

An underwater photograph of a kelp forest. The water is a clear, vibrant blue-green. Several large, dark green kelp stalks with long, narrow blades rise from the bottom. In the center, a tall, feathery yellow-green kelp stalk stands out. Numerous small, dark blue fish are swimming throughout the scene, some near the kelp and others in the open water. The overall atmosphere is serene and natural.

# Office of Science and Technology Strategic Science Plan

National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
April 6<sup>th</sup>, 2013

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## INTRODUCTION

The Office of Science and Technology (ST) of the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NOAA Fisheries) serves a critical role as liaison among NOAA Fisheries field scientists and the leadership of NOAA Fisheries and NOAA. ST staff and scientists also facilitate communication and collaboration between NOAA Fisheries leadership and Congress as well as with other government agencies, international and academic partners, and private entities.

The coordination of science programs at the national level and across the regional NOAA Fisheries Science Centers (Centers) of Alaska, the Pacific Islands, Northeast, Northwest, Southeast, and Southwest is also a key role of ST. In conjunction with the Centers, ST helps prioritize and direct funding of the science activities undertaken by the agency. As NOAA moves toward a more comprehensive ecosystem-based approach to managing resources, ST is working to make incorporation of key ecological, climate, and social drivers in marine resource assessments a high priority. ST's activities link directly to the Administration's priorities for stewardship of the nation's ocean and coastal resources contained in the National Ocean Policy, and to NOAA goals for climate, ocean health, coastal communities and economies, and science and technology, as identified in the NOAA Next Generation Strategic Plan.

ST recognizes the increasing need to balance core activities that meet our legal mandates and associated operational requirements today and develop forward-thinking scientific activities that meet tomorrow's needs. To this end, ST has drafted a Strategic Science Plan aimed at laying out a path to strike that balance.

The ST Strategic Science Plan is organized into four major themes that encompass and describe ST activities:

- Collect data and conduct assessments.
- Advance science: activities to improve data collection and assessments.
- Manage and disseminate information.
- Integrate and coordinate support services.

ST will develop an Implementation Plan to guide execution of the ST Strategic Science Plan in concert with plans developed for each Center. This process will include compiling and analyzing information to make and communicate resource allocation decisions to meet priority objectives and activities.

## NATIONAL PRIORITIES FOR OCEANS

The National Ocean Policy (2010)<sup>1</sup> serves as the overarching policy that recognizes “America’s stewardship of the ocean, our coasts, and the Great Lakes is intrinsically linked to environmental sustainability, human health and well-being, national prosperity, adaptation to climate and other environmental changes, social justice, international diplomacy, and national and homeland security.” The Executive Order defines a national policy that includes guiding principles for management decisions and actions toward achieving the vision of the policy. Under the Policy, NOAA is recognized as a primary steward of U.S. ocean, coastal, and Great Lakes resources.

NOAA Fisheries is primarily authorized by the Magnuson-Stevens Fishery Conservation and Management Act (MSA), Endangered Species Act, and Marine Mammal Protection Act (MMPA). NOAA, NOAA Fisheries, and the Office of Science and Technology are also driven by their visions and missions (Table 1) which support the priorities of the National Ocean Policy and the goals of the Agency.

*The National Ocean Policy strives to achieve an America whose stewardship ensures that the ocean, our coasts, and the Great Lakes are healthy and resilient, safe and productive, and understood and treasured so as to promote the well-being, prosperity, and security of present and future generations...*

Table 1. NOAA, NOAA Fisheries, and Office of Science and Technology vision and mission statements

	Vision	Mission
<b>NOAA</b>	Resilient Ecosystems, Communities, and Economies.  Healthy ecosystems, communities, and economies that are resilient in the face of change.	Science, Service, and Stewardship -To understand and predict changes in climate, weather, oceans and coasts, -To share that knowledge and information with others, and -To conserve and manage coastal and marine ecosystems and resources.
<b>NOAA Fisheries</b>	The American people enjoy the riches and benefits of healthy and diverse marine ecosystems.  As a steward, NOAA Fisheries has an obligation to conserve, protect, and manage living marine resources in a way that ensures their continuation as functioning components of marine ecosystems, affords economic opportunities, and enhances the quality of life for the American public.	Stewardship of living marine resources through science-based conservation and management and the protection and the promotion of healthy ecosystems.
<b>Science and Technology</b>	NOAA Fisheries is the trusted source of the scientific information and advice needed to ensure that Americans enjoy the sustained riches and benefits of healthy and diverse marine ecosystems.	To sustain and enhance NOAA Fisheries’ science programs to enable sound conservation and management of the Nation’s living marine resources and their ecosystems.

<sup>1</sup> Executive Order No. 13547, July 22, 2010

These vision and mission statements make it clear that stewardship of living marine resources and the ecosystems on which they depend are central to the Agency. The activities undertaken by ST link to three goals in NOAA's Next Generation Strategic Plan (NGSP):

- 1) Healthy Oceans
- 2) Climate Adaptation and Mitigation
- 3) Resilient Coastal Communities and Economies

Nearly all the programs, research, and activities supported by ST fall under the Healthy Oceans Goal. However, some activities are tightly linked to the Climate and Coastal Goals. ST also supports the Science and Technology Enterprise Objectives to understand the interdependencies between human health and prosperity, and the intricacies of the Earth system, and the Engagement Enterprise Objectives to meet the needs of stakeholders through the delivery of data and knowledge.

Each year, within the context of the NGSP, the NOAA Administrator lays out NOAA's path to meet these goals in the Annual Guidance Memorandum. Current ST activities support:

- Advancement of efforts to ensure the long-term sustainability of marine fisheries and recovery of protected species and their habitats.
- Advancement of observations, modeling, and research necessary to understand climate change and its impacts.
- Delivery of integrated data, information, products, and services needed to support resilient coastal communities and economies.
- Understanding of ecosystems and phenomena—across missions and disciplines—with the goal of increasing the resilience of ecosystems, economies, and communities.

## THE ROLE OF THE OFFICE OF SCIENCE AND TECHNOLOGY

Housed at NOAA Headquarters, ST serves a unique and critical role for the agency as liaison among NOAA Fisheries field scientists and the leadership of both NOAA Fisheries and NOAA. ST staff and scientists also facilitate collaboration between NOAA leadership and Congress as well as with international and academic partners, government agencies, and private entities. These relationships, required for mission success and regional science endeavors, are maintained through proactive and responsive communications.

ST is responsible for coordinating and helping to frame the direction of science programs at the national level and across the Centers serving Alaska, the Pacific Islands, Northeast, Northwest, Southeast, and Southwest. In conjunction with the Centers, ST helps prioritize and direct funding of the science activities undertaken by the agency. ST also manages national-scale programs. Through its education programs ST supports training the future generations of the fisheries workforce.

ST has organized its activities into four themes, each of which are further broken into foci (Table 2). While the themes and foci contained in the ST Strategic Science Plan are different from those in the Centers, they link to the themes and foci in the Center plans.

