, after major floods, many ask when the river will be “put back.” Some rivers are re-diverted, but others are not; society must decide which ones should be. Mr. Chard added that water diversion is a huge issue in the West with ditches and water rights combatting restructured waterways post-floods. If a ditch and/or waterway is not re-diverted to its original location, communities will not receive water.

Dr. MacDonald said that both Ms. Rydell and Mr. Chard’s comments emphasize that NOAA’s Resilience priority needs to encompass the “before” conditions of a developed area in order to plan and prepare for the future. Susan Avery said that the other part of Resilience is the ability to rebuild, and this also heavily relies on the partnership and relationship-building that was so important to the success of responding to the 2013 flood. This also depends on rebuilding support from Agencies such as FEMA. Mr. Chard said that there are a lot of issues with rebuilding to “pre-flood” conditions. There is often not enough money after rebuilding to prepare for another disaster. This is a problem that local communities are aware of, and there are “resiliency” meetings occurring throughout counties and cities.

Dr. Sullivan said that Mr. Chard raised an important point. Hurricane Sandy (2012) initiated a shift at the federal and policy level. There are major interests and players in post-event rebuilding, including the President, the Department of Transportation, the Department of Housing and Urban Development (HUD), and FEMA. Rebuilding procedural changes are being worked on actively and some require congressional change. There is acknowledgement of the economics issue in that preparation for the future requires substantial investment now. There is a need to change the post-event discussion from building back to building forward to prepare for the next event. There is not an agreed-upon method for factoring this into economic analyses. Changes are and will be slow moving because they will always combat the attitude that “we will not retreat.”

Mr. Chard said that his community did have a high threat reduction program for his county’s waterways. FEMA helped the community submit a Threat and Hazard Identification and Risk Assessment (THIRA) during the 2013 event, which reissued policy guidance mid-disaster. This was instrumental for future protection. The policy guidelines can be changed rapidly, but they need the right pressure from the communities and community leaders.

Jeremy Jackson asked whether people can get flood insurance in Boulder, CO, and whether costs are impacted by flood events. He also wondered whether insurance policies factor in climate science; extreme events are more common, and this fact should be communicated to local communities so that they are informed to prepare for these events. Mr. Chard replied that there is flood insurance in Boulder, and it does cost more after the 2013 flood. Boulder County has a Climate Adaptation Plan, but it is a more progressive community willing to manage and adapt to climate change. This is not true for many other communities in Colorado. As a local leader, Mr. Chard relays the facts from scientists and his job is to plan for the impacts of those facts.

Dr. Sullivan said that the reinsurance industry is very aware of climate science data and risk. However, there are also political consequences for a dislocating population. These are all factors that must be considered in developing resiliency in communities. Holly Bamford, Assistant Administrator for the National Ocean Service, added that the reinsurance models are aligned with weather, but are not good at predicting long-term risks like sea level rise and wildland fire. She said the Federal Agencies, insurance companies, and local communities must make better investments to prepare for the future. This is an area that NOAA is working on actively.

Dr. Sullivan said that NOAA is working across line offices to develop tools that people can use to attach meaning to warnings and events and then respond with action. Action inevitably means working against political, economic, and personal convictions, which is the greatest challenge. The difference between the Big Thompson and Front Range floods was communication. During the Front Range flood, the public was engaged in the conversation and responded to and oriented themselves within the information provided. Resilience depends on communication.

Mr. Chard agreed that it is important to know what people think on a local level. Just providing facts from the NWS scares people; leaders must also provide hope, empathy, and solutions to build the trust that invokes action within a community. Without the latter, people become disengaged. Proposing actions given the facts allows community involvement, which often stimulates positive action. If the situation worsens, the community will then follow the recommendations to take action. The “hope” aspect is critical and helps build trust along with continued communication on a local level.

