

## DRAFT Climate Science Strategy Regional Action Plan for the South Atlantic NOAA Fisheries Southeast Fisheries Science Center

### BACKGROUND – NOAA FISHERIES NATIONAL CLIMATE SCIENCE STRATEGY

Climate change affects every aspect of the NOAA Fisheries mission from fisheries management to protected species conservation. With this in mind, NOAA Fisheries developed a [National Climate Science Strategy](#) (Strategy) 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 identifies seven common objectives to meet these science information requirements. It is part of a proactive approach to increase the production, delivery, and use of climate-related information to fulfill NOAA Fisheries mandates in a changing climate. Implementing this Strategy will help reduce impacts and increase the resilience of our valuable living marine resources, and the people, businesses, and communities that depend on them.

The seven objectives (Figure 1) are considered interdependent and build from the basic information needs and science capacity through to science-informed decision-making and management:

- Objective 1: Identify appropriate, climate-informed reference points for managing living marine resources (LMRs).
- Objective 2: Identify robust strategies for managing LMRs under changing climate conditions.
- Objective 3: Design adaptive decision processes that can incorporate and respond to changing climate conditions.
- Objective 4: Identify future states of marine and coastal ecosystems, LMRs, and LMR -dependent human communities in a changing climate.
- Objective 5: Identify the mechanisms of climate impacts on ecosystems, LMRs, and LMR-dependent human communities.
- Objective 6: Track trends in ecosystems, LMRs and LMR-dependent human communities and provide early warning of change.
- Objective 7: Build and maintain the science infrastructure needed to fulfill NOAA Fisheries mandates with changing climate conditions.

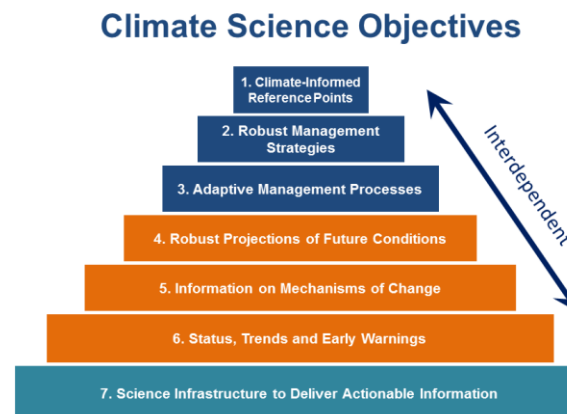


Figure 1. NOAA Fisheries Climate Science Strategy objectives.

The Strategy provides a nationally consistent blueprint to guide efforts by NOAA Fisheries and partners in each region. It is designed to be customized and implemented through Regional Action Plans that focus on identifying and assessing the strengths, weaknesses, priorities, and actions required over the next 3-5 years. Scientists and managers can use regional action plans to prioritize and identify research gaps, identify potential impacts for priority species, and determine best management approaches to reduce impacts and increase resilience of fish stocks, fisheries, and fishing-dependent communities.

The expected results of implementing the Regional Action Plans are:

- **Better tracking** of ecosystem changes that provide early warnings of climate-related changes.
- **Increased understanding** of what's vulnerable and the mechanisms of change.
- **Near and long term forecasts** of ocean and resource conditions.
- **Climate sensitive** resource assessments and biological reference points.
- **Robust management scenarios.**
- **Reduced impacts and increased resilience.**

### ***STATUS OF THE SOUTH ATLANTIC REGIONAL ACTION PLAN***

The draft South Atlantic Regional Action Plan table (Table 1) details specific actions that build regional capacity, strengthen partnerships, and address information needs that will strengthen the ability of the Southeast Fisheries Science Center to continue to support sustainable fisheries, fishing communities, and protected species in the South Atlantic as climate change occurs. We would like to achieve a balance of big picture goals, practical on-the-ground actions, partnership building, and specific scientific studies that address information gaps. We also intend to highlight ongoing research that contributes to our knowledge of South Atlantic climate science.

A team of scientists and managers have been developing and designing the actions in the table, and the draft plan is still in progress. Eventually, the table will be accompanied by supporting text and there may be some re-writing and consolidation of similar actions. While we are not presenting the entire report at this time, the action items included in the table are the heart of our Regional Action Plan and we look forward to input on the actions and the direction we're taking in our plan.

The Action Plan table includes broad time frames for actions to occur over the next five years. We are still working on the staging, sequencing, and finer planning details of the timing of each of these actions. Some of the actions are sequential, and teasing out individual steps for complicated action items will help us resolve the staging of various action items. We expect to refine some timing details where possible, before we release the draft for public review.