Table 2: Office of Science and Technology Themes and Foci

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### **Theme 1: Collect data and conduct assessments**

#### **Data Collection for Assessments**

**Assess Living Marine Resources, Ecosystems, Habitats, and Fishing Communities**

### **Theme 2: Advance science: Activities to Improve Data Collection and Assessments**

#### **Improving Data Collection**

**Improving Assessments: Living Marine Resources, Ecosystems, Habitats, and Fishing Communities**

### **Theme 3: Manage and Disseminate Information**

#### **Enterprise Data Management**

**Data Analysis and Decision Support Systems**

**Science Enterprise Information Management and Information Technology**

**Scientific Publications**

### **Theme 4: Integrate and Coordinate Support Services**

**NOAA and NOAA Fisheries Strategic Planning**

**Scientific Data and Information Quality Management**

**Intra-agency and Interagency Planning and Coordination**

**Science Education**

**International Science**

**Science Board and Science Operations Board support**

## RESEARCH OR PROGRAM THEMES

### THEME 1: COLLECT DATA AND CONDUCT ASSESSMENTS

Among the critical components of the NOAA Fisheries science enterprise are the observational platforms that collect oceanographic, ecosystem, and marine resource data. ST provides national coordination to assemble and advocate for regional fishery-independent survey and assessment requirements. Other types of data, including fishery-dependent and socio-economic, are collected by NOAA Fisheries and partners through a variety of survey techniques. ST will continue to develop national policies, procedures, budget formulations, and annual spend plans needed to ensure that these data collection activities are high-quality, cost-effective, productive, and able to achieve program objectives.

ST coordinates collection, compilation, and analysis of data to assess the performance and impacts of U.S. commercial and recreational fisheries, and compiles and reports information on domestic and international U.S. fishery product market performance. ST plays a pivotal role in providing national fisheries statistics to U.S. Government agencies, foreign governments, national and international organizations, private businesses, and those interested in the management and development of U.S. fishery resources.

ST also collects economic and socio-cultural data on U.S. fishing activities and communities. The economic and social science advice provided by NOAA Fisheries can be used to evaluate the benefits and costs of alternative management actions, prioritize management needs, and facilitate policy design that maximizes societal benefits from ocean and coastal resources. NOAA Fisheries will continue to collect economic and socio-cultural data and conduct assessments required under the applicable mandates governing federal rulemaking. In addition, ST supports activities to better understand the human connection to the marine environment and how this changes over time.

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#### FOCUS: DATA COLLECTION FOR ASSESSMENTS

NOAA Fisheries is responsible for collecting data that are integral to fish stock, essential fish habitat, and protected species assessments and science. As NOAA Fisheries moves toward integrating ecosystem-based management (EBM) principles into agency activities, these data are increasingly important for achieving ecosystem and habitat level assessments. NOAA Fisheries collects data using survey vessels and other observation platforms, observers on fishing vessels, and various statistical, economic, and social science surveys. These methods provide oceanographic and biological data, fishery-dependent and fishery-independent data on commercial and recreational fisheries catch and bycatch, and socio-economic data required for assessments.

ST coordinates a number of national data collection programs that provide data for assessments of fish stocks and marine habitats. Data collection varies across the Centers to support regional needs, and ST works with regional partners to ensure a comprehensive, integrated program that meets national needs and effectively supports regional data and statistical requirements for stock assessments and other management needs. At-sea resource surveys are necessary for high-quality resource assessments. Fisheries-independent sampling of fish populations provides data that serve as key inputs for fish stock assessments, including age and size samples, catch composition, and indices of relative abundance. Additional data collection programs focus on the biology and life history of fishery stocks, which further contribute to stock assessments and fishery management efforts.

Information on habitat and environmental conditions is often collected concurrently during resource surveys, and augments mapping surveys to provide critical data for assessing the habitats and ecosystems that managed stocks depend on. Data collected through cooperative research—conducted by partnering the fishing industry, fishermen, and other stakeholders with federal and university scientists and other collaborators—is another valuable source of fundamental fisheries information. The collection of this information on fisheries resources assists scientists and managers by providing information to supplement the data currently collected through existing federal research programs. ST selects high-level cooperative research projects nationwide through competitive grant, cooperative agreement and contract procurements.

*Objective: Support at-sea observations for marine resources using NOAA ships, chartered vessels, aircraft, and advanced technology platforms.*

At-sea observations are collected by the NOAA fleet (fishery survey vessels, small boats, and aircraft), managed and operated by the NOAA Office of Marine and Aviation Operations (OMAO). These observations are augmented by chartered academic and private industry platforms. Ship surveys, manned and unmanned aircraft surveys, moored instrument observations, and satellite sensors collect data over a wide range of temporal and geographic scales. Developing technologies such as autonomous underwater vehicles, remotely operated vehicles, and unmanned aerial systems will augment traditional observation platforms.

ST works continuously with the Centers to ensure that NOAA Fisheries' highest-priority resource survey data collection needs are identified and prioritized. ST engages OMAO and NOAA line offices to validate at-sea survey requirements, assign cross-line-office priorities to effectively allocate NOAA platform assets, and successfully execute annual surveys within constrained operational budgets.

Forward-looking strategic planning is required to address long-range needs for NOAA fleet and platform improvements. ST is collaborating with OMAO on a new NOAA Fleet Plan (2012–2027) that anticipates new vessel construction, mid-life retrofitting, mission sensor upgrades, and phased retirement of NOAA fleet assets. ST will also lead and represent Center requirements in the OMAO development of a new regional-class research vessel (RCRV) critically needed to replace current T-AGOS ships supporting NOAA Fisheries.

Progress toward this objective over the next 5 years will include:

- *Sufficient science program days-at-sea are available to maintain time series of stock abundance for key stocks and to improve understanding of stock delineation, exploitation, life history parameters, ecological relationships, recruitment, and habitat use.*
- *Maintenance of existing and addition of new time series for key stocks are prioritized.*
- *Permanent funding for charter vessels conducting standard fishery-independent surveys is increased.*
- *Adequate ship-based and aerial surveys of protected resources are conducted.*
- *An actionable NOAA Fleet Plan is developed and supported in out-year planning and budget formulation.*

*Objective: Coordinate commercial fisheries observer program activities.*

Fisheries observers monitor and record catch and bycatch data from U.S. commercial fishing vessels and processing facilities. Data are used to support science, conservation, and management activities, including bycatch



reduction, stock assessments, monitoring protected species interactions, gear research, and fisheries regulations. ST coordinates the National Observer Program Advisory Team with representatives from each of the regional observer programs to identify issues of national concern, recommend program or policy changes, and support improved data collection.

Progress toward this objective over the next 5 years will include:

- *High-quality data on catch and bycatch, protected species interactions, and data for stock assessments are provided.*
- *Number of fisheries with observer coverage are expanded.*
- *Number of sea days observed annually are increased.*
- *Observer programs in fisheries with bycatch concerns are maintained and expanded.*
- *Alternative methods for at-sea data collection, such as electronic monitoring, are developed and evaluated.*

*Objective: Produce and disseminate high-quality recreational fishing statistics in a timely manner.*

Continuous monitoring of recreational fishing catch, effort, and participation is required to support fishery stock assessments and related management actions, including specifying annual catch limits. Estimates of recreational fishing effort and landings are needed to predict the impacts of alternative management scenarios on a fishery, evaluate the impacts of management regulations once they have been implemented, and account for catch against established catch limits. ST supports collaboration among government agencies, independent scientists, recreational fishing groups, and conservation organizations, ensuring scientifically rigorous collection of appropriate information that meets the needs of managers and stakeholders.