Lynn Scarlett said that a lot of the discussion stemming from the Flood Panel was on the significant role of communication. There are two strains of communication: warnings themselves and the enhanced effectiveness of warnings, and a broader discussion about sustained learning that results in decisions and actions that reposition communities to reduce risks. She asked if there was social sciences research that informs the recalibration of long-term decisions and actions. Successful warnings are important, but there is also a need for a fundamental policy shift in communities for long-term resiliency. Dr. Grunfest replied that there is a movement towards climate adaptation work; however, much of the work is conducted outside of the U.S. where the weather and climate continuum is not a political and social argument. Again, there is a capacity issue in that there are many people who want to examine this, but there are not enough social scientists supported to study this interface. The Front Range flood and Boulder, CO example is somewhat anomalous in the U.S.; Boulder is an exceptional case.

Mr. Chard mentioned that there is an Intermountain Alliance of small communities that work together to handle issues relevant to the region. Resilience is also highly dependent on whether communities are urban or rural. The Alliance was a grassroots initiative that demanded information and a plan. They used ham radio operations to communicate warnings during the 2013 event once infrastructure was lost.

Jerry Schubel said that he wanted to expand the conversation about rebuilding. The human population must understand that it is a part of a natural system. For example, a tremendous amount of funding and time is dedicated to rebuilding marshes along coastlines that are vulnerable to sea level rise. These will be lost when sea level rises unless there is somewhere for the marshes to migrate upland. Mr. Chard agreed that a major challenge is how to restore the beauty of communities and the environment. Dr. Schubel said that Environmental Systems Research Institute (ESRI) has amazing tools that allow the scaling-up of these questions to a national level. Dr. Avery added that restoration to the natural environment is only one part of the equation; the intersection of the natural and built environment must be considered, too, and there are creative ways to have both.

Ms. Scarlett asked what are the research needs or practices that NOAA should support for the long term to tackle resiliency. Dr. Bamford said there is a lack of understanding and research about mixed infrastructure. The U.S. Army Corps of Engineers has the funding to put in alternative infrastructure, but is hesitant to do so because there is not enough research to support its benefits versus traditional

infrastructure methods. Monitoring systems would provide data to support these decisions. Dr. Gruntfest said that she would like to see more investment in social sciences and interdisciplinary education and research. Ms. Rydell said that the forecasters are open to new methods of communication. She would like to see more relationship-building and research on messaging so that the forecasting operations are more successful at relaying information. Mr. Chard said that capacity is vital. Intimate relationships between the forecasters and their communities really pay off. Scaling down to a local capability will only enhance the communication.

Dr. MacDonald concluded by saying that, as the human population faces great threats, the solution to preparedness, resiliency, and adaptation will always include more accurate information as well as communication among people.

### **Public Comment Period**

There were no public comments.

### **Comments and Recommendations on the NOAA RESTORE Act Science Program Draft Science Plan from the Gulf Coast Ecosystem Restoration Science Program Advisory Working Group (RSPAWG)**

Dwayne Porter, University of South Carolina and Chair, RSPAWG

#### Summary

Dwayne Porter thanked the SAB for the opportunity to present the first report of the RSPAWG. Dr. Porter outlined the working group's membership and commented that the working group members are heavily weighted in research and academics. Dr. Porter reviewed the purpose of the working group and its initial charge from the NOAA RESTORE Act Science Program, which was to provide comments and recommendations on the Program's Draft Science Plan (Science Plan hereafter).

The process for providing comments and recommendations on the Science Plan began at the working group's first meeting in mid-June 2014. After the meeting, the working group members split into sub-teams to consolidate comments and recommendations on the four Focus Areas of the Science Plan. An Overview team synthesized overarching comments and provided the introduction to the report. The Co-Chairs of the working group formatted and finalized the report, which has overarching comments and recommendations as well as specific comments and recommendations related to the restructuring of the Science Plan Focus Areas and Priorities.

The working group had several overarching findings and recommendations. The working group found that the Science Plan was generally too focused on management and in some places was too focused and/or specific on specific management objectives or tools. For example, the Science Plan references Marine Protected Areas (MPAs), but MPAs are just one management tool of many. Additionally, the Plan did not adequately address the role of science in informing management decisions.

