# CHARGE TO THE REVIEW TEAM

## Purpose of the Review

This Laboratory scientific review is being conducted to evaluate the quality, relevance, and performance of science within the National Environmental Satellite, Data, and Information Service (NESDIS) Center for Satellite Applications and Research (STAR) with respect to both internal and external interests, and to help strategically position the Center in planning for its future science. This review is intended to ensure that STAR research is linked to the National Oceanic and Atmospheric Administration (NOAA) Strategic Plan, relevant to NOAA Research mission and priorities, and consistent with NOAA planning, programming, and budgeting.

Each reviewer will independently prepare their written assessments; the Chair, a federal employee, will create a five to ten page report summarizing the individual assessments. The Chair will not analyze individual comments or seek a consensus of the reviewers.

## Scope of the Review

This review will cover the activities of NESDIS/STAR (formerly the Office of research and Applications (ORA)) over the last nine years, focusing predominantly on the past four years, consistent with NOAA's move toward quadrennial laboratory/center reviews. The review portfolios address science (ecosystems, climate, weather and water, commerce and transportation) and mission support enterprises (satellite service; modeling and observing infrastructure) efforts.

For context, an interlinked summary of NOAA's strategic and research foci follows. At NOAA's broad mission goal level there is a one-to-one correlation with the science themes highlighted for this STAR Review. The mission support enterprises facilitate implementation of STAR's science into applications and operations and subsequent maintenance. NOAA (STAR) research for the mission goal themes progresses under the following set of overarching research questions:

1. What factors, human and otherwise, influence ecosystem processes and impact our ability to manage marine ecosystems and forecast their future state?
2. What is the current state of biodiversity in the oceans, and what impacts will external forces have on this diversity and how we use our oceans and coasts?
3. What are the causes and consequences of climate variability and change?
4. What improvements to observing systems, analysis approaches, and models will allow us to better analyze and predict the atmosphere, ocean, and hydrological land processes?
5. How are uncertainties in our analyses and predictions best estimated and communicated?
6. How can the accuracy and warning times for severe weather and other high-impact environmental events be increased significantly?

In conjunction with these overarching questions, NOAA identifies a cross-agency priority for state-of-the-art research. Specifically, NOAA is a science-based agency with responsibilities to direct and maintain a vigorous and forward-looking research enterprise

internally and externally in the academic community. Moreover, continuing and improved success in NOAA's operational services depends on how well NOAA understands the complex behavior of the atmosphere, the oceans, ecosystems, and associated social and economic systems. Short-term research increases the effectiveness of existing activities. Long-term, visionary research is critical to recognizing emerging issues and opportunities; managing future environmental, ecological, and societal needs; and building the foundation for tomorrow's innovative products and services.

The NOAA (STAR) foci guiding research are outlined below, with associated specific research areas, objectives, and outcomes identified.

- *Ecosystems*: Protect, restore, and manage the use of coastal and ocean resources through an ecosystem approach to management
    - Research Areas:
        - Advancing understanding of ecosystems to improve resource management
        - Exploring the oceans
        - Forecasting ecosystems events
        - Developing integrated ecosystem assessments and scenarios, and building capacity to support regional management
    - Objectives:
        - Increase the number of fish stocks managed at sustainable levels
        - Increase the number of protected species with stable or increasing populations
        - Improve ecosystem health through conservation and restoration
        - Increase environmentally sound aquaculture production
        - Advance understanding and characterization of coastal, marine, and Great Lakes ecosystem health and associated socio-economic benefits, and develop forecasting capabilities to meet management needs
        - Provide tools, technologies, and information services that are effectively used by NOAA partners and customers to improve ecosystem-based management
        - Improve public understanding and stewardship so that ecosystem and sustainable development principles are incorporated into planning, management, and use of coastal and marine resources
    - Outcomes:
        - Healthy and productive coastal and marine ecosystems that benefit society
        - A well-informed public that acts as a steward of coastal and marine ecosystems
- *Climate*: Understand climate variability and change to enhance Society's ability to plan and respond.
    - Research Areas
        - Develop an integrated global observation and data management system for routine delivery of information, including attribution of the state of the climate