We welcome input on feedback on the actions in the table, the staging and sequencing of actions, and the process for making those decisions.

We believe the action plan will greatly benefit from discussion at this stage.

We are still working on refining the details of funding scenarios. Many of the existing actions require an increase in funding. Because we’re currently operating in a challenging fiscal environment, we plan to refine our understanding of which actions or subsets of actions we can initiate with current resources by redistributing effort and funds as appropriate, and in what priority order we would consider the actions. Funding scenarios will be assessed and refined in the table before we release the draft for public review.

For the South Atlantic, and regardless of funding scenarios, some of the highest priorities for climate information, products, and services are:

- Climate vulnerability assessments for priority species.
- Strategic planning that includes:
  - Explicitly considering how climate science is coordinated and prioritized across the SEFSC and with partners.
  - Conducting a data gap analysis in coordination with partners.
  - Identifying climate ready and/or multi-mission cruises in the South Atlantic.
  - Developing a comprehensive and collaborative monitoring program for climate and other ecosystem information together with fisheries, protected species, corals, primary productivity, phytoplankton, and other tropic levels.
- Increased capacity in terms of new FTEs, dedicated staff time, and survey statistics.
- Obtaining and maintaining critical baseline data that for addressing critical science needs.
- Increased emphasis on collaborative research efforts focused on understanding the drivers and mechanisms of climate change in the South Atlantic, including process studies that examine primary productivity, phytoplankton, and other tropic levels.
- Close coordination with Office of Atmospheric Research and Southeast Regional Office scientists.

**Table 1.** Draft South Atlantic Regional Action Plan table.

	<b>Category:</b>	<b>Funding Scenario (Level or Increase)</b>	<b>Time Frame (years) – TENTATIVE</b>	<b>Action Title and Description (short description of who, what, key products and expected outcomes)</b>	<b>Partners/ Notes</b>
<b>Objective 1 – Climate Informed Reference Points</b>					
1	Workshop for Climate Informed	Increase	2017-2021	Plan and hold a workshop or meeting to explore how to develop climate- informed reference points—include timing, who needs to be involved, goals and objectives. Consider making this a national effort,	AOML, University, SEDAR,

	<b>Category:</b>	<b>Funding Scenario (Level or Increase)</b>	<b>Time Frame (years) – TENTATIVE</b>	<b>Action Title and Description (short description of who, what, key products and expected outcomes)</b>	<b>Partners/ Notes</b>
	Reference Points			or have national level touch points.	ICCAT
2	Climate Informed Reference Points	Level/ Increase	2017	Assess whether environmental and climatic impacts have been accounted for in assessments when setting buffers for management reference points.	SAFMC
3	Climate Informed Reference Points	Increase	2017-2021	Incorporate environmental and climatic impacts in the establishment of reference points and use in stock assessments.	
4	Climate Informed Reference Points	Increase	2017-2021	Similar to the precautionary approach applied to fisheries harvest regulations, incorporate explicit climate and ecosystem considerations into developing incidental take recommendations, Essential Fish Habitat Designations, HAPC and other management actions.	
5	Climate Informed Reference Points	Increase	2017-2021	Explore using protected species benchmarks, i.e., coral recovery criteria and potential biological removal (PBR) as climate informed reference points.	
6	Climate Informed Reference Points	Increase	2017-2021	Assess stakeholder priorities to establish societal objectives for resource distribution and productivity in fisheries, and develop reference points to assess the impact of climate change scenarios relative to the societal objectives. Hold a workshop and begin to assess stakeholder priorities, possibly through a pilot workshop.	
7	Climate Informed Reference Points	Increase	2017-2021	Work with HQ to strengthen our ability to share ideas, tools, statistical approaches, etc. for developing climate-informed reference points for priority species with other Science Centers.	AOML, NOAA Science Centers in other regions.