The working group recommended that the Science Plan should state the long-term goals of the Program at the beginning and should emphasize the identification and articulation of the science needs in support of informing management for improved decision-making. The science needs should address higher-level needs for the entire Gulf of Mexico region, including waters of the Gulf of Mexico, watersheds impacting the Gulf of Mexico, and interconnected processes within the Gulf of Mexico and adjacent waterbodies and uplands (e.g. the Florida Loop Current).

There are a great variety of partners and programs involved in RESTORE-related activities in the Gulf of Mexico, which presents a tremendous challenge and opportunity. Communication between entities is essential, and a comparison, or “crosswalk” between entities would help identify research gaps and redundancies as well as assist with NOAA’s research prioritization. The working group expressed concern regarding communication between RESTORE Act elements 1603, 1604, and 1605.

Communication should ensure avoidance of duplication of research and/or monitoring efforts, prevent gaps in research and monitoring needs, and identify opportunities for inter-element collaboration. The working group strongly recommended that each element clearly outline their respective research foci and observing and monitoring plans, and share this information across the elements to address the concerns listed above. This “crosswalk” between the RESTORE Act elements should be an ongoing process as research and monitoring needs evolve.

The working group believed the task to rank the Science Plan research Priorities was the responsibility of NOAA. Ranking the Priorities must take into consideration the current status of the science, the need for the science to support management decisions, and the availability of funds.

In addition to the overarching findings and recommendations, the working group provided general recommendations for realigning the Science Plan Focus Areas and associated science priorities. The working group did not recommend any major changes to the science priorities, but suggested that two of the priorities should be merged, resulting in nine rather than ten priorities overall. The working group expressed some concern regarding the third Focus Area which included a priority to create an accessible data framework for the Gulf of Mexico. The working group thought that data management and integration should be considered infrastructure for the entire Science Plan. The working group also noted that efforts are already underway to set up such architecture in the Gulf of Mexico.

The working group highlighted that all of the Focus Areas are equal in importance, but there is a natural hypothesis-driven flow between them. The initiation point in the process is situational, and depends upon unique regional needs and the science questions at hand. The Focus Areas in the Science Plan are presented in a linear fashion, but the working group suggests that the Plan should note that they are not prioritized in a linear way. Recognizing this relationship between Focus Areas is important to consider when the NOAA RESTORE Act Science Program develops the Federal Funding Opportunities (FFOs) and/or Requests for Proposals (RFPs).

Dr. Porter summarized the working group’s comments and recommendations, stating that the key recommendations were: 1) the Science Plan should address the science in support of improved understanding and decision-making (emphasizing science rather than management); 2) the Science Plan must consider funding constraints in the prioritization of research topics and projects; and 3) it is critical for the Program to develop a strategy to ensure interaction and communication with all of the partners in the Gulf of Mexico.

## Discussion

Lynn Scarlett began the discussion by asking for questions and comments from those on the phone; there were none.

Mike Donahue said that Jean May-Brett and he, as SAB liaisons to the working group, were very impressed with the group’s efforts. He thought the working group did an incredible job with the task at

hand, especially with a very short period of time for review. Dr. Donahue emphasized the recommendation that the Program should develop a strategy to ensure interaction, communication, and coordination between all efforts in the Gulf of Mexico.

Eric Barron supported the working group's recommendations, and said that the notion of prioritization and goal clarity is important. He asked whether, after twenty years of Program investment, there would be enough information to better predict the outcomes of another large-scale disaster such as *Deepwater Horizon*. The Science Plan priorities are wide-reaching. To this end, Dr. Barron asked what would be the end-goal for the Program's investments, and what would define the Program's success?