        - Document and understand changes in climate forcings and feedbacks, thereby reducing uncertainty in climate projections
        - Improve skill of climate predictions and projections and increase range of applicability for management and policy decisions
        - Understand impacts of climate variability and change on marine ecosystems to improve management of marine ecosystems
        - Enhance NOAA's operational decision support tools to provide climate services for national socio-economic benefits
    - Objectives
        - Describe and understand the state of the climate system through integrated observations, monitoring, and data management
        - Understand and predict climate variability and change from weeks to decades to a century
        - Improve the ability of society to plan for and respond to climate variability and change
    - Outcomes
        - A predictive understanding of the global climate system on time scales of weeks to decades to a century with quantified uncertainties sufficient for making informed and reasoned decisions
        - Use of NOAA's climate products by climate-sensitive sectors and the climate-literate public to support their plans and decisions
- *Weather and Water*: Serve Society's needs for weather and water information
    - Research Areas:
        - Improve weather forecast and warning accuracy and amount of lead time
        - Improve water resourc3es forecasting capabilities
        - Provide information to air-quality decision makers and improve NOAA's national air quality forecast capability
        - Improve NOAA's understanding and forecast capability in coasts, estuaries, and oceans
    - Objectives
        - Increase lead-time and accuracy for weather and water warnings and forecasts
        - Improve predictability of the onset, duration, and impact of hazardous and severe weather and water events
        - Increase application and accessibility of weather and water information as the foundation for creating and leveraging public (federal, state, local, tribal), private, and academic partnerships
        - Increase development, application, and transition of advanced science and technology to operations and services
        - Integrate local, regional, and global observation systems into NOAA's weather and water services to increase the collaboration between NOAA and external environmental partners
        - Reduce uncertainty associated with weather and water forecasts and assessments
        - Enhance environmental literacy and improve understanding, value, and use of weather and water information and services
    - Outcomes

        - Reduced loss of life, injury, and damage to the economy
        - Better, quicker, and more valuable weather and water information to support improved decisions
        - Increased customer satisfaction with weather and water information and services
- *Commerce and Transportation*: Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation
    - Research Areas
        - Explore, develop and transition emerging technologies and techniques to enhance marine navigational safety and efficiency
        - Provide accurate, timely, and integrated weather information to meet air and surface transportation needs
        - Improve accuracy of positioning capabilities to realize national economic, safety, and environmental benefits
        - Develop the information and tools to make reliable decisions in preparedness, response, damage assessment, and restoration
    - Objectives
        - Support decisions in aviation, marine, and surface navigation
        - Research, develop, and deploy more accurate and timely information products
        - Research, develop, and deploy advanced monitoring and observing systems, new models, prediction techniques, and assessments
        - Support decisions in coastal resource management
        - Build public understanding of the scientific, technological, and environmental factors of commerce and transportation
    - Outcomes
        - Safe, secure, efficient, and seamless movement of goods and people in the U.S. transportation system
        - Environmentally sound development and use of the U.S. transportation system
- *Mission Support*: Provide critical support for NOAA's mission
    - Satellite Subgoal - Satellite Services researches, develops, and operates satellites to collect, calibrate, and distribute the data necessary to monitor land, sea, atmosphere, and space
        - Research Areas
            - Advancing space-based data collection capabilities and associated platforms and systems
        - Objectives
            - Increase the quantity, quality, and accuracy of satellite data that are processed and distributed within targeted time
            - Increase government procurement of NOAA-licensed remote sensing systems
        - Outcomes
            - A continuous stream of satellite data and information with the quality and accuracy to meet users' requirements ofr spatial and temporal sampling and timeliness of delivery

- Modeling and Observing Infrastructure (MObI) Subgoal – Environmental modeling; the U.S. Integrated Ocean Observing System (IOOS); and technology, planning and integration
  - Research Areas
    - Overall observing systems architecture design
    - Advancing *in situ* and surface-based data collection
    - Data management, associated visualization technology and models, and related high performance computing and communication
  - Objectives
    - Ensure a strategic, integrated, and balanced observing system investment portfolio for NOAA through the use of quantitative analysis
    - Integrate national and regional efforts to optimize ocean observations, data management, and understanding
    - Provide for research, development, and operational cap abilities that improve, maintain, and operate models and provide guidance for environmental forecasts at all temporal and spatial scales
    - Ensure computational infrastructure and high-performance computing strategies needed to sustain computational workloads of NOAA's research and operational modeling enterprise and support NOAA's data management and stewardship capabilities
  - Outcomes
    - Integration of observing system architectures, data management architectures, and computing and modeling capabilities to better enable NOAA's mission

**Focus Areas for the Review and Questions to be Addressed**

1. ***Quality:*** Assess the quality of the Laboratory's/Center's research and development. Assess whether appropriate approaches are in place to ensure that high-quality work will be performed in the future. Assess progress toward meeting NESDIS's goal to conduct preeminent research as listed in the "Indicators of Preeminence."
   - How does the quality of the Laboratory's/Center's research and development rank among Research and Development (R&D) programs in other U.S. federal agencies? Other science agencies/institutions?
   - Are appropriate approaches in place to ensure that high-quality work will be done in the future?