	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – <i>TENTATIVE</i>	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
<b>Objective 2 – Robust Management Strategies</b>					
8	Management strategy evaluation	Increase	2017-2021	Use Management Strategy Evaluations in the region to identify harvest control rules that remain effective as climate changes.	SAFMC
9	Robust Management Strategies	Level/Increase	2017-2021	Continue and expand working collaboratively with the Fishery Management Councils, HMS advisory panel, and other organizations (e.g., FAO, CITES, CMS) to incorporate climate impacts and ecosystem processes in management.	SERO, SAFMC, others
10	Ecosystems Considerations	Increase	2017-2021	Develop an ecosystem considerations summary (similar to <a href="#">Alaska Marine Ecosystem Considerations 2014 Report</a> or SAFE report) for the South Atlantic to accompany management documents, including stock assessments, fishery management plans, Biological Opinions, environmental assessments and environmental impact statements.	SERO, SAFMC
11	Ecosystem Considerations	Increase	2017-2021	Incorporate vulnerability assessments results (Obj. 5) into management so that research and assessment resources can be more effectively targeted on species of highest concern	SERO, SAFMC
12	Robust Management Strategies	Increase (or re-allocation)	2017-2021	Develop management strategy (in concert with <b>research &amp; development under Obj 5</b> ) to guide implementation of assistive strategies to enhance climate resilience of reef corals. Specifically, evaluation of risk: benefits and trigger points (e.g., climate, population, or community status thresholds) for implementation of specific strategies should be developed.	FKNMS, SERO, NPS, Florida FWC
<b>Objective 3 – Adaptive Management Processes</b>					
13	Decision tables	Increase	2017-2021	Develop capacity to present quantitative advice using decision-theoretic approaches, for example constructing decision tables that quantify management tradeoffs under various hypotheses of climate change.	University
14	Events analysis	Increase	2017-2021	Create a mechanism to respond to possible climate related events	Marine

	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – <i>TENTATIVE</i>	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
				(e.g., coral bleaching or disease, fish kills, red tide, or other events) by collecting additional samples, analyzing new data, and modeling. This capacity would allow us to provide a rapid response in the form of scientific advice to managers, and capture important episodic data. This capacity could be in the form of an events analysis team and could include development of a rapid evaluation tool to recognize events.	mammals stranding networks, fish kill networks, etc. State partners. SAFMC (Links to citizen science.)
15	Increase dialogue	Increase	2017-2021	Hold informal workshops with fishermen, scientists and managers to learn about climate changes observed by fishermen who have been fishing for long time periods and who fish frequently. This could eventually be a component of a Citizen Science effort.	SAFMC, Advisory Panels, SERO,
16	Increase dialogue	Increase	2017-2021	Increase dialogue between scientists and managers to allow the adaptive decision processes to evolve and respond to climate change impacts in the South Atlantic through ecosystem considerations (Item #12) (see Schindler & Hilborn 2015).	SERO, SAFMC, AOML
17	Environmental covariates in stock assessments	Level and Increase	Ongoing	Expand the use of environmental covariates in stock assessments to guide management decisions (e.g., temp currently used to standardize CPUE estimates)	SERO, AOML, SAMFC
18	Ecosystem Status	Increase	2017-2021	Develop a South Atlantic Ecosystem Status Report to motivate dialogue and to highlight to the science and management communities the range of drivers that may be important to consider.	SERO, AOML
19	Ecosystem Status	Ongoing/ level	2016-2017	Contribute to the revision of the SAFMC Fishery Ecosystem Plan and identify the synergies between the FEP and the RAP.	SAFMC, SERO
<b>Objective 4 – Project Future Conditions</b>					

	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – <i>TENTATIVE</i>	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
20	Down-scaled climate model validation	Increase	2017-2021	Conduct a retrospective evaluation of the utility of the climate models for long term forecasting to establish process for calibrating and validating downscaled climate models and use validations to improve forecasts.	AOML, University, GFDL
21	Physical and biological predictions	Level	Ongoing	Use a high-resolution regional coupled physics-biogeochemistry model for the South Atlantic to assess changes in ocean and coastal acidification, temperature, nutrients, etc. Force this model with the downscaled projections in the objective above to provide a range of realistic scenarios of future environmental and ecosystem changes in terms of physical and biogeochemical processes in the South Atlantic for the research community and fisheries resource managers.	AOML, University, GFDL, SOCAN
22	Physical and biological predictions	Increase	2017-2021	Expand research to assess the influence of Gulf Stream oceanographic characteristics (including Gulf Stream positional variability, AMOC, and eddies) on populations of managed species, and the potential effects of climate change on those influences.(e.g., Ezer et al 2013; Rahmstorf et al 2015)	University, OAR, AOML
23	Application of existing models to priority species	Level	Ongoing	Continue research on sea level rise (Kopp et al 2015; Krasting et al 2016) and use existing down-scaled climate models to map predicted coastal flooding and assess ecosystem services and impacts on marsh and estuarine dependent species (e.g. forage species, black sea bass, gray snapper, shrimp, Atlantic and shortnose sturgeon, bottlenose dolphin). Integrate into the South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts described in Objective 7.	NOS, IMS UNC, States, AOML
24	Application of existing models to priority species	Increase	2017-2021	Evaluate effects of climate change on the frequency of unusual mortality events for protected species (cold stuns for turtles, strandings of marine mammals, health related effects [viruses, bacteria, cancers]) in the South Atlantic by collaborating with partners who have climate data. Integrate into the South Atlantic comprehensive monitoring program and other strategic planning efforts described in Objective 7. Examine this risk using down-scaled	AOML, States