ST designs and administers recreational fishing surveys along the coasts of the Atlantic Ocean, Gulf of Mexico, Puerto Rico, and Hawaii, and provides funding and statistical support for surveys in California, Oregon, and Washington. ST administers regional telephone and mail surveys, as well as onsite, shore-based surveys that collect the necessary data to estimate total recreational fishing effort and catch by species. ST maintains databases of catch and effort statistics, which are publicly accessible through an online query system.

The Regional Fisheries Information Network partnerships play an essential role in technical, logistical, and funding support for collection of recreational catch and effort data and development and dissemination of catch and effort statistics. Partners work with NOAA Fisheries to participate in recreational surveys and generation of catch and effort estimates for their respective regions.

ST will continue to coordinate data collection activities with input from survey design experts, data collection partners, data users, and other stakeholders to provide design, operational, and statistical support for effective surveys of U.S. recreational fisheries.

Progress toward this objective over the next 5 years will include:

- *Estimates of recreational fishing catch and effort, and associated estimates of precision, for all key species, including highly migratory species, are produced by sample period, sub-region and state, fishing mode, and area fished for all sub-regions and states except Alaska and Texas.*
- *Recreational catch estimates are available to customers through readily accessible web query tools.*
- *Sufficient resources are available to fill gaps in the temporal and geographic coverage of recreational fishing surveys.*

*Objective: Aggregate and develop national-level information and statistics on commercial fisheries and U.S. fishery markets.*

National summary-level statistics on commercial fishery landings, value, and participating fishing vessels data provide important information on the state of U.S. fisheries. ST acquires information from a variety of regional sources, including NOAA Fisheries Science Centers and Regional Offices, state-federal Fisheries Information Networks, and the U.S. Geological Survey's Great Lakes Science Center. ST compiles this information into a web-based searchable database for U.S. commercial fisheries landings that provides the public with up-to-date information on fish and shellfish species.

ST also compiles data and statistics from multiple sources into web-accessible information and searchable databases with up-to-date information on fishery markets, foreign trade in fishery products, commercial fishing vessels, and aquaculture. Fishery market data from federal and industry sources are summarized to provide accurate and unbiased information on current conditions affecting domestic trade of fishery products. Searchable databases contain statistics on foreign exports and imports from the Foreign Trade Division of the U.S. Census Bureau; U.S. Coast Guard data on U.S. fishing vessel characteristics, documentation, and ownership; and statistics on U.S. marine aquaculture from a variety of sources, including the U.S. Department of Agriculture. An annual report summarizes ST managed commercial and recreational fisheries statistics, as well as statistics on trade, processing, and consumption.

ST will continue to provide national-level summary statistics on U.S. fisheries.

Progress toward this objective over the next 5 years will include:

- *Monthly and annual fishery landings information is provided to the public.*
- *Monthly and quarterly Market News reports are updated and provided to the public in a timely manner.*
- *The Fisheries of the United States report is released annually.*
- *The content of Fisheries of the United States and other reports is analyzed based on its accuracy and its usefulness to its audience. Improvements continue to be made.*

*Objective: Coordinate and support economic and socio-cultural data collection across U.S. commercial and recreational fisheries.*

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires NOAA Fisheries to collect socio-economic data on fishery participants. ST requires each Center to submit an annual spend plan for its commercial fisheries data collection program that details the use of funds in terms of timing, fisheries coverage, and survey methods. Annual progress in cost data collection and capability to assess the economic status of federally managed fisheries is monitored to identify gaps in the agency's ability to collect and assess commercial fisheries economic data.

NOAA Fisheries' economic data collection for recreational fisheries is coordinated by ST. This includes maintaining an inventory of the recreational fishing economic surveys as well as establishing NOAA priorities for recreational fishing economic data collection. ST has developed a framework for identifying data collection gaps and priorities, which will aid out-year planning.

In addition, every 5 years ST conducts a national survey of saltwater anglers' expenditures on recreational fishing. The first nationwide survey was conducted in 2006 and the second nationwide survey is just being completed for 2011. ST will continue to coordinate recreational fishing economic data collection and the national survey of U.S. recreational fisheries.

To meet these requirements, ST will continue to coordinate and support economic and socio-cultural data collection across NOAA Fisheries.

Progress toward this objective over the next 5 years will include:

- *Annual spend plan submissions from each Center are analyzed to determine program-wide progress in data collection and assessment capabilities.*
- *Gaps in commercial fisheries economic data collection (e.g., revenue, operating costs, and fixed costs) and assessment capability (e.g., net revenue and profits) are identified and addressed.*
- *Data collection gaps are identified and incorporated into planning.*
- *Priorities are established for recreational fishing economic data collection.*
- *The 2016 saltwater angler survey is conducted.*

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## FOCUS: ASSESS LIVING MARINE RESOURCES, ECOSYSTEMS, HABITATS, AND FISHING COMMUNITIES

NOAA Fisheries produces assessments of living marine resources, the ecosystems and habitats they require, and the communities they support. Assessments are driven by statutory and regulatory requirements, as well as managers who require assessments to provide a sound scientific basis for resource management and policy. Fish stock assessments determine whether stocks are currently overfished and forecast sustainable levels of catch. Marine fisheries management organizations will continue to require quality information and analysis on commercial and recreational fisheries to support resource management and allocation decisions. NOAA Fisheries programs ensure that high-quality monitoring and statistical information is readily available to inform management decisions and ensure the ongoing provision of the information products required by science and related programs. In addition, the MSA requires NOAA Fisheries to assess the economic impacts of rebuilding plans on fishery participants, conduct economic impact assessments of fishery sectors, and provide for the sustained participation of fishing communities.

*Objective: Lead and coordinate science support to national and regional programs engaged in assessment of living marine resources, including managed fish stocks, protected resources, and marine ecosystems and habitats.*

Continued provision of sound management advice requires adequate resources to collect, analyze, and report information on the status of living marine resources. ST leads national programs to coordinate and expand the capacity for fish stock assessment, protected species stock assessment, integrated ecosystem assessment, and habitat assessment. These programs champion goals to provide more frequent and precise assessments, to train and hire assessment scientists to meet increased demand, and to find efficiencies through improved methodologies, advanced technology, and streamlined processes from data collection to implementation. Coordination at the national level enables the identification of efficiencies and gaps within and between programs that can be addressed through strategic planning. ST also provides scientific support to the Centers and other partners to assist in current and future development of resource assessments and related products. In collaboration with partners, ST reports on the status of living marine resources and national assessment efforts.