Indicators of Preeminence: Types of Indicators can include the following; not all may be relevant to the Laboratory/Center.

a. A lab's total number of refereed publications per unit time and/or per scientific Full Time Equivalent staff (FTE).

b. A list of technologies (e.g. observing systems, information technology, numerical modeling algorithms) transferred to operations/application and an assessment of their significance/impact on operations.
c. The number of citations for a lab's scientific staff by individual or some aggregate.
d. A list of awards won by groups and individuals for research, development, and/or application.
e. Memberships and involvement in prestigious organizations (e.g., the National Academy of Sciences, National Academy of Engineering, or fellowship in the American Meteorological Society, American Geophysical Union or the American Association for the Advancement of Science etc.).
f. Service of individuals in technical and scientific societies such as journal editorships, election to boards or executive level offices, service on U.S. interagency groups, service of individuals on boards and committees of international research-coordination organizations.
g. A list of research products, information and services and an assessment of their impact by end users, including participation or leadership in national and international state-of-science assessments.
h. Evidence of collaboration with other national and international research groups, both inside and outside of NOAA as well as reimbursable support from non-NOAA sponsors.
i. Significance and impact of involvement with patents, Cooperative Research and Development Agreements (CRADAs) and other activities with industry.
j. Other forms of recognition from NOAA information customers such as decision makers in government, private industry, the media, education communities, and the public.
k. Contributions of data to national and Global Earth Observing System of Systems (GEOSS)-related data bases and programs, and involvement in international quality-control activities to ensure accuracy, precision, inter-comparability, and accessibility of global data sets.

2. ***Relevance:*** Assess the degree to which the research and development is relevant to NOAA's mission and of value to the Nation.

- Does the research address existing (or future) societally-relevant needs (national and international)?
- How well does it address issues identified in the NOAA research plans or other policy or guiding documents?
- Are customers engaged to ensure relevance of the research?
- Are there R&D topics relevant to national needs that the Laboratory/Center should be pursuing, but is not? Are there R&D topics in NOAA and NESDIS plans that the Laboratory/Center should be pursuing, but is not?

3. ***Performance:*** Assess the overall effectiveness with which the Laboratory/Center plans and conducts its research and development, given the resources provided, to meet NOAA Strategic Plan objectives and the needs of the nation. The evaluation will be conducted within the context of three sub-categories: research leadership and planning, effectiveness, and transition of research to operations/applications.

3a. *Research Leadership and Planning*. Assess whether the laboratory has clearly defined objectives, scope, and methodologies for its key projects.

- Does the Laboratory/Center have clearly defined and documented scientific objectives, rationale, and methodologies for key projects?
- Has the scope of key projects been identified, including methods for determining when areas of investigation should end or be transitioned to operations or information services?

3b. *Efficiency and Effectiveness*. Assess the efficiency and effectiveness of the Laboratory's/Center's research and development, given the Laboratory's/Center's goals, resources, and constraints and how effective the Laboratory/Center is in obtaining needed resources through NOAA and other sources.

- Does the Laboratory/Center execute its research in an efficient and effective manner? Are research investments being made in the right places (effectiveness)? Are the most economical research investments being made (efficiency)?
- Is the Laboratory/Center organized and managed to optimize the conduct and planning of research, including the support of creativity?
- How well integrated is the work with NOAA's planning and execution activities? Are there adequate inputs to the planning process of NOAA's Programming, Planning and Budgeting and Execution System (PPBES)?
- Is the proportion of the external funding appropriate, relative to the Laboratory's/Center's funding from NOAA?
- Are human resources adequate to meet current and future needs? Is the Laboratory/Center organized and managed to ensure diversity in its workforce?
- Are appropriate resources and support services available?

3c. *Transition: How well has the Laboratory/Center delivered products?* Assess the Laboratory's/Center's effectiveness in transitioning and/or disseminating its research into applications, operations, and /or information services.

- How well is the transition of research to applications/operations and/or dissemination of knowledge planned and executed?
- Are there appropriate interactions with stakeholders and customers? Are end users of the research and development involved in the planning and delivery of applications and/or information services?
- Are the research results communicated to stakeholders and the public?