Dr. Barron suggested that the Program goal should be to develop an integrated region of Environmental Intelligence across different regions of the Gulf, which have differing and multiple stressors. Models of appropriate resolution and an integrated observing system would serve as platforms for information accessibility and coherence across the Gulf, facilitating the transition from observations to information. Future work in the Gulf would want to conduct research within the framework of the established research platform because of its integration. This strategy, forming an integrated information and observations platform, would help the Gulf of Mexico respond to future disasters more capably. Dr. Barron said the Science Plan should identify the outcome or end-game of its long-term research priorities. NOAA has the opportunity to create a powerful story about what to do overall in the Gulf of Mexico.

Walter Faulconer agreed with the working group's suggestions. However, he suggested the circular approach to the research Focus Areas, as opposed to the linear presentation, is also a misrepresentation of the process. The exit criteria and desired outcomes should be identified.

Kathryn Sullivan said the NOAA RESTORE Act Program goals should lead to long-term outcomes beyond a collection of datasets, research articles, and reports. There are a lot of research results in the Gulf of Mexico from the past 50 years or so, but the *Deepwater Horizon* event was still disastrous. The goal of the Science Plan should be to better position research in the Gulf of Mexico, as suggested by Dr. Barron so that the region is better prepared to face the next disaster.

David Lodge agreed with Dr. Sullivan's comment, but added that although the RSPAWG response to the Science Plan raises these issues, it does not clarify how the sum of the research priorities will be greater than their individual contributions. There does not seem to be enough attention to how Environmental Intelligence is going to be used in adaptive management. He also wanted to know the indicator for a successful transition. Dr. Lodge endorsed the RSPAWG comment that the Science Plan needs a watershed-scale focus, and added that he would also like to see some mention of social science and economics and how these could contribute to evaluating the transition of science to management.

Steve Fine, NOAA Research Deputy Assistant Administrator, and Chair of the NOAA RESTORE Act Science Program Executive Oversight Board, reiterated the language in the RESTORE Act that defines the charge for the NOAA RESTORE Act Science Program:

"...the Gulf Coast Ecosystem Restoration Science, Observation, Monitoring, and Technology program [is] to carry out research, observation, and monitoring to support, to the maximum extent practicable, the long-term sustainability of the ecosystem, fish stocks, fish habitat, and the recreational, commercial, and charter fishing industry in the Gulf of Mexico," and "...priority shall be given to integrated, long-term projects that, 1) build on, or are coordinated with, related research activities; and

2) address current or anticipated marine ecosystem, fishery, or wildlife management information needs,” Section 1604, Moving Ahead for Progress in the 21<sup>st</sup> Century Act, Public Law 112-141, 2012.

Dr. Sullivan said that this demonstrates clear Congressional intentions for the areas of greatest concern in the Gulf of Mexico.

Lynn Scarlett said that the lack of clarity for the long term goals of the Program is a challenge. Is the lack of clarity a consequence of the Science Plan as written, or linked back to the lack of clarity in the broader RESTORE Act goals and their translation into implementation? Ms. Scarlett said she thinks the lack of clarity is from the lack of coordination between the many entities involved in RESTORE-related activities, and this is reflected throughout the Science Plan. Ms. Scarlett said that the purpose of the Program’s research activities is not exclusively to better understand the system’s dynamics so that the Gulf of Mexico is better prepared for another extreme event. A significant part of the Plan is that the scientific research should inform the restoration efforts, such that the efforts yield better ecological and socioeconomic outcomes.

Richard Merrick, previous Chair of the NOAA RESTORE Act Science Program Executive Oversight Board, said that the NOAA RESTORE Act Science Program has no ability to control how any other funds are applied. All sections of the RESTORE Act are independent; the largest sums of money that could be used for substantial restoration are with other sections. The RESTORE Act Science Program has tried to outline a Plan that supports ecosystem work because NOAA has no control over what the other funding entities will do. While NOAA has tried to influence the larger funded entities in a certain direction, NOAA realistically only has control over a small portion of the total RESTORE Act funds.

Ms. Scarlett replied that perhaps the SAB could bring awareness of these limitations to light, and suggest that the Science Plan can highlight these constraints up front. Drs. Merrick and Fine supported this idea.

