

## NOAA Technical Memorandum NMFS-NE-239

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# Northeast Regional Action Plan – NOAA Fisheries Climate Science Strategy

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# 1. EXECUTIVE SUMMARY

The Northeast U.S. Shelf Ecosystem supports a wide array of living marine resources from Atlantic sea scallops, one of the most valuable, to the North Atlantic Right whale, one of the most endangered. All of these resources - fish, invertebrates, marine mammals, sea turtles, plants, habitats, and other ecosystem components - are being impacted by climate change and multidecadal climate variability. In fact, the pace of observed climate change in the Northeast U.S. is faster than in many other U.S. Large Marine Ecosystems, and future change in the Northeast U.S. Shelf ecosystem is projected to be greater than many other portions of the world's oceans. These changes in climate are already creating significant challenges for the region. Species distributions are becoming out of sync with the spatial allocations of management. The productivity of some iconic species is decreasing, making rebuilding and recovery difficult. Some ports rely on one or two fisheries; changes in these fisheries could have dramatic consequences for the human communities connected to these ports. Changes in science and management can be slow, while changes in the physics, chemistry, and biology of the ecosystem are occurring rapidly. Despite these challenges, there are opportunities. Some species in the region are responding positively to the changes in climate: moving into the region and increasing in productivity. For many managed species, management actions can occur relatively rapidly: the New England Fisheries Management Council (NEFMC) and Mid-Atlantic Fisheries Management Council (MAFMC) have developed specification procedures and framework adjustments that can be implemented within a year of receiving new, peer-reviewed advice. The region has an excellent marine science infrastructure and advanced technologies offer new tools for observing, understanding, and adapting to change. Recognizing the opportunities and challenges resulting from climate change, NOAA Fisheries released the Climate Science Strategy in August 2015. This Strategy develops a national framework to meet the growing demand for information to better prepare for and respond to climate-related impacts on the nation's living marine resources and resource-dependent communities.

The Strategy calls on each region to develop a Regional Action Plan to customize and execute the Strategy over the next 3-5 years. The Plan and Strategy cover all NOAA Fisheries mission elements: sustainable fisheries, protected resources, aquaculture, habitat, and ecosystems; work is needed across all of these mission elements. Here, the Northeast Regional Action Plan (NERAP) applies to the Northeast U.S. Shelf Ecosystem, which extends from North Carolina to Maine, and includes watersheds, estuaries, the continental shelf and the open ocean. The Northeast Regional Action Plan identifies 15 NERAP Actions of highest priority. These actions are ordered by the objectives of the NOAA Fisheries Climate Science Strategy (e.g., NERAP Action 1 is associated with Objective 1 of the Strategy). Actions are prioritized for *No New Resources* and *New Resources* scenarios ([Table 1](#)). Under *No New Resources*, the Plan describes actions that can be taken to advance the NOAA Fisheries Climate Science Strategy at current funding and staffing levels. These actions are broadly consistent with activities currently underway at Northeast Fisheries Science Center (NEFSC) and the Greater Atlantic Regional Fishery Office (GARFO) and within the region but will require greater integration across the NEFSC and GARFO and greater collaboration with partners throughout the region. Under *New Resources*, the Plan prioritizes actions that can be taken with \$2 million in additional funding. The description of actions under *New Resources* is limited and does not encompass everything that is needed to accomplish the action.

The recommended Northeast Regional Action Plan (NERAP) actions are:

NERAP Action 1 - Give greater emphasis to climate-related Terms of Reference and analyses in stock assessments.

NERAP Action 2 - Continue development of stock assessment models that include environmental terms (e.g., temperature, ocean acidification).

NERAP Action 3 - Develop climate- related products and decision support tools to support protected species assessments and other management actions.

NERAP Action 4 - Increase social and economic scientist involvement in climate change research through multidisciplinary work on climate that includes both social and natural sciences.

NERAP Action 5 - Develop Management Strategy Evaluation capability to examine the effect of different management strategies under climate change.

NERAP Action 6 - Improve spatial management of living marine resources through an increased understanding of spatial and temporal distributions, migration, and phenology.

NERAP Action 7 - Continue to build industry-based fisheries and ocean observing capabilities and use information to develop more adaptive management.