	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – TENTATIVE	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
				model projections develop as part of the objectives above.	
25	Application of existing models to priority species	Increase	2017-2021	Integrate outputs from climate models above into existing spatial density models for marine mammals. Survey data and habitat information are current inputs to spatial distribution maps for marine mammals in the South Atlantic. Use existing climate model outputs to predict potential changes to those distributions. Requires collaboration with AOML and other partners. Integrate into the South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts described in Objective 7.	AOML, USGS
26	Application of existing models to priority species	level/increase	2017-2021	Continue research to assess red snapper population connectivity within and between Gulf of Mexico and South Atlantic regions, applying biophysical modeling and other approaches.	University of Miami, NC State University, FL Fish and Wildlife research Institute
27	Standard modeling toolbox	Increase	2017-2021	Develop a standard modeling toolbox and best practices for modeling under uncertainty to link future ocean and freshwater states and LMRs, with ability to couple models across types. Develop techniques that enable indicators to be included in stock assessment models and projections of stock status. Integrate into the South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts described in Objective 7.	AOML, University
28	Predicting income distribution and productivity	Increase	2017-2021	Assess the potential economic impact of climate change on the commercial and recreational fishing industries, particularly in terms of changes in income distribution and productivity at the vessel level. Integrate into the South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts described in Objective 7.	Continue and expand SERO, HQ



	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – <i>TENTATIVE</i>	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
<b>Objective 5 – Understand the Mechanisms of Change</b>					
29	Vulnerability assessments	Level	2016-2018	Scope priority vulnerability assessments with all interested parties and identify funding mechanisms. Consider interplay with stock assessment prioritization in the region.	HQ, SERO, NEFSC
30	Vulnerability assessments	Increase	2017-2021	Conduct climate vulnerability assessments for identified species in the South Atlantic, their habitats, and associated human communities.	SERO, NEFSC, AOML, University
31	Vulnerability assessments	Ongoing	Ongoing	Conduct climate vulnerability assessments for protected species (marine mammals, sea turtles, sturgeon, etc.) in the South Atlantic to determine/monitor impact climate change is having on various life history categories (e.g., fecundity, nesting rate). For instance, sea-level rise and changes to salinity should be examined for Atlantic and shortnose sturgeon. Sturgeon YOY are sensitive to elevated salinity levels, so any changes to hydrology and salinity in the estuary environment may affect survival and reproductive success of both species. See Protected Species Climate Vulnerability Assessment Group, NMFS Endangered Species Act and Climate Working Group Policy Subgroup	NEFSC, University
32	Vulnerability assessments	Increase	Ongoing	Adapt community social vulnerability indices for coastal and fishing communities in the South Atlantic based on the outcome of vulnerability analyses.	SERO
33	Research	Increase	2017-2021	Increase emphasis on collaborative field and laboratory research efforts focused on understanding the drivers and mechanisms of climate change in the South Atlantic, including process studies that examine primary productivity, phytoplankton, and other trophic levels/priority species. Identify existing cruises surveys or partners that could collect this information.	AOML, University
34	Research	Increase	Ongoing	Continue research on the climate driven displacement of marsh grass	