**Proposed Schedule and Time Commitment for Reviewers**

The on-site review will be conducted over a three day period, 09 – 11 March 2010, in Washington, DC metro area. The review concludes with the review panel presenting their initial feedback to the Assistant Administrator for NOAA'S National Environmental Satellite, Data, and Information Service (NESDIS) at the AA's office in Silver Spring, MD, during the morning of 12 March. Two teleconferences are planned with the Director and Deputy Director for STAR, who will be the liaison with the review team and for the completion of the report. The goal of the first teleconference, January 2010, will be to discuss the charge to you, a reviewer, as well as the scope of the review, focus areas for

the review questions to be addressed, and initial information provided to reviewers that addresses the questions. In the second phone call, scheduled for February 2010, the Director will discuss the draft review agenda and the proposed template for reviewers to use for their assessments. During this call, we ask that you as a reviewer identify any additional information needs. All relevant information requested by the review team will be provided on the review website by February 2010 before the second call with the review team.

Each reviewer is asked to independently prepare their written assessments; the co-Chairs, federal employees, will create a five to ten page report summarizing the individual assessments. The co-Chairs will not analyze individual comments or seek a consensus of the reviewers. We request that within 45 days of the review, the review team provide the draft summary report to the Director, STAR. Once the report is received, STAR staff will review the report to identify any factual errors and will send corrections to the review team. The final individual assessments and the summary report are to be submitted to the Assistant Administrator, NESDIS.

## Review Team Resources

The STAR Director will provide resources necessary for the review team to complete its work.

1. Review Team Support: Information to address the focus areas of the review will be prepared and posted on a password-protected web page for reviewers. The first round of information will be compiled and posted in January and the second major update, to respond to reviewers' requests, will be provided by the end of February. A hard copy of review-specific information on the website will also be provided to reviewers at the review.
2. Travel arrangements for the onsite review will be made and paid for by STAR.

# Guidelines for Review Team Members

## 1. Introduction

A goal within NOAA is to conduct regular scientific reviews to evaluate the **quality**, **relevance**, and **performance** of research in NOAA Laboratories/Centers with respect to both internal and external interests, and to help strategically position the Laboratory/Center in its planning of its future science. These reviews are intended to ensure that the Laboratory/Center research is linked to the National Oceanic and Atmospheric Administration (NOAA) Strategic Plan, relevant to NOAA Research mission and priorities, and consistent with NOAA planning, programming, and budgeting.

These guidelines have been prepared using experience gained from previous Laboratory/Center reviews. The goal of the guidelines is to clarify your role and assist in the organization of the work of the review team. The guidelines cover the process from when you receive the invitation letter to participate on the review team to submission of the summary report of the review team.

## 2. Science Areas in Review and Charge to the Review Team

Each member of the review team should have received the "charge to the reviewers" document. The charge covers the following topics: purpose of the review, scope of the review, focus areas for the review including questions to be addressed by the review team, proposed schedule including the dates of the review and time frame for delivery of the review report as well as the time commitment for reviewers and review team resources. Each member is asked to complete an individual review report on two or more review areas and provide the reviews to the Chair. The Chair, as a federal review team member, will summarize the individual reports of the review team, but will not attempt to seek a consensus of the review team on any findings or recommendations. We are asking for a summary, not consensus, report to conform to the Federal Advisory Committee Act (FACA) regulations. FACA regulations allow consensus reports only from external groups established under FACA, and our short-term review teams do not meet these criteria. Each member of the review team should also have received a conflict of interest disclosure form which should be returned to NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) Center for Satellite Applications and Research (STAR).

## 3. Resources for the Review Team

The Director of STAR will provide the resources necessary for you and the review team to complete its work. All Laboratory/Center review materials and presentations for the review will be posted to a website in advance of the review. The web site will contain background documents from NOAA (e.g., NOAA Research 5 Year Plan) and background data on the lab, including several "indicators of preeminence" (e.g., publications, awards, scientific leadership, etc.). A hardcopy version of presentations and review material will be provided to review team members on the first day of the review. In addition, reviewers will be provided electronic versions of all review material

on a USB flash drive in advance of the review. You will also be provided a template (form) on which to complete your review observations, findings, and recommendations.