NERAP Action 8 - Work with NOAA Oceanic and Atmospheric Research and academic scientists to develop short-term (day to year) and medium-term (year to decade) living marine resource forecasting products.

NERAP Action 9 - Work with NOAA Oceanic and Atmospheric Research and academic scientists to develop and improve regional hindcasts and climatologies.

NERAP Action 10 - Conduct research on the mechanistic effects of multiple climate factors on living marine resources with a goal of improving assessments and scientific advice provided to managers.

NERAP Action 11 - Develop and implement vulnerability assessments in the Northeast U.S. Shelf Region.

NERAP Action 12 - Continue production of the NEFSC Ecosystem Status Report, and other related products, and improve the distribution of information from the reports through the formation of an NEFSC Environmental Data Center.

NERAP Action 13 – Maintain ecosystem survey effort in the Northeast U.S. Shelf ecosystem including the Bottom Trawl Survey, Ecosystem Monitoring Program, Sea Scallop Survey, Northern Shrimp Survey, Clam Survey, and Protected Species Surveys and expand where possible (e.g., data poor species).

[NERAP Action 14 – Initiate a Northeast Climate Science Strategy Steering Group \(NECSSSG\) to coordinate, communicate, facilitate, and report on issues related to climate change and living marine resource management.](#)

[NERAP Action 15 – Coordinate with other NOAA Programs to link living marine resource science and management to climate science and research activities](#)

A critical element of this Action Plan is partnerships. The challenges are great, the issues are complex, and resources are limited. By working together, we can reduce the impacts of climate change on living marine resources and increase the resilience of the ecosystem to this change, including living marine resources and the people, businesses, and communities that depend on them.

## 2. INTRODUCTION

The NOAA Fisheries Climate Science Strategy seeks to increase the production, delivery, and use of the climate-related information required to fulfill the National Marine Fisheries Service (NOAA Fisheries) mandates (Link et al. 2015). These mandates are derived from numerous statutes, primarily the Magnuson-Stevens Fishery Conservation and Management Act (MSA); Fish and Wildlife Coordination Act (FWCA); Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA); Endangered Species Act (ESA); Marine Mammal Protection Act (MMPA); National Aquaculture Act (NAA); Coral Reef Conservation Act (CRCA); and the National Environmental Policy Act (NEPA). There are also a number of other statutes and Executive Orders that have bearing on the mission of NOAA Fisheries including the Federal Ocean Acidification and Monitoring Act (FOARAM); Federal Power Act; Clean Water Act; Coastal Zone Management Act; Comprehensive Environmental Response, Compensation, and Liability Act; Oil Pollution Act; Fish and Wildlife Coordination Act; Coastal Wetlands Planning, Protection, and Restoration Act; American Recovery and Reinvestment Act; Executive Order 13547 Stewardship of the Ocean, Our Coasts, and the Great Lakes; Executive Order 13653 Preparing the United States for the Impacts of Climate Change; Executive Order 13642 Making Open and Machine Readable the New Default for Government Information; Executive Order 12898 Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations; and Executive Order 12866 Regulatory Planning and Review.