	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – <i>TENTATIVE</i>	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
				by mangrove habitat, and the impact on shrimp and juvenile fish nursery habitat.	
35	Research			Work in partnership with SOCAN and UGA to identify and address issues related to ocean acidification in the region.	SOCAN, UGA , SERO
36	Research to develop assistive enhancement strategies to improve climate resilience of corals	Increase	2017-2021	Research to identify, develop, and assess risks for tools to propagate climate-resilience traits within reef coral populations are needed. Strategies might include (but are not limited to) improved population enhancement techniques, selective breeding, manipulating symbiotic partners, strategic translocation, or stress conditioning	AOML, Academia, NCCOS,
37	Research on linkage of climate stressors with coral disease	Increase	2017-2021	Research is needed to better understand and develop means to mitigate the clear linkage of warm-stress-induced coral bleaching with subsequent coral disease outbreaks and mortality.	AOML, Academia, NCCOS
<b>Objective 6 – Track Change and Provide Early warnings</b>					
38	Ecosystem Status Report	Partial with level, increase	Ongoing	Generate an Ecosystem Status Report for the South Atlantic, including expanding human dimensions component. Need to determine who will be involved, costs, funding sources, timeline, etc. Note: different from FEP	Many, SERO, HMS, AOML
39	Baseline data	Increase	2017-2021	Obtain and maintain critical baseline data for addressing critical science needs. Critical baseline data should eventually be outlined in the South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts described in Objective 7 (e.g. ichthyoplankton survey, broad scale temperature variations)	
40	Baseline data	Level	2016-2017	Conduct a comprehensive, South Atlantic-wide survey for marine mammals. Integrate into the South Atlantic <b>comprehensive</b>	BOEM

	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – <i>TENTATIVE</i>	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
				<b>monitoring program</b> and other strategic planning efforts described in Objective 7.	
41	Baseline data	Increase	2017-2021	Collaboratively assess socio-economic data needs for examining impacts of climate change on fishing communities (vulnerability assessments), e.g., fishing crew employment data. Integrate into the South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts described in Objective 7.	Many
42	Baseline data	Increase	2017-2021	Establish a network for long-term monitoring of nesting populations of sea turtles in the South Atlantic to continue collecting baseline data on, and evaluate/monitor trends in, hatchling sex ratios, pivotal temperatures and upper thermal thresholds, nesting habitat use (loss and gains), nesting phenology, etc. Integrate into the South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts described in Objective 7.	Many
43	Tracking change	Increase	2017-2021	Develop an early warning toolbox to identify which physical and biological indicators will track climate trends and provide early warnings.	AOML, University, other NOAA Science Centers
44	Tracking change; coral	Partial with level, increase	Ongoing	Continue coral monitoring efforts (NCRMP and partner efforts and SEFSC elkhorn-focal monitoring) to track population status over changing environmental conditions. Enhanced effort to target other listed species and effects of specific bleaching and disease events.	AOML, Academia, NCCOS, NPS
45	Baseline data; tracking change	Level	Initiated	Discuss options for coordinating fishery-independent survey approaches to improve the utility of survey-generated information pertaining to species (e.g., blueline tilefish, snowy grouper, black sea bass) whose ranges overlap the South Atlantic-Mid-Atlantic boundary.	NEFSC
46	Baseline data; tracking change	Increase	2018-2021	Implement survey calibration studies or expand current surveys across the South Atlantic-Mid-Atlantic boundary to address data needs for species whose distribution overlaps that boundary (see	NEFSC

	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – <i>TENTATIVE</i>	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
				Action # 48).	
<b>Objective 7 – Science Infrastructure to Deliver Actionable Information</b>					
47	Strategic planning	Level	2016-2018	Explicitly consider how climate science is coordinated and prioritized across the SEFSC and with partners for the Center’s next strategic plan, including coordinating on strategy with SERO and AOML.	Many
48	Strategic planning	Level	2016-2018	Create a plan for incorporating relevant recommendations from the March 2016 Ecosystems Science Program Review into planning for climate science needs. Climate science is an integral part of our ecosystem science program, and the review recommendations may influence some of the elements of the RAP.	Many
49	Strategic planning	Increase funding or dedicate staff time	2016-2018	Conduct a <i>data gap analysis</i> . Assess existing data for meeting climate science needs. Identify and prioritize data needs, including biological, ecosystem, climate, physical, chemical, socio-economic and other necessary data in coordination with SERO, AOML, USGS, and other partners. Consider using management strategy evaluation to close the gap.	AOML, SERO
50	Strategic planning	Increase funding or dedicate staff time	2016-2018	Identify <i>climate ready and/or multi-mission cruises</i> in the South Atlantic. Assess where additional data can be efficiently collected by leveraging existing surveys and expeditions, including advanced sampling technologies. Coordinate with AOML on their data needs that could be addressed on our cruises, and vice versa. Aim for having all NOAA cruises in the South Atlantic be multi-mission cruises that meet shared needs.	AOML, OMAO
51	Strategic planning	Increase	2017-2019	Using the priorities of the updated strategic plan, the results of the data gap analysis, and the goal of multi-mission cruises, develop a <i>comprehensive and collaborative monitoring program</i> for climate and other ecosystem information together with fisheries, protected species, corals, primary productivity, phytoplankton, and other trophic levels. Include identification of likely changes and drivers of	SERO,, AOML, States, SAFMC, FWS, others