Progress toward this objective over the next 5 years will include:

- *Enhancement of marine resource assessments.*
- *Incorporation of habitat, ecosystem, and climate information into fish and protected resource stock assessments is increased.*
- *Coordination of protected resource assessment and science programs is improved.*

*Objective: Provide tools that estimate economic and socio-cultural impacts of fisheries.*

ST also develops and maintains both a commercial fisheries and a recreational fisheries economic impact model, which can be used to estimate how changes in policies or environmental factors affecting commercial or recreational fishing will lead to potential changes in a state's economy. The economic impacts (sales generated, jobs supported, and value added to gross domestic product) of these sectors on each state and the national economies are available through an online interactive tool. In addition, the economic impact statistics are reported annually in *Fisheries Economics of the United States*, an ST publication. ST also coordinates the NOAA Fisheries socio-cultural program, which is tasked with helping NOAA Fisheries meet its National Standard 8 requirement to ensure the "sustained participation of fishing communities."

ST will continue to maintain fisheries economic impact models, update economic impact statistics, and develop tools for socio-cultural programs.

Progress toward this objective over the next 5 years will include:

- *Fisheries Economics of the United States is updated annually.*
- *Social indicators are developed for tracking the well-being, resiliency, and vulnerability of fishing communities.*
- *Standardized indicators are developed and used to assess economic performance of fisheries.*
- *The NOAA Fisheries Socio-cultural Practitioners Manual is completed and released.*
- *A Best Practices Manual for meeting MSA and Environmental Protection Act requirements is completed and released.*

## THEME 2: ADVANCE SCIENCE: ACTIVITIES TO IMPROVE DATA COLLECTION AND ASSESSMENT

NOAA mandates require comprehensive research programs to support marine resource management. Long-term investments in research are necessary for NOAA Fisheries to increase scientific understanding of and reduce uncertainty in assessment of stock structure and dynamics. ST works with the Centers to coordinate the overall NOAA Fisheries integrated research program and align regional needs with national program standards. ST advocates a commitment by NOAA Fisheries to maintain a significant ongoing level of strategic research as an annual investment. In addition to scientific assessments, ST develops state of knowledge reports, research priorities, and guidance materials for use by agency scientists, partner agencies, academia, resource managers (including the regional fishery management councils), policy makers, industry partners, non-governmental organizations, and the public. Cooperative research involves partners in all phases of the research, including survey/statistical design and then conducting the research, analyzing the results, and communicating the results, which provides avenues to improve data collection and use in assessments. Research areas include advancing the science of fisheries, protected species, and habitat assessments, including programs to enable incorporation of ecosystem approaches and considerations into living marine resource management.

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## FOCUS: IMPROVING DATA COLLECTION

Demand is increasing for accurate, precise, and timely information upon which to base assessments of marine resources and their habitats and ecosystems. Meanwhile, financial support for surveys and ship time is declining. With increasing demands for ocean and resource observations, ST is working to build capability for advanced sampling technology and integrated ocean observing in each Center and for NMFS-wide application.

*Objective: Support new and innovative uses of ocean resource observation platforms, technologies, and survey methods to improve assessments.*

Innovative technologies hold promise to reduce measurement and sampling uncertainties and to fill the gaps in the quantitative measures of stocks and their habitats and ecosystems. To provide more comprehensive data while controlling costs, ST continues to support development, evaluation, and implementation of promising refinements to and innovations in sampling technology. These technologies include sensors, platforms for deploying the sensors, and software for interpreting and managing the data. The aim is to improve the quality of assessments with a focus on abundance and dynamics, environments, fishing impacts, and the range of temporal and spatial sampling scales. Looking forward, ST will work to further include technological advances to integrate ecosystem processes into assessments.

Progress toward this objective over the next 5 years will include:

- *Measurement and sampling uncertainties and resource assessment gaps that may be addressed by advanced technologies are evaluated.*
- *Technical assistance and training needs related to standardized application of advanced technologies are identified.*
- *Technological expertise is established at the Centers and integrated into surveys and assessments.*
- *New funding opportunities are developed in collaboration with other organizations.*
- *National advanced technology and methodology research initiatives are developed and conducted, and results and products are disseminated.*
- *Maturing technologies are transitioned from research to operations.*
- *Shared use advanced sampling equipment for Center surveys is augmented.*

*Objective: Develop and test new recreational fishing and industry survey designs.*

ST coordinates research to develop and test improved recreational fishery survey designs that reduce bias, address gaps in information, and produce more precise, accurate statistics. National data collection standards and best practice survey methods resulting from this research guide regional implementation of improved survey methods. Enhanced survey designs and new survey components support resource management and assessment by providing more accurate and timely monitoring of recreational fisheries catch and effort at greater levels of temporal and spatial resolution.

ST also designs and administers the only annual, comprehensive regional and national scale survey of the U.S. seafood processor industry. The data enable estimation of annual U.S. seafood consumption, value-added margins, consumer expenditures related to commercial fisheries, and impacts of fishery management plans and natural disasters.

Progress toward this objective over the next 5 years will include:

- *Improved sampling and estimation designs that reduce the potential for bias and provide more accurate recreational catch and effort statistics are developed and tested.*
- *Precision, timeliness, and spatial resolution of recreational catch and effort estimates are increased.*
- *National data collection standards for recreational fishing catch and effort surveys are developed.*
- *Survey coverage to include more fishery processors is improved.*
- *Improved data collection methods are implemented.*
- *NOAA Seafood Inspection Program operations are streamlined to reduce burden on survey respondents.*

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## FOCUS: IMPROVING ASSESSMENTS: LIVING MARINE RESOURCES, ECOSYSTEMS, HABITATS, AND FISHING COMMUNITIES

ST conducts a variety of activities to improve assessments. ST plans, hosts, coordinates, and leads a number of initiatives to integrate climate, ecosystem, and habitat related information into assessments. These efforts are fostered through assessment reviews, workshops, development of models, and working group organization, among other tools and strategies.

Research conducted and coordinated by ST is an important aspect in an ongoing cycle that includes development and enhancement of survey designs, transitioning new survey designs to an operational state, and maintaining the survey operations. Ongoing research is necessary to address the dynamic needs of fisheries management and assess new developments in survey research methods.

ST also conducts research on commercial fisheries to inform fishery management policy design and develop the capability to evaluate the economic impact of management decisions. Research on optimum yield—in economic terms bounded by acceptable biological catch and annual catch limits—examines risk and foregone economic yield in relation to optimal rebuilding times. ST leads efforts to estimate fishing capacity and technical efficiency (production relative to potential production) of fisheries to meet national requirements and international plans of action. ST conducts research on the relationship between fishery management and vessel safety and is engaged in developing vessel safety performance measures.

*Objective: Guide science programs and support implementation of assessment improvement plans to ensure that assessments are high-quality and represent the best science available to managers.*

Improving the science of stock assessments is a critical research area for NOAA Fisheries. Currently, ST leads this effort through the coordination of stock assessment research and standardization of methods. ST chairs the Assessment Methods Working Group, which coordinates projects to improve fish stock assessment precision, accuracy, and methods and to support development, testing, standardization, and documentation of analytical methods for stock assessment. This includes support of projects researching assessment methods, support for a software package for the development of nonlinear models, and leading a stock assessment toolbox effort. These combined efforts facilitate consistency, accuracy, accessibility, and ease-of-use for computerized mathematical models used to conduct fish stock assessments. ST also holds biennial workshops to bring together scientists from NOAA Fisheries and academia to discuss methods for assessing the status of fish stocks and for using these results to provide scientific guidance for fishery management. ST will continue to work toward improved stock assessment capability.