Dr. Lodge said that it was very helpful to see the full chart outlining all of the entities involved in RESTORE-related activities. He asked what entities make the decisions for Section 1603. The RESTORE Act directs 80% of the Clean Water Act penalties associated with the Deepwater Horizon oil spill into a trust fund to support the various activities authorized in the Act. Ninety-five percent of trust funds principal will be divided between the three 1603 entities: the direct component to five Gulf States for restoration, development, and tourism promotion (35%); the Council-selected restoration component for ecosystem restoration (30%); and the Restoration Impact Allocation to the five Gulf States (30%). While the total amount of funding has not been determined, there is a governance document that states how the funds should be spent. The current order of magnitude of funding from existing settlements is hundreds of millions of dollars; the additional penalties from remaining responsible parties for the oil spill may be in the billions of dollars. Dr. Porter added that the NOAA RESTORE Act Program will receive approximately 2.5% of the trust fund’s principal, which is estimated to be approximately \$20 M from the *Transocean* settlement. NOAA plans to spend this amount over approximately 10 years, but more funds could be available once the Clean Water Act penalties against *BP* resolved.

The National Fish and Wildlife Foundation (NFWF) does not receive a portion of the RESTORE Act funds, but is receiving funding from a non-RESTORE Act related settlement associated with the Deepwater Horizon oil spill. Dr. Sullivan is on the NFWF advisory board to maintain communication between NOAA and NFWF. Dr. Sullivan said that certain funds have been apportioned to specific

activities such as State restoration projects, but the projects do not consider a changing climate. NFWF has already established criteria for how it will spend these funds.

Dr. Merrick emphasized that Mary Erickson and the rest of the NOAA RESTORE Act Science Program leadership team recognize that the Program has a critical role to determine the effects of *Deepwater Horizon* on the Gulf of Mexico ecosystems. It is important to the Program that the SAB and the RSPAWG provide strong scientific advice as to how to best accomplish this role. Dr. Sullivan said that the SAB can express key needs for the Program, even if up against the constraints of the RESTORE Act. The SAB's comments, concerns, and advice can be used to leverage NOAA's efforts.

Dr. Barron said that the complex nature of the RESTORE Act relationships and funding constraints is an argument for the necessity to express a vision for the end results of the program. Otherwise, there is the potential for the Program to result in individual and disconnected products. NOAA is already investing in comprehensive models and observing systems in the Gulf of Mexico. The NOAA RESTORE Act Program could provide a framework for the existing efforts and position itself as a point of information access. Dr. Sullivan agreed that the Program should envision long-term goals.

Ms. Scarlett brought the discussion back to the decisional action at hand, and suggested the Science Plan would benefit from additional introductory information that discusses the context, constraints, challenges, and long-term goals of the Program.

Dr. Porter agreed, and commented that the RSPAWG had also discussed the concerns raised by the SAB members. It was difficult for the working group to decipher what the long-term vision and goals of the program really meant for the research activities it would fund.

Dr. Barron added that the Science Plan should discuss leveraging. He suggested the SAB could accept the working group's report, but also request a white paper from NOAA that details the agency's long-term approach and vision for the Gulf of Mexico. Dr. Donahue supported this idea, and said that the NOAA-wide long-term approach and vision is beyond the scope of the working group. There are many research plans in development for the Gulf of Mexico, but they are all compartmentalized. Dr. Merrick said NOAA is drafting an overall strategy for the Gulf of Mexico that could be vetted by the SAB.

Susan Avery said that she was concerned about the feasibility of the aims of the Science Plan considering the funding available.

Dr. Sullivan said the Program cannot get bogged down in the definitions of its charge [to support healthy, resilient, sustained, and restored ecosystems]. The science activities should be structured so that they accumulate an integrated set of models, data, platforms, etc., so that when the next disaster occurs, there is enduring capability to address the event and its effects. Definitions will continually change; there needs to be a long-term vision that is disconnected from the definitions for longevity. Additionally, the actual amount of funding that NOAA will receive is tiny compared to the total amount of money available. With this in mind, NOAA has tried to become a niche player in order to have the best possible impact on the rest of the RESTORE Act entities and on the Gulf of Mexico.