	Category:	Funding Scenario (Level or Increase)	Time Frame (years) – <i>TENTATIVE</i>	Action Title and Description (short description of who, what, key products and expected outcomes)	Partners/ Notes
				change in the South Atlantic. Include Citizen Science possibilities. Consider examples such as EcoFOCI, GLOBEC.	
52	Infrastructure	Increase	2017-2021	Coordinate with the SAFMC and other partners on Citizen Science programs for the South Atlantic to address climate science needs as determined in South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts (potentially link to Obj 6.)	SAFMC, Sea Grant
53	Strategic planning	Increase	2017-2021	Establish a joint team with FWS to identify priority studies and data for South Atlantic sea turtle populations. Integrate into the South Atlantic <b>comprehensive monitoring program</b> and other strategic planning efforts described in Objective 7.	SERO, AOML, University, FWS, others
54	Strategic Planning	Level	2016-2017	Review for incorporation into the RAPs, the report resulting from the NOAA Fisheries Economics & Human Dimensions Program Climate Science Workshop and the “Increasing Resilience in Fishing Communities to a changing climate Workshop” with respect to planning and collaborative research efforts in the southeast.	SERO
55	Build capacity	Increase	2016-2021	Establish a formal SEFSC, AOML, SERO climate science team including members focused on climate issues in the Gulf of Mexico, South Atlantic, and the Caribbean, with regular meetings to identify climate science needs overlap, mechanisms of change, leverage existing data, identify research gaps, set joint priorities. Participants should represent sustainable fisheries, highly migratory species, and protected species, and social sciences. This group would be responsible for implementing, managing, and updating the RAP. Team will coordinate with Climate Communities of Practice, SOCAN, IOOS partners, NOAA regional partnerships, others for the Gulf of Mexico, South Atlantic, and Caribbean.	SERO, AOML, Climate Communities of Practice, SOCAN, IOOS partners, NOAA regional partnerships, others
56	Build capacity	Increase	2016-2017	Organize a climate science workshop for the above team to initiate the effort and assess climate science needs.	
57	Build capacity	Level	2016	Invest in new Management Strategy Evaluation FTE position at the	

	<b>Category:</b>	<b>Funding Scenario (Level or Increase)</b>	<b>Time Frame (years) – TENTATIVE</b>	<b>Action Title and Description (short description of who, what, key products and expected outcomes)</b>	<b>Partners/ Notes</b>
				SEFSC, with regional emphasis.	
58	Build capacity	Increase funding or dedicate staff time	2017-2021	Invest in and prioritize time of FTEs with climate science and data management skill (possibly joint/shared positions with AOML).	AOML
59	Build capacity	Increase	2017-2021	Increase capacity by investing in the professional development of current staff by supporting training opportunities, e.g., multivariate time series analysis, for staff and technicians collecting data, and contracting experts to help us develop new capabilities.	AOML, SERO, HQ, other NOAA Science Centers, University
60	Build capacity	Increase	2017-2021	Develop short term rotational assignments and/or exchanges between AOML, SEFSC, SERO, and HQ (SF and HMS) to build capacity and share ideas.	AOML, University
61	Build capacity	Level	2016-2018	Strengthen relationship with NOAA’s Geophysical Fluid Dynamics Laboratory (GFDL) to engage their expertise in climate science efforts.	GFDL, AOML
62	Build capacity	Increase funding or dedicate staff time	2016-2018	Invest in a survey statistician consultant with regional emphasis to increase statistics capacity for climate science needs.	SERO, NMFS HQ, AOML, University
63	Build capacity	Level	2016-2018	Evaluate existing external and internal funding opportunities for appropriate climate science priorities and objectives. Integrate results of strategic planning processes.	SERO, HQ, AOML
64	Infrastructure	Increase	2017-2021	Work with NOAA’s National Centers for Environmental Information (NCEI) to create a database portal or contribute to existing portals ( <a href="https://my.usgs.gov/gcmp/main/map">https://my.usgs.gov/gcmp/main/map</a> ) for climate science and related data.	NCEI, AOML, SERO, HQ, USGS
65	Build Capacity	Increase	2017-2021	Invest in a social scientist FTE dedicated to climate science efforts and the human dimension.	SERO, ST