ST leads the national fish stock assessment program, and will continue coordinating with the Centers and offering science support as needed to ensure high-quality stock assessments are available to provide information required

by managers. The *Marine Fisheries Stock Assessment Improvement Plan (SAIP; 2001)*<sup>2</sup> calls for increasing the number of stocks assessed, elevating stock assessments to national standards of excellence, producing next-generation stock assessments, and increasing support for the stock assessment enterprise. ST is responsible for implementation of the SAIP at the national level, planning for future improvement of NOAA Fisheries stock assessment capability, and advocating for increased support for the stock assessment program. Program evaluation from a scientific perspective ensures the performance, quality, and content of assessment products. Additionally, ST is responsible for organizing national-level stock assessment results, and providing input for stock-related data requests and national agency reports, such as *Our Living Oceans* and the annual *Report to Congress on the Status of U.S. Fisheries*. Communication of stock assessment results to the government, stakeholders, and the public facilitates implementation of fishery management goals.

NOAA Fisheries also has responsibilities for protected species and habitat assessments. ST works to identify research priorities and resource needs for improved monitoring and evaluation of protected species. ST supports protected species stock assessments and compiles data for a national-scale analysis of bycatch in U.S. fisheries. ST also focuses on coordinating national habitat science efforts and meeting the goals outlined in the *Marine Fisheries Habitat Assessment Improvement Plan (2010)*<sup>3</sup> such as addressing current gaps in NOAA Fisheries habitat science, steps to improve habitat assessments, and the need for a nationally coordinated habitat science program.

ST coordinates the development of analytical tools and advanced technologies to augment protected species data collection efforts, improve the quality and quantity of stock assessments, and support management actions. Additionally, ST coordinates a Protected Species Science Working Group to address critical protected species science issues and facilitate the organization of national-level workshops to improve protected species stock assessment methods and the use of advanced technologies to cover maximum species and answer multi-dimensional questions that support MMPA and ESA mandates.

Improving the science for assessing and mapping the habitats of living marine resources is a key aspect of improving fish and protected resources assessments, ecosystem assessments, designation and management of Essential Fish Habitat (EFH), and identification of Critical Habitat for ESA-listed species. ST develops strategies and coordinates projects to improve the agency's capabilities to conduct habitat science and incorporate the results of this science into management advice. ST also coordinates the agency's work on developing priorities for habitat assessment and facilitates the integration of science into the NOAA habitat initiatives. ST also holds a biennial workshop that brings together habitat and stock assessment scientists and managers to improve collaboration and address emerging issues.

ST will continue to work toward meeting goals for improving assessments.

Progress toward this objective over the next 5 years will include:

- *Stock assessment capacity, capability, and performance are increased.*
- *National Stock Assessment Workshops are held in 2013 and 2015.*
- *Protected resource research priorities are identified and programmatic support is increased.*
- *Efforts to integrate fishery, protected resource, and habitat information in assessments are increased.*
- *The U.S. National Bycatch report is updated biannually in 2013 and 2015.*

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<sup>2</sup> NMFS. 2001. Marine Fisheries Stock Assessment Improvement Plan. Report of the National Marine Fisheries Service National Task Force for Improving Fish Stock Assessments. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-56, 69 p., 25 appendices.

<sup>3</sup> NMFS. 2010. Marine Fisheries habitat assessment improvement plan. Report of the National Marine Fisheries Service Habitat Assessment Improvement Plan Team. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/SPO-108, 115 p.

- *ST, Center, and National Ocean Service scientists develop the coastal component of the National Fish Habitat Partnership program's 2015 national assessment.*
- *Communication and coordination within NOAA Fisheries on protected species science issues are improved.*
- *Quality and frequency of protected resources stock assessments are improved.*
- *NOAA Fisheries habitat assessment priorities are identified in all regions.*
- *Level of EFH information used in assessments is increased.*
- *Habitat science research is funded through an annual competitive process.*
- *National Habitat Assessment Workshops are held in 2012 and 2014.*
- *Inter-line office collaboration on habitat science projects, including the NOAA Habitat Blueprint, is increased.*

*Objective: Enhance the integration of climate and ecosystem information into marine resource management.*

A national priority for marine resources is to adopt ecosystem-based management (EBM). Marine resources are sensitive to factors such as exploitation, environmental variability, climate-related changes, habitat modifications, and anthropogenic sound. EBM enables the consideration of, and interaction between, these factors and ecosystem components. ST develops tools such as indicators and models to better understand impacts to and improve assessments of marine resources. These tools also enable the evaluation of alternate management actions to achieve resource goals and objectives. This information is used to inform management policies and strategies to incorporate new information into management decisions. ST develops and coordinates research programs to advance the incorporation of climate and ecosystem information into living marine resource management and will continue to support these initiatives to perpetuate the adoption of EBM.

Progress toward this objective over the next 5 years will include:

- *Development of ecological and oceanographic indicators and forecasting models used to improve stock and ecosystem assessments is continued.*
- *National, cross-NOAA coordination of the Integrated Ecosystem Assessment framework for organizing and synthesizing science to inform multi-scale, multi-sector EBM is expanded.*
- *Coordination of climate research activities to increase the understanding of, and the capacity to reduce the impacts of, climate change and ocean acidification on marine ecosystems is improved.*
- *Policies and strategies to incorporate climate change into living marine resource management and identify climate adaptation strategies are promoted.*
- *Impacts of habitat modification on productivity, species interaction, and ecosystem function are better understood.*
- *Impacts of anthropogenic sound in the oceans on marine species are better understood and scientific advice for regulatory and policy decisions is developed.*
- *International programs are provided with expert advice on implementing EBM approaches to assessing, recovering, and sustaining living marine resources and environments in developing countries.*

*Objective: Develop decision support tools for recreational and commercial ocean use activities.*

ST has helped develop an integrated decision support tool for assessing the benefits associated with recreational fishing management options. A key feature of the model is the integration of recreational fishing behavior with the age-structured population model used by NOAA Fisheries stock assessment scientists. The integrated model can be used to analyze the economic effects of size and possession limits in a recreational fishery and the economic benefit streams associated with rebuilding. Recognizing the increasing role of spatial management for integrated ecosystem assessments and ecosystem-based fisheries management, ST also supports research and



development of behavioral models to predict commercial fishing response to and the economic trade-offs of alternative spatial management options.