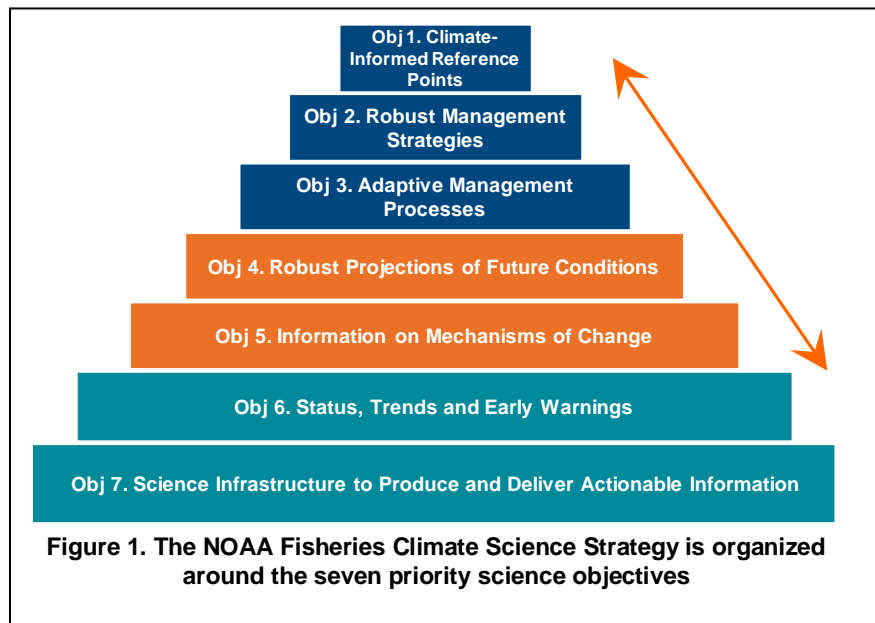
In general, these mandates are intended to instruct and support NOAA Fisheries to work in 5 thematic areas: fisheries, protected species<sup>1</sup>, aquaculture, habitats, and ecosystems. NOAA Fisheries primarily focuses on fisheries in federal waters, that being generally 3 miles from the coast to the 200 mile extent of the Exclusive Economic Zone (EEZ). However, many marine species also use coastal, estuarine, and fresh waters during some portion of their life cycle, which can broaden the spatial scope of NOAA Fisheries activities in the region. Further complicating the mission, many species migrate outside the U.S. EEZ into other national jurisdictions or international waters. Multiple fisheries also interact with marine mammals and other protected

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<sup>1</sup> For the purposes of this document only, “protected species” refers to ESA listed species, MMPA protected marine mammals, ESA Candidate Species and Species of Concern.

species. Moreover, the MSA requires consideration of human communities and fishing industries (Clay and Olson 2008), food production (Olson et al. 2014), and the sustainability of marine species and their habitats (Fluharty 2000). Further, before designation of critical habitat under the ESA, careful consideration must be given to economic impacts ([NOAA Fisheries Critical Habitat website](#)). Clearly, the NOAA Fisheries mission of science and management activities extends from the headwaters of watersheds to the deep ocean and includes interactions among physical, chemical, biological, and human components of ecosystems.

One requirement of the NOAA Fisheries Climate Science Strategy is for each region to develop a Regional Action Plan. The NOAA Fisheries Climate Science Strategy defines 7 interdependent objectives with the goal to inform and fulfill NOAA Fisheries mandates in a changing climate (Figure 1). The Strategy also identifies 4 near-term actions, 1 of which is the



development of Regional Action Plans, to customize and execute the Strategy over the next 3-5 years in a given region. The Northeast Regional Action Plan, addresses this near-term action. The Northeast U.S. Shelf Ecosystem extends from Cape Hatteras, North Carolina to the western end of the Scotian Shelf and includes the Mid-Atlantic Bight, Southern New England, Georges Bank, and the Gulf of Maine. Regional Action Plans are intended to: (1) identify strengths, weaknesses, and priority needs and actions to implement the 7 National Climate Science Strategy Objectives in each region over the next 5 years; and (2) increase awareness, partnerships and support for these efforts internally and externally at regional to national scales. This document provides information related to both of these goals.

This Northeast Regional Action Plan has 3 sections. The first section – [Development of the Northeast Regional Action Plan](#) - describes the process used to develop the Regional Action Plan. This section starts with a summary of the effects of climate change on living marine resources in the Northeast U.S. The strengths, weaknesses, opportunities, and challenges to implementing the Strategy in the Northeast U.S. are then identified. A range of needs is described and prioritized for the region based on the assessment of strengths and weaknesses and relative to the 7 objectives of the NOAA Fisheries Climate Science Strategy. The second section - [Action Plan](#) - provides more detailed information for the NERAP Actions defined in the Plan. Specific actions under budget neutral (*No New Resources*) and budget increase (*New Resources*) scenarios are described. The third section - [Timeline and Metrics](#) - presents a plan for managing actions under the Regional Action Plan and for evaluating success.