Dr. Merrick reminded the SAB members that the working group still lacks members from the Centers of Excellence. He also reminded them that built within the working group are *ex officio* and representative members that help coordinate between RESTORE Act entities.



Ms. Scarlett stated that there are several suggestions on the table for the SAB's action. First, the SAB could accept the working group's report with an additional document that captures some of the SAB's concerns and considerations to inform NOAA's strategic decision and planning. This language could be included in the transmittal letter. With the understanding that there is a larger NOAA strategic vision for the Gulf of Mexico in progress, the SAB and/or working group's next step could then be to review that strategic vision.

Dr. Sullivan's inclination was to accept the report, but to move forward at a later juncture.

Dr. Faulconer asked what the next step is for the Program if the report is accepted. Will the Program have an Implementation Plan?

Ms. Scarlett said that another option is for the SAB to accept the report, but could communicate in the transmittal letter some of the SAB's concerns for future action. In particular, the letter could flag the SAB's concerns regarding the Program's broader context. Dr. Porter agreed with this approach, and said that the working group expected to revisit the Science Plan.

Ms. Scarlett said that the SAB could accept the report in a future meeting after further analysis. The report as presented could be accepted as an "interim" report, and the transmittal letter could flag the issues discussed without necessarily resolving how to address them.

Dr. Sullivan agreed that the report could be accepted as a first look at the Science Plan and Program, with the caveats that the SAB wants to address some of the concerns through the working group.

Dr. Barron motioned to accept the report as interim and Dr. Avery seconded the motion. The report was accepted unanimously as interim.

Action 6: The Science Advisory Board accepts the Report and Annotated draft Science Plan from the Gulf Ecosystem Restoration Science Program Advisory Working Group (RSPAWG) as interim comments and recommendations on this document. The transmittal letter to NOAA will note concerns the Board has about the need for the Science Plan to explain better the context in which the Plan will be implemented within the entire RESTORE Act structure. It will also highlight the SAB concern that this Plan should delineate the expected "endgame" for the NOAA RESTORE Act Science Program. The SAB would like to explore these issues further with the RSPAWG and will discuss this at a future meeting.

### **NOAA Boulder: A Leader in Environmental Intelligence**

Alexander MacDonald, Director, NOAA Earth System Research Laboratory

#### Summary

The purpose of this presentation was an overview of NOAA's capabilities in environmental intelligence at the Earth System Research Laboratory. NOAA has defined environmental intelligence as timely, actionable information developed from authoritative science. NOAA has an incredible set of tools that have been developed and are being developed including the Joint Polar Satellite System (JPSS), Geostationary Operational Environmental Satellite-R Series (GOES-R) as well as a new ability, with advanced data assimilation, to accurately model the physical system as well as the chemistry and biology. NOAA is working towards a framework to put these factors all together in a

usable way that can be communicated. Nine hundred people in Boulder are doing incredible things to work toward this goal. Alexander MacDonald provided examples, using Hurricanes Isaac and Sandy, of how NOAA observations and modeling were put into forecasts for those storms that were used by emergency managers.

Presentations were also made by other NOAA organizations in Boulder:

- Jim Butler, ESRL Global Monitoring Division, provided information on observing and modeling changes in global carbon dioxide;
- Eric Williams, ESRL Chemical Sciences Division, provided details on work done to understand tropospheric ozone processes during the 2013 Las Vegas Ozone Study;
- Martin Hoerling, ESRL Physical Sciences Division, discussed the science behind efforts to explain the causes of extreme weather events to inform decisions makers;
- Jennifer Jencks, National Geophysical Data Center, discussed the NOAA role in the Extended Continental Shelf project to lead bathymetric data collection and processing; to participate in analysis, science and policy decisions and to manage data and derived products;
- Brent Gordon, Space Weather Prediction Center, discussed the Center's mission to predict solar storms and to provide space weather forecasts and information to non-military U.S. government agencies and industry; and
- Tim Schneider and Jebb Stewart from the ESRL Global Services Division discussed work to develop the next generation of weather models in the High Impact Weather Prediction project.