Progress toward this objective over the next 5 years will include:

- *Model applications are expanded to all NOAA Fisheries regions.*
- *Economics surveys to underpin models are designed and implemented.*
- *Spatial economic analysis techniques for fisheries are developed.*
- *Independent peer reviews of regionally specific tools are conducted.*

*Objective: Develop tools to estimate economic and stakeholder valuation of marine ecosystem goods and services.*

ST, both independently and in coordination with the Science Centers, uses economic research methods to estimate local, regional, and national public values for marine ecosystem goods and services that are not traded in the market. For example, ST estimates regional values for marine protected areas and the change in value from increasing or decreasing size and use restrictions within protected area boundaries. These values assist in designing and designating marine protected areas that address both ecological and economic needs, directly supporting comprehensive spatial marine planning. Similarly, ST estimates the economic value of recovering threatened and endangered marine species. These values provide a benefit measure to assist in protected species recovery planning and an estimate of the public value of services provided by marine ecosystems.

ST also conducts survey research to understand stakeholder needs, expectations, attitudes, and preferences for managing marine ecosystems and to provide a basis for informed decision-making. Survey research is driven by management needs and priorities and is generally targeted toward specific stakeholder and constituent groups. Survey research has been used to better understand stakeholder expectations and preferences for ecosystem-based fisheries management, stakeholder perceptions of current fisheries management, and angler motivations for catch disposition. Understanding anglers' preferences for rebuilding and rebuilt fisheries has been identified as a priority research need.

Progress toward this objective over the next 5 years will include:

- *Understanding of the trade-offs associated with marine spatial management options in each NOAA Fisheries region is increased.*
- *Number of protected resources species for which economic value is determined is increased.*
- *Regional-scale estimates for protected species economic value are developed to complement existing national-scale estimates.*
- *Understanding of stakeholder preferences and attitudes related to fishery management objectives is increased.*

### THEME 3: MANAGE AND DISSEMINATE INFORMATION

Effective information management and dissemination are essential to ST's vision of serving as a trusted source of the scientific information and advice needed to ensure that Americans enjoy the sustained riches and benefits of healthy and diverse marine ecosystems. ST approaches this through three interrelated focal areas that address how data are managed, analyzed, and disseminated.

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## FOCUS: ENTERPRISE DATA MANAGEMENT

Enterprise Data Management is the discipline of data management, applied by today's best data driven organizations such as NOAA Fisheries. The ST Enterprise Data Management program assists regional offices and science centers nation-wide in implementing best practices for data management. ST also helps regional office and science centers in measuring the positive results.

*Objective: Assist programs throughout NOAA Fisheries to improve their operations through the application of best data management practices.*

Data management is advanced by the Fisheries Information Management Advisory Committee, which is chaired by ST's Information Architect and funded by ST. The Fisheries Information Management Advisory Committee's role is to help programs identify their operational effectiveness goals, define best practices in the form of procedural directives, match identified operational effectiveness goals with best practices, and assist management to achieve their goals using data management plans.

Effectiveness goals that are achievable through Enterprise Data Management are:

- *Analytic capability*
- *Speed of process, from data collection to final analysis*
- *Efficiency*
- *Accuracy*
- *Cost Reduction*
- *Confidence in data integrity and analytical results*

Policies and directives that are generated by the Advisory Committee are implemented in part by the ST funded Fisheries Information System Program. The Fisheries Information System Program produces and maintains data systems such as InPort and FOSS. InPort provides users, both inside NOAA Fisheries and in the public, with information about all NOAA Fisheries data collections. FOSS provides access to the actual data for analysis, reporting, and management decision support purposes.

Progress toward this objective over the next 5 years will include:

- New procedural directives will be added to fully define best practices.
- A complete inventory of important Fisheries data systems will be made available through *InPort*.
- Expansion of best practices, in collaboration with data users and stewards.
- Provide resources for program managers who hope to improve the effectiveness of their operations and measure results.
- Maximize the use of shared resources by collaborating with other EDM related groups within (and external to) NOAA.
- Sharing of data management solutions nationwide.

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## FOCUS: DATA ANALYSIS AND DECISION-SUPPORT SYSTEMS

ST provides a national focal point for regional and national biological, ecological, and socio-economic data collections, and in some cases provides a worldwide view of ecosystem-related data through use of geographic data visualization tools. Data analysis and management decision support systems are developed to provide efficient data processing and management. Tools are built for timeliness of information access and reporting capabilities. These systems and tools will provide an integrated and comprehensive environment to support marine resource management decision-making.

*Objective: Provide tools for reporting and analyzing data for public access to up-to-date fisheries information.*

ST supports public and internal reporting requirements by hosting the most up-to-date information on the status of managed stocks and stock assessments as well as fishery-independent surveys. In addition, ST provides bycatch estimates by fishery, species, and stock. These integrated systems have flexible querying, mapping, and reporting capabilities to analyze impacts of changes through time. These reports enable ST to understand, forecast, and mitigate the impacts of budget changes; make strategic management decisions on fisheries monitoring and assessment priorities; and make this information available to the public as appropriate. ST will continue working to improve data analysis and dissemination of information.

Progress toward this objective over the next 5 years will include:

- *Improved data analysis provided by linking assessments, surveys, observations, and statistics through common elements such as time, geography, species, and gear type.*
- *Information is disseminated in readily accessible formats.*

*Objective: Improve the existing and future framework for collaboration with NOAA partners who collect, manage, and disseminate fisheries-dependent information.*

Easy access to up-to-date, high-quality information on U.S. fisheries is needed to support marine resource stewardship. This includes developing electronic systems for fishery-related topics such as permits, landings, trip tickets, and reporting. ST administers and coordinates projects to build and enhance partnerships for fisheries information systems. These projects develop processes and technologies that improve the accuracy, completeness, timeliness, and accessibility of fisheries information.

ST will share, promote, and expand our national fishery data code standards for identifying information such as gear type, species identification, catch reporting areas, and location names. Implementation of standards provides a common ground that supports a consistent national view of regional fishery data collection programs without compromising the quality and integrity of the underlying data.

The internet provides an effective pathway for ST to disseminate information to stakeholders. To make this pathway between ST information publishers and stakeholders more direct, ST will implement a Content Management System to streamline the process for updating web-based access to fisheries information. This makes it easier for ST staff to create, manage, edit, and publish web content (documents, text, images, and data), allowing ST to provide more timely, accurate, and engaging information.

Through joint efforts with partners, ST will support the move toward “one-stop shopping” for all fisheries information at state, regional, and national levels.

Progress toward this objective over the next 5 years will include:

- *Electronic information collection is expanded and adapted to meet needs for information on U.S. fisheries.*
- *Timeliness and accuracy of U.S. fishery-dependent information are improved.*
- *Existing data collection systems are catalogued, facilitating the development and implementation of national standards for information collection and management.*
- *Integrated information management systems are developed within and across regions.*
- *Better systems for collection of data on aquaculture are developed and implemented.*
- *Increased number of fishery datasets contain standard fishery codes.*
- *Existing national code standards are incorporated into fishery datasets where applicable.*
- *Historical datasets are cross-referenced with national fishery codes to facilitate time series and spatial analysis.*
- *Approaches are developed to increase use of standard fishery codes.*
- *Timeliness and efficiency of web-based information dissemination are improved through a Content Management System.*

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## FOCUS: SCIENTIFIC INFORMATION MANAGEMENT AND INFORMATION TECHNOLOGY

ST supports, facilitates, and coordinates NOAA Fisheries’ scientific enterprise, which is the “business” of providing the best available ecosystem science to living marine resource managers and the public. ST develops and maintains information systems that track scientific proposals, help scientists manage the details surrounding stock assessments and fishery-independent surveys, and provide tools for planning future fishery vessel deployment and field-based statistical survey logistics and execution.