The NOAA Fisheries Climate Science Strategy and Regional Action Plans are closely related to the [NOAA Fisheries Ecosystem-Based Fisheries Management \(EBFM\) Policy](#). One purpose of the EBFM policy is to, “*Build on the agency’s (and its partners’) past progress and clarify the agency’s commitment to integrating its management programs for living marine resources and their habitats under changing climate, ecological, and ocean conditions.*” Further, the [draft EBFM Road Map](#) states, “*NOAA Fisheries, in collaboration with its partners and stakeholders, has already begun the process of implementing EBFM, through the recognition of the need for ecosystem considerations in a number of actions including: . . . The need to better understand, prepare for, and respond to effects of climate variability and change on marine ecosystems and fisheries.*” Thus, implementation of the Northeast Regional Action Plan will be in close coordination with the broader implementation of the EBFM Policy and Road Map regionally and nationally.

### **3. DEVELOPMENT OF THE NORTHEAST REGIONAL ACTION PLAN**

The Northeast Fisheries Science Center (NEFSC) and Greater Atlantic Regional Fisheries Office (GARFO) established a Working Group to develop the Northeast Regional Action Plan. The Working Group is representative of the different components of NEFSC and GARFO, as well as other NOAA Fisheries offices in the Northeast Region (see Appendix A). Two NEFSC and two GARFO staff members formed a smaller Leadership Group from the Working Group (see Appendix A). The Action Plan covers the Northeast U.S. Shelf, which extends from Cape Hatteras, North Carolina, to the western end of the Scotian Shelf and includes the Mid-Atlantic Bight, Southern New England, Georges Bank, and the Gulf of Maine.

Each member of the Working Group was asked, individually, to identify regional strengths, weaknesses, opportunities, challenges, and needs related to each objective of the NOAA Fisheries Climate Science Strategy. The idea was to capture a broad perspective across the related, but varied, GARFO and NEFSC organization. Staff from the New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MAFMC), and Atlantic States Marine Fisheries Commission (ASMFC) were also asked to provide input on regional strengths, weaknesses, opportunities, challenges, and needs related to each objective based on their involvement in fisheries management (see Appendix B). Representatives of different line offices of NOAA (National Ocean Service, Office of Oceanic and Atmospheric Research, National Centers for Environmental Information, other NOAA Fisheries offices) that work in the Northeast U.S. (see Appendix B) were also asked to provide similar input. This input was solicited at the individual level and not meant to represent the official comments of NOAA Line Offices. A list of relevant documents was compiled and reviewed to ensure that existing information was used in the development of the Regional Action Plan (see Appendix C). Finally, the NOAA Fisheries Climate Science Strategy was reviewed to ensure that the priorities identified in the Northeast Regional Action Plan were consistent with priorities identified in the NOAA Fisheries Climate Science Strategy.

The input and review of existing documents was used to complete the assessment of regional strengths, weaknesses, challenges, and opportunities ([Regional Assessment Section](#)) and to draft a list of actions to implement the NOAA Fisheries Climate Science Strategy in the Northeast region. These draft lists of strength, weaknesses, and actions were reviewed by the



working group to ensure completeness and to formulate the draft actions at approximately the same level of detail. The working group then prioritized a list of 63 actions. Working group members were asked to rank actions as high, medium, or low priority. There were no restrictions on the number of actions in each category, but working group members were asked to strive for an even distribution to provide a range in individual rankings. Working group members were given the following guidance/questions to help frame their rankings.

- Respondents should consider NOAA Fisheries mission as a whole
  - “Fisheries” refers to harvested species: managed, unmanaged, highly migratory, etc.
  - “Protected species” refers to ESA listed species, MMPA protected marine mammals, ESA Candidate Species, and Species of Concern unless otherwise specified.
  - “Habitat” components include pelagic, benthic, marine, estuarine, and freshwater areas of the Northeast U.S. Shelf ecosystem.
  - “Ecosystem” components range from physical oceanography to the economic and social aspects of human communities.
  - “Aquaculture” refers to the development and sustainability of cultured plants, invertebrates, and vertebrates.
  - “National Environmental Policy Act (NEPA) issues” references the environmental review of potential impacts of planned projects or permits.
- Does the action address a high priority need in the Northeast U.S. Region?
- Does the action advance climate science related to NOAA Fisheries Mission in the Northeast U.S. Region (NOAA Fisheries Mission and NEFSC and GARFO Strategic Plans)?
- Will the action reduce uncertainty of management advice related to NOAA Fisheries Mission in the Northeast U.S. Region (NOAA Fisheries Mission and NEFSC and GARFO Strategic Plans)?
- Does the action lead to tangible improvements or increased knowledge within the 5 year time frame?