**4. Logistics and Agenda for the Review**

Center staff will contact you to arrange travel to the review and all travel arrangements will be paid for by STAR. Your travel worksheet is enclosed. Please provide the Center with your intended dates of travel and other particulars by the requested due dates to ensure all arrangements can be made satisfactorily. Airplane and train travel must be arranged through the Center staff and government travel agency. The Center will reserve a block of hotel rooms for the reviewers, but you will be asked to cover all your travel expenses (except air/train fare) upfront and will be reimbursed, usually through direct deposit to your bank, after Center staff complete the travel reimbursement forms with your help. Some receipts may be needed for reimbursement. If you have not been the recipient of federal travel reimbursement before, you will need to register as a U.S. government vendor to receive your travel reimbursement. The Center travel staff will do that for you, but you will have to provide them with some personal identifying information, including the routing number for your bank account for direct deposit of the reimbursement check. For non-U.S. reviewers, you will be sent a check for travel cost reimbursement. Travel schedules should be chosen to allow you to attend all scheduled review sessions. The review agenda will include presentations and discussions that will provide information on the science areas to be reviewed and the questions to be addressed by the review team.

Center staff may also ask for information for building security in advance of the review, particularly for reviewers who are not U.S. citizens.

**5. Teleconferences Prior to the Review**

Two teleconferences will be scheduled to discuss the review process and answer any questions you may have approximately two months and one month prior to the review. In addition to the review team members, attendees will include the Director and Deputy Director for STAR and senior management from the laboratory. On the first call, the charge to the review team and the draft agenda for the review will be discussed, as well as any other questions reviewers may have on the process. The focus for the second call will include information provided on the website, presentation materials, the final review agenda, and the review reports.

**6. During the Review**

The Review will be held over a three day period. On the morning of the first day, you will meet at breakfast with the NESDIS Assistant Administrator (AA), Deputy AA, and STAR Director to discuss any final issues before the review. Generally the first morning will include an overview presented by the Laboratory/Center director. Material is then presented for each of the primary science areas of the Laboratory/Center. These presentations will include PowerPoint presentations and poster sessions. Time will be built into the review schedules for questions and discussion following presentations. Interactive dialogue and discussion during all of the sessions is strongly encouraged.

Time will also be set aside for reviewer closed sessions to meet with Laboratory/Center management, as well as with bench scientists without management present. The Laboratory/Center will facilitate separate sessions with bench scientists and the laboratory management team that are designed for you to address the research **quality**, **relevance,** and **performance**. Please use these closed sessions to probe more deeply into the operations of the Laboratory/Center. Time will also be set aside for reviewers-only closed sessions. The goal of the reviewers-only sessions is to provide time for the review team to discuss any presentations or information provided and to identify additional information needed or issues that need to be clarified. The closed sessions also provide an opportunity to discuss the process/timeline for preparing reports and feedback for the preliminary report to laboratory management at the end of the on-site review. At any time during the review, you should feel free to request additional information or clarifications from laboratory staff.

### 7. Preparation and Submission of the Review Report

We ask that you complete your individual report on two or more science areas covered in the review. A reporting form is attached that provides the questions to be assessed for each science area in the review and expandable text boxes for you to enter your observations/findings as well as specific recommendations for the laboratory to review and consider incorporating in its research and operations. The chair, a federal reviewer, will compile a summary report from the individual reports. The summary report is requested within 45 days of the review and should be submitted by the Chair to the STAR Director. STAR will have 30 days from the submission of the draft report to review it for technical/factual corrections. Any technical/factual corrections will be sent back by NESDIS to the review team members to make adjustments, as appropriate, to the final individual and summary reports. An example of a recent review report will be provided to the review team for their information.

### 8. Uses for and Distribution of the Review Report

As outlined in the “purpose of the review” section of the “charge to reviewers”, Laboratory/Center scientific reviews are conducted to help strategically position the Laboratory/Center in planning its future science and to ensure that laboratory research is linked to the National Oceanic and Atmospheric Administration (NOAA) Strategic Plan, relevant to NOAA Research mission and priorities, and consistent with NOAA planning, programming, and budgeting. After submission of the final report by the review team, the Laboratory/Center will be asked to review the report and prepare a plan, to be discussed with NESDIS management, to incorporate recommendations into Laboratory/Center research and operations.

The summary report will be a public document and may be distributed to internal NOAA and external audiences. Your individual reports will not be made public, and will only be used by NESDIS as background for the summary report. Internal distribution of the individual reports will be limited.