*Objective: Use modern, secure information technology to manage scientific information.*

None of ST’s information systems would be possible without modern, capable, and secure information technology and operations. ST manages computer servers, networking devices, and data storage, as well as server software and systems such as web server software and relational databases. ST maintains all of these systems through adherence to strict security controls.

In the coming years ST will decrease its reliance on physical computers, opting to follow the Administration’s “cloud first” directive by moving the infrastructure to off-site virtual servers where possible. Doing so will allow more efficiency and agility in IT operations, saving money and space. ST will also encourage web application accessibility through mobile devices with mobile web development, allowing for greater access to fisheries data. ST will continue to work closely with scientific program managers to be more efficient with systems and resources.

Progress toward this objective over the next 5 years will include:

- *Efficiency and space utilization will increase through use of virtual cloud-computing capabilities.*
- *Fisheries data accessibility will increase through development of mobile device applications*

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## FOCUS: SCIENTIFIC PUBLICATIONS

NOAA Fisheries has been publishing scientific materials since 1872. Scientific publications are the primary basis for communicating research results, stimulating future research, and supporting fisheries management and policy statements.

*Objective: Editing, publishing, and disseminating peer-reviewed professional papers, special publications, and technical memoranda to document fisheries research.*

ST is responsible for editing, publishing, and disseminating (electronic and print) NOAA Fisheries' peer-reviewed scientific journals, professional papers, special publications, and technical memoranda. ST provides added value to the NOAA Fisheries science enterprise by ensuring the highest quality in its published works and by its effective presentation and dissemination. Added value is provided by the external peer-review process, professional editing and publishing, and dissemination of both printed and free web-based electronic copies of the published papers. NOAA Fisheries research is broadly available to fisheries scientists and other interested parties. Future enhancement of the electronic scientific record will include adding science documents produced by the agency during the last 140 years and structuring them into more easily accessible formats to broaden public availability.

Progress toward this objective over the next 5 years will include:

- *Electronic availability is increased for NOAA publications previously available only in print form.*
- *Citation of NOAA Fisheries journal articles and technical reports is increased in the scientific literature.*

## THEME 4: INTEGRATE AND COORDINATE SUPPORT SERVICES

ST performs a number of diverse integration and coordination support services. ST is active in standardizing processes across the Centers, NOAA Fisheries, and NOAA to aid in managing the science enterprise. Through coordination of educational training efforts, ST works to increase fisheries capacity and capability for the future. ST also engages in coordination and support of intra-agency, interagency, and international working groups that exchange information to develop policy and scientific strategy.

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## FOCUS: NOAA AND NOAA FISHERIES STRATEGIC PLANNING

Overarching strategic planning efforts for NOAA and NOAA Fisheries science activities addressing the objectives of NOAA's Healthy Oceans Goal are carried out within the guidelines of the NOAA Strategy Execution and Evaluation (SEE) process. SEE enables NOAA to gauge performance of its programs while responding to economic, governmental, social, and environmental forces. This multi-line-office effort brings forth the most relevant and timely information on living marine resource and ecosystem monitoring, assessment, and forecasting activities, and the funding and capabilities needed to sustain and improve them.

*Objective: Coordinate NOAA Fisheries science activities across Centers, line offices, and goal teams to address agency strategic objectives and goals.*

Strategic planning for science activities is the primary responsibility of the NOAA Fisheries Ecosystem Science Team (NEST) within ST. NEST identifies and communicates science program needs, requirements, solutions, and performance assessments to all levels of leadership within the SEE hierarchy. NEST interfaces with scientists across the six Centers, the NOAA Office of Program Planning and Integration, the Healthy Ocean Goal team, the NOAA Fisheries Office of Management and Budget, and other relevant NOAA Fisheries offices and cross-NOAA collaborators. This ongoing communication ensures that strategic science needs, performance metrics, and goals are vetted and incorporated into implementation plans, budget documents, and responses to congressional questions. In addition to leading NOAA Fisheries science strategic planning, NEST supports the budget, programming, and execution of NOAA Fisheries science funds through budget narratives, development of out-year funding scenarios, draft spend plans, and performance reports.

The strategic planners within NEST work to address the scientific requirements set by NOAA's legislative mandates. NEST works to align scientific activities conducted in the Centers with the management requirements to meet these mandates, thus ensuring the continuation of appropriate activities and the long-term health and sustainability of living marine resources.

Progress toward this objective over the next 5 years will include:

- *Timely implementation of the annual SEE process is continued.*
- *Provision of NOAA Fisheries and Healthy Oceans Goal Team input into the NOAA Five-Year Strategic Plan is continued.*
- *Science Board input into strategic planning process is increased.*
- *Coordination of input between Center and NOAA strategic plans is improved.*

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## FOCUS: SCIENTIFIC DATA AND INFORMATION QUALITY MANAGEMENT

Recent adoption of the NOAA Scientific Integrity Policy highlights the importance, as a science-based agency, of the quality of scientific data, analyses, and information produced through agency activities. ST is developing internal policies that are consistent with the Policy and related guidance. ST supports a number of activities aimed at ensuring the integrity of the NOAA and NOAA Fisheries science enterprise.

*Objective: Develop and implement standardized program reviews in NOAA Fisheries Science Centers and ST.*

While NOAA Fisheries has a long tradition of reviewing its scientific programs, ST is coordinating the development and implementation of a standardized science program review on a 5-year cycle that examines a common, annual program theme at each Center and ST. These standardized reviews will allow NOAA Fisheries to examine programs across its science enterprise and plan strategically for the future. Comparisons of the activities at each Center will identify commonalities, gaps, and efficiencies that can be gained by better coordinating Center activities. The first full review cycle will be completed from 2013 to 2017.

Progress toward this objective over the next 5 years will include:

- *A national overview of Center and ST strategic priorities is developed.*
- *The first round of annual standardized reviews of ST and Centers in fiscal years 2013– 2017 is completed.*

*Objective: Monitor science quality through independent peer review.*

ST ensures the quality of science for regional living marine resource management by conducting independent peer reviews through the Center for Independent Experts, and the Scientific and Statistical Committees associated with each fishery management council. ST also provides coordination of NOAA Fisheries activities regarding implementation of the Data Quality Act (also known as the Information Quality Act).

Progress toward this objective over the next 5 years will include:

- *Funding is maintained for the Center for Independent Experts.*
- *Independent reviews of stock assessments and science products are conducted.*
- *Support of Scientific and Statistical Committees is continued.*

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#### FOCUS: INTRA-AGENCY AND INTERAGENCY PLANNING AND COORDINATION

An important role of ST is its involvement in planning and coordination at numerous levels. Many ST staff members participate in ad hoc or standing working groups that involve planning and coordination within the divisions of ST, between offices of NOAA Fisheries or other NOAA line offices, or between NOAA and other government agencies, non-governmental agencies, and international entities.