Working group members were asked to identify their top 10 actions if no new resources are available and their top 10 actions if new resources are available. In preranking discussions, Working Group members noted that their prioritization may differ depending on the resources available, so top 10 actions were identified separately for the no new resources and the new resources scenarios. For each of the top 10 actions, working group members were asked to identify, to the best of their ability, the specific steps that should be taken in the next 5 years. Working group members were also asked to identify important partners. Members could state why the action is important and provide additional comments if desired, but these latter 2 responses were optional.

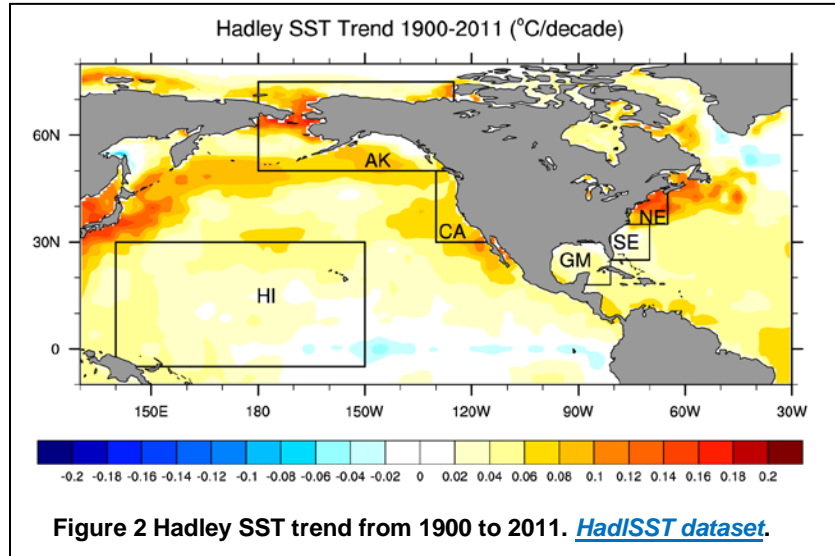
Following Working Group ranking, the leadership group then compiled the ranks and the action statements. The numbers of high, medium, and low ranks were then tabulated for each draft action. The numbers of top 10 ranks were also tabulated for each action. The leadership group then used these rankings, while considering the NOAA Fisheries Climate Science Strategy

and input from external and NOAA Partners (Appendix B), to combine some actions and to identify NERAP actions of highest priority for the region; these NERAP actions are itemized in Section 4 below. The full list of the 63 actions developed and considered by the working group is presented in Appendix D.

NERAP Actions were aligned with the most applicable objective from the NOAA Fisheries Climate

Science Strategy, as well as NOAA Fisheries mission elements. This latter step will help users of the Regional Action Plan to view the actions identified for a particular mission area, as well as the actions identified as overall priorities.

The draft NERAP was then opened for public comment from May 9 – July 29, 2016. Comments were received from 24 individuals / organizations and these comments were considered when finalizing the NERAP.





<http://midatlanticocean.org/wp-content/uploads/2018/04/MACAN-Fact-Sheet.pdf>

### ***Species Habitats Predicted to Move under Continued Ocean Warming***

The animations on this site show projected distributions of suitable thermal habitat for fall and spring based on the NOAA Geophysical Fluid Dynamics Laboratory's high-resolution global climate model (CM2.6). In the 80-year model run, atmospheric CO<sub>2</sub> increases by 1% per year and doubles by year 70. This results in a global surface warming of 2°C (3.6°F), which is equivalent to the 2060-80 time period in the IPCC's RCP8.5 (highest emissions scenario). Therefore, the time steps (60-80) correspond roughly to the years 2060-80 in the IPCC's RCP8.5 emissions scenario. It is important to note that these are ONLY projections of thermal habitat and DO NOT include other important factors such as fishing mortality, species interactions, and bottom-up forcing.

***IPCC*** = Intergovernmental Panel on Climate Change; ***RCP*** = Representative Concentration Pathway