In his closing remarks, Dr. MacDonald said, due to the time constraints, speakers needed to compress their talks a bit. However, the Science Advisory Board members should still get a sense of the incredible diversity of work in environmental information in both research and operations in NOAA's Boulder programs and the results that can be achieved through the use of new data, advanced capabilities and the knowledge in the NOAA community.

### Discussion

There was no discussion after this presentation.

### **Public Meeting Adjourned**

The public meeting was adjourned at 5:30 PM MDT.

### **Wednesday, 30 July**

#### **Working Administrative Session**

#### Summary

Members of the SAB and senior NOAA leadership met for a working administrative session. Dr. Kathryn Sullivan proposed overarching questions for the discussion, which addressed: 1) NOAA in the future, 2) best practices for managing an R&D portfolio, and 3) how NOAA research and development (R&D) is translated to practice. The SAB's discussion with NOAA during the Executive Session outlined considerations for developing NOAA's R&D portfolio by specifying, designing, and building the future.

The questions posed to the SAB as a framework for the discussions were as follows:

1. The SAB could engage in “blue sky” discussions about the future of NOAA (5+ years).
  - a. What does the future look like with respect to NOAA’s mission and Dr. Sullivan’s priorities?
  - b. What are the drivers of change into the future? What are some of the trends that could lead to disruptive technologies or policies affecting NOAA's mission priorities?
  - c. How would these drivers of change influence NOAA’s science, partnerships, and capacity, now and moving forward? (e.g., Is the research culture appropriate? Are there new kinds of public-private relationships that NOAA should pursue? Are there different kinds of research capacities that might be needed?)
  - d. How should this vision be implemented in order to build a more effective NOAA in the future?
2. NOAA has a wide range of research, programs, partners, etc. The SAB could discuss best practices for science portfolio management. The SAB Portfolio Review Task Force report began to address this concept, and could be used as a starting point. It may be relatively easy to see what the needs are, but it is much harder to execute those needs.
  - a. What is the right architecture for prioritizing research investments, in light of clear mission priorities?
  - b. Where and how does risk management (i.e., the ability to fund high risk, high payoff R&D) fit into NOAA’s science portfolio and portfolio management practices?
3. The SAB could consider how NOAA science is translated to practice (e.g., coastal resilience and resource management).
  - a. Interpreting and communicating science to decision-makers is a growing body of research; how can it be applied to NOAA?
  - b. How can NOAA science be informed by users, but also successfully inform users?

### Synthesis of the Discussion in the Context of the Questions

The SAB and NOAA emphasized that the future of NOAA should include enhanced communication and coordination with end-users and stakeholders. This would foster an environment for successful co-production of knowledge, and the translation of data and information to wisdom, knowledge, and action. The end-user and stakeholder communities may shift through time in composition and values held, and this should be considered in how NOAA forges these partnerships.

Designing the future should begin by outlining future scenarios. Three scenarios were created for use in developing the NOAA Next Generation Strategic Plan; these could be used as a starting point for developing the NOAA future R&D portfolio, and more scenarios could be added if needed. The scenarios should include input from the social sciences, compelling stories of the future, and consideration of emerging and disruptive technologies. Current emergent technologies that were mentioned during the discussion included the commercial space launch environment, low cost commercialization of satellites, 3-D printing, informatics, robotics, and social media, but there may be additional technologies to consider.

Building NOAA toward the future includes assessing NOAA’s capabilities now, and how those may strategically change or be organized into the future. A Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis could be conducted on the existing portfolio with the future scenarios in mind.

Additionally, the SAB has produced reports in the past that are good places to start to frame NOAA's R&D portfolio logic (e.g. the R&D Portfolio Review Report).