*Objective: Exchange of information, improving and refining scientific protocols, development of NOAA policy and guidance, and providing input on inter-agency reports.*

ST staff participate in and coordinate a diverse array of science and policy activities. Some projects are undertaken with the goal of improving science communication within the office and to the public. Other activities include participation on working groups that rely on scientific expertise to improve existing and develop new scientific protocols. ST staff support the development of program, office, and NOAA research strategic plans to make sure NOAA-level and Center-level priorities are represented. ST staff are also working to develop NOAA policies to attract, promote, and retain top-notch scientists. ST provides membership on working groups that play an integral role in developing national strategies and guidance policies. When called upon, ST will continue to participate in planning and coordination activities to support both agency and interagency needs.

Progress toward this objective over the next 5 years will include:

- *NOAA Research and Development Plan is coordinated with ST and Center Strategic Research Plans.*
- *NOAA administrative order establishing a science career track is adopted and implemented.*
- *Participation of ST staff on intra-agency and interagency working groups is continued.*

*Objective: Contribute to NOAA-wide and national Earth and ocean observing systems.*

NOAA Fisheries makes a significant contribution to a larger NOAA-wide and national portfolio of Earth and ocean observations (e.g., U.S. Integrated Ocean Observing System). ST articulates the breadth and critical nature of our observing systems to meet national mandates for marine resource science and management.

Progress toward this objective over the next 5 years will include:

- *Biological, ecosystem, and socio-economic monitoring and observing capacity are advanced as an integral component of the observing system portfolio of NOAA and the Nation.*

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#### FOCUS: SCIENCE EDUCATION

ST's education and outreach efforts primarily focus on building capacity and increasing diversity in NOAA Fisheries science workforce, particularly in the field of stock assessment science and marine resource economics. These efforts include supporting faculty and students both domestically and internationally.

*Objective: Build capacity and increase diversity in the scientific workforce and support education and outreach to increase national and international understanding of fisheries issues.*

ST provides funding and national coordination for faculty in the field of stock assessment science at several academic institutions around the country to help train the next generation of stock assessment scientists. ST also provides staff and funding for graduate fellowship programs designed to introduce qualified applicants to NOAA Fisheries and encourage them to pursue careers in stock assessment science and marine resource economics, critical need areas for NOAA Fisheries. ST provides staff support and non-monetary resources to enhance and strengthen a cooperative agreement between NOAA and a consortium of seven minority-serving institutions focused on preparing a diverse student body for careers in marine and fisheries sciences. In addition, ST manages funds and promotes ocean literacy and careers in fishery science to diverse, inner-city K-12 students with a focus at the secondary level.

Progress toward this objective over the next 5 years will include:

- *Number of trained stock assessment scientists and marine resource economics is increased.*
- *Diversity of NOAA Fisheries workforce is increased.*
- *Public literacy in the areas of oceans and the environment is increased.*

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#### FOCUS: INTERNATIONAL SCIENCE COORDINATION

NOAA Fisheries' ability to achieve many of its marine resource goals is enhanced through its science enterprise and international partnerships. NOAA Fisheries international science activities are a critical component for providing the best available science to inform and guide the conservation of marine resources.



*Objective: Support NOAA Fisheries international science enterprise by implementing NOAA Fisheries International Science Strategy.*

ST helps coordinate NOAA Fisheries international science enterprise across all Centers through the implementation of the NOAA Fisheries International Science Strategy. The Strategy provides the framework by which NOAA Fisheries supports: a) meeting U.S. obligations to provide science advice to Regional Fishery Management Organizations and international bodies, b) participation in bilateral and multilateral science agreements, and c) efforts to strengthen fishery science capacity in other countries. These investments in the international science arena, including leadership roles in organizations such as the International Council for the Exploration of the Sea, Large Marine Ecosystems, the North Pacific Marine Science Organization, and the International Whaling Commission strengthen NOAA Fisheries' science capacity to support the management and conservation of marine resources.

Progress toward this objective over the next 5 years will include:

- *The International Science competitive program, initiated in 2012 to provide dedicated funds to support international fisheries science activities, is maintained and funding is increased.*
- *Number of scientific staff exchanges with partner countries is increased.*
- *Exchange of fisheries data between the U.S. and partner countries to strengthen knowledge and conduct assessments for migratory species is increased.*
- *Agreement between ST and NOAA Fisheries Office of International Affairs is established to strengthen coordination and standard operating procedures for addressing international science and management programs.*

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#### FOCUS: SCIENCE BOARD AND SCIENCE OPERATIONS BOARD SUPPORT

ST provides administrative and logistical support for the NOAA Fisheries Science Board and Science Operations Board.

*Objective: Support coordination across the Centers at the Director and Deputy Director level.*

The NOAA Fisheries Science Board is made up of the NMFS Chief Science Advisor, who serves as the Board's chair, the Director of Science and Technology, and the Science Directors from each of the six regional Fisheries Science Centers. The Science Board meets routinely with objectives to: 1) ensure the integrity and quality of NOAA Fisheries science; 2) address national science issues and programs; and 3) develop national science policy. Similarly, the Science Operations Board consists of the Deputy Directors of each of the Centers, and addresses operational needs across the Centers.

Progress toward this objective over the next 5 years will include:

- *Coordination and collaboration are increased between NOAA Fisheries Science Centers.*

- *Science Board Meetings are coordinated with the strategic planning cycle to provide a mechanism for regular reporting to the Board and to solicit their feedback.*

## RESEARCH INFRASTRUCTURE AND SUPPORT

ST maintains office space at NOAA Headquarters in Silver Spring, Maryland. The activities undertaken by ST require the support of technical and administrative staff whose dedication and expertise ensure the smooth function of the office. Many ST scientific staff members, in addition to performing their routine duties, are trained to support the office in areas such as contracts administration.

ST supports NOAA's efforts to modernize its fleet of fisheries, oceanographic, and hydrographic survey ships by making sure NOAA Fisheries requirements are taken into consideration in design and development. Considerable effort is expended toward ensuring that NOAA research vessels incorporate ship-quieting technology, dynamic positioning capability, ship-to-ship and ship-to-shore communication and data links, extensive laboratories, direct sampling gear, and a full suite of modern scientific instrumentation including multi-beam and multi-frequency acoustic technologies for concurrent fisheries and oceanographic research. Continuous automated environmental observations collected while underway provide richer and more efficiently collected data streams.

## IMPLEMENTATION STRATEGY

With input from existing Center implementation processes, ST will develop an implementation plan that guides the decision-making process for executing the ST Strategic Science Plan in concert with the Strategic Science Plans developed for each Center. This process will include compiling and analyzing information to make and communicate resource allocation decisions in order to meet the priority objectives and activities outlined in the Strategic Science Plan. The ST and Center Implementation Plans will be discussed among the Science Board as needed for making decisions across the NOAA Fisheries science enterprise.