# Evaluation Guidance and Forms

**Evaluation Focus (from "Charge to Reviewers" document)**

1. ***Quality:*** Assess the quality of the Laboratory's/Center's research and development. Assess whether appropriate approaches are in place to ensure that high-quality work will be performed in the future. Assess progress toward meeting NESDIS's goal to conduct preeminent research as listed in the "Indicators of Preeminence."
    - How does the quality of the Laboratory's/Center's research and development rank among Research and Development (R&D) programs in other U.S. federal agencies? Other science agencies/institutions?
    - Are appropriate approaches in place to ensure that high-quality work will be done in the future?

Indicators of Preeminence: Types of Indicators can include the following; not all may be relevant to the Laboratory/Center.

a. A lab's total number of refereed publications per unit time and/or per scientific Full Time Equivalent staff (FTE).
b. A list of technologies (e.g. observing systems, information technology, numerical modeling algorithms) transferred to operations/application and an assessment of their significance/impact on operations.
c. The number of citations for a lab's scientific staff by individual or some aggregate.
d. A list of awards won by groups and individuals for research, development, and/or application.
e. Memberships and involvement in prestigious organizations (e.g., the National Academy of Sciences, National Academy of Engineering, or fellowship in the American Meteorological Society, American Geophysical Union or the American Association for the Advancement of Science etc.).
f. Service of individuals in technical and scientific societies such as journal editorships, election to boards or executive level offices, service on U.S. interagency groups, service of individuals on boards and committees of international research-coordination organizations.
g. A list of research products, information and services and an assessment of their impact by end users, including participation or leadership in national and international state-of-science assessments.
h. Evidence of collaboration with other national and international research groups, both inside and outside of NOAA as well as reimbursable support from non-NOAA sponsors.
i. Significance and impact of involvement with patents, Cooperative Research and Development Agreements (CRADAs) and other activities with industry.
j. Other forms of recognition from NOAA information customers such as decision makers in government, private industry, the media, education communities, and the public.
k. Contributions of data to national and Global Earth Observing System of Systems (GEOSS)-related data bases and programs, and involvement in

international quality-control activities to ensure accuracy, precision, inter-comparability, and accessibility of global data sets.

2. ***Relevance:*** Assess the degree to which the research and development is relevant to NOAA's mission and of value to the Nation.

- Does the research address existing (or future) societally-relevant needs (national and international)?
- How well does it address issues identified in the NOAA research plans or other policy or guiding documents?
- Are customers engaged to ensure relevance of the research?
- Are there R&D topics relevant to national needs that the Laboratory/Center should be pursuing, but is not? Are there R&D topics in NOAA and NESDIS plans that the Laboratory/Center should be pursuing, but is not?

3. ***Performance:*** Assess the overall effectiveness with which the Laboratory/Center plans and conducts its research and development, given the resources provided, to meet NOAA Strategic Plan objectives and the needs of the nation. The evaluation will be conducted within the context of three sub-categories: research leadership and planning, effectiveness, and transition of research to operations/applications.

3a. *Research Leadership and Planning*. Assess whether the laboratory has clearly defined objectives, scope, and methodologies for its key projects.

- Does the Laboratory/Center have clearly defined and documented scientific objectives, rationale, and methodologies for key projects?
- Has the scope of key projects been identified, including methods for determining when areas of investigation should end or be transitioned to operations or information services?

3b. *Efficiency and Effectiveness*. Assess the efficiency and effectiveness of the Laboratory's/Center's research and development, given the Laboratory's/Center's goals, resources, and constraints and how effective the Laboratory/Center is in obtaining needed resources through NOAA and other sources.

- Does the Laboratory/Center execute its research in an efficient and effective manner? Are research investments being made in the right places (effectiveness)? Are the most economical research investments being made (efficiency)?
- Is the Laboratory/Center organized and managed to optimize the conduct and planning of research, including the support of creativity?
- How well integrated is the work with NOAA's planning and execution activities? Are there adequate inputs to the planning process of NOAA's Programming, Planning and Budgeting and Execution System (PPBES)?
- Is the proportion of the external funding appropriate, relative to the Laboratory's/Center's funding from NOAA?
- Are human resources adequate to meet current and future needs? Is the Laboratory/Center organized and managed to ensure diversity in its workforce?
- Are appropriate resources and support services available?

3c. *Transition: How well has the Laboratory/Center delivered products?* Assess the Laboratory's/Center's effectiveness in transitioning and/or disseminating its research into applications, operations, and /or information services.

- How well is the transition of research to applications/operations and/or dissemination of knowledge planned and executed?
- Are there appropriate interactions with stakeholders and customers? Are end users of the research and development involved in the planning and delivery of applications and/or information services?
- Are the research results communicated to stakeholders and the public?