The R&D portfolio is the framework for NOAA's products and services of the future, and it needs to be constructed in a coherent and compelling fashion. The R&D portfolio logic should provide clear definitions of its basic, applied, testing, transition, infrastructure, long-term priorities, and development components. The portfolio needs to define the scale and scope of R&D topics (i.e. broad, gap-filling, niche-playing), and determine the R&D priorities on different scales (e.g. short-term vs. long-term core strengths). The balance between the push and pull from researcher and stakeholder relationships should be addressed, and social sciences need to be integrated throughout. Furthermore, the portfolio should consider the lifetime of R&D components. When do research themes or projects pivot to something new? When are emerging topics integrated into the portfolio in a larger role? How fast can/should R&D results transition to products and services?

Those that conduct the day-to-day research to operations of NOAA should be included in the design of the R&D portfolio framework. NOAA needs to evaluate how to use more effectively its programs and partners. Programs and partners may include existing partners and related programs (e.g. Cooperative Institutes, Sea Grant, RISAs, Regional Collaboration Teams, NCCOS CSCOR), core R&D facilities (e.g. Fisheries Science Centers, Laboratories), and new partners (e.g. sustainable capitalism investors, private industries, local and state governments). Roles and responsibilities in each of these categories should be clearly defined. Who provides nimbleness and adaptability? Who provides innovation and creativity? Who maintains the stability of long term R&D projects? Who provides leveraging?

Taking NOAA R&D into the future may require a shift in NOAA's culture. NOAA needs to consider possible mechanisms for positioning its R&D portfolio to provide support in the context of cultural shifts, innovation, creativity, communication and problem-solving. What are the mechanisms and/or approaches that support a growth strategy? How does organizational excellence provide the support that allows the necessary cultural and organizational shifts? While priorities and the environment within which NOAA functions may change, the process of the enterprise must allow for adaptation and responsiveness, while communicating a compelling and bold story that is NOAA research.

### **Meeting Adjourned**

This working administrative session was adjourned at 12:00 PM MDT.

### **Summary of Meeting Actions**

Action 1: NOAA will take action to review the ideas discussed on changes in the Cooperative Institute review process. For the next meeting, NOAA will provide the SAB with a synthesis of this discussion and identify possible changes in the review process for discussion with the SAB.

Action 2: The Science Advisory Board accepts the Report from the Review Panel for the Cooperative Institute for Meteorological Satellite Studies (CIMSS) with the caveat that the Review Panel Chair, Len Pietrafesa, edit the report to ensure each recommendation is supported by appropriate findings from the review. After revisions, SAB will transmit the report to NOAA.

Action 3: Dr. Len Pietrafesa, Chair of the CIMSS Review Panel, will revise the Review Report to ensure each recommendation is supported by appropriate Findings and submit back to the SAB Office to manage the process for the final transmittal to NOAA.

Action 4: The Science Advisory Board accepts the Report from the Review Panel of the Joint Institute for Studies of the Atmosphere and Ocean (JISAO) with the addition of a paragraph by Jeremy Jackson, Chair of the Review Panel that provides more details on the specifics of the recommendation for JISAO to reduce the number of research themes. After revisions, the SAB will transmit the report to NOAA.

Action 5: Jeremy Jackson, Chair of the JISAO Review Panel, and Tom Ackerman, Director of JISAO, will work together to develop language to be added language to the Review Report that provides more details on the recommendation for JISAO to reduce the number of research themes. The revised report will be submitted back to the SAB Office to manage the process for the final transmittal to NOAA.

Action 6: The Science Advisory Board accepts the Report and Annotated draft Science Plan from the Gulf Ecosystem Restoration Science Program Advisory Working Group (RSPAWG) as interim comments and recommendations on this document. The transmittal letter to NOAA will note concerns the Board has about the need for the Science Plan to explain better the context in which the Plan will be implemented within the entire RESTORE Act structure. It will also highlight the SAB concern that this Plan should delineate the expected “endgame” for the NOAA RESTORE Act Science Program. The SAB would like to explore these issues further with the RSPAWG and will discuss this at a future meeting.