NOAA FISHERIES

Draft Pacific Islands Regional Action Plan to Implement the NOAA Fisheries Climate Science Strategy in 2022 - 2024

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About this report

This is a draft document for public comment. Comments will be considered with drafting the final document. Implementation of the plan is contingent on available resources.

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Executive Summary

Changing climate and oceans are affecting the nation's valuable living marine resources and the many people, businesses and communities that depend on them. Warming oceans, rising seas, extreme events, and acidification are impacting the structure of marine and coastal ecosystems, and the distribution and abundance of species in many regions. These impacts are expected to increase and there is much at risk.

To prepare for and respond to climate impacts on marine and coastal resources, the 2015 NOAA Fisheries Climate Science Strategy (NCSS) identified seven key objectives to increase the production, delivery, and use of climate-related information needed to fulfill the agency's mandates (e.g., fisheries management, protected resources conservation) in a changing climate. Beginning in 2016, NOAA Fisheries developed Regional Action Plans (RAPs) to implement the NCSS in each region based on regional needs and capabilities. As part of this effort, the Pacific Islands Regional Action Plan (PIRAP) was developed to address the effects of climate change that are already evident across the Pacific Islands region.

To continue effectively managing our living marine resources in the face of changing conditions, the region has developed this draft updated PIRAP for 2022-2024. The updated plan draws upon the successes and lessons learned from carrying out the initial PIRAP from 2017 through 2021. It also seeks to align the regional response to climate change with Executive Order (EO)13990 and EO 14008.

This draft PIRAP includes action items to address five key areas of need (themes). These five themes and associated actions are listed below, with labels indicating which of the seven NCSS objectives they address:

- *Baselines and Shifting Distributions* This need ranges from nearshore to pelagic conditions and includes protected, target, and bycatch species. It is exacerbated by a downward trend in the capacity to maintain established monitoring of biological and physical time series across the region. Actions include:
    - Expand staff capacity and resources (Obj. 7)
    - Assess current conditions and track changing conditions and species ranges (Obj. 6)
    - Develop species distribution models for select pelagic species (Obj. 6)
    - Assess shifts in green sea turtle behaviors and habitat (Obj. 6)
    - Examine how changing conditions affect species distributions, fishers and communities (Obj. 5)
    - Project future species distributions based on climate scenarios (Obj. 4)
    - Develop tools to inform future FEP amendments (Obj. 3)
    - Investigate ways to reduce by-catch (Obj. 2)

    - Contribute to development of climate resilient markets and policies (Obj. 2)
- *Impacts to Life History and Biology* Before we can develop climate-informed stock assessments and incorporate climate-based reference points into regional management, we need a better understanding of how climate and biology interact. Actions include:
    - Establish temporal baseline and monitoring to investigate climate impacts on life history attributes (Obj. 6)
    - Identify predictive environmental and food web attributes for incorporation into stock assessments and productivity projections (Oct. 5)
    - Examine sensitivity of food web and fisheries to changes in the oxygen minimum zone (Obj. 4)
- *Ecosystems, Habitats, and Humans* All species are part of a larger ecosystem and share their habitats to varying degrees. Human communities both influence and are influenced by marine ecosystems and habitats. Effective management in the face of climate change requires a system-level perspective. Actions include:
    - Assess the role of bioslicks in driving fisheries and ecosystem productivity across the Main Hawaiian Islands. (Obj. 4 - 7)
    - Expand capacity for diet studies (Obj. 7)
    - Build capacity for data collection and analysis (Obj. 7)
    - Update the West Hawaii Ecosystem Status Report (Obj. 6)
    - Conduct Climate Vulnerability Assessments (Obj. 5, 6)
    - Ensure environmental justice, equity and gender representation in climate mitigation measures (Obj. 2)
    - Understand and monitor coral recover and degradation (Obj. 6)
- *Regional Coordination and Operations* Improving regional coordination will streamline our response to climate change by better matching research activities with management needs. Reducing our region's carbon footprint is an essential component of responding to climate change. Actions include:
    - Coordinate and collaborate between science and management on setting climate priorities. (Obj. 7)
    - Improve regional reporting of climate variables. (Obj. 3 & 6)
    - Reduce the NOAA Fisheries Pacific Island region's carbon footprint (Obj. 7)
    - Monitor climate impacts to protected species habitat. (Obj. 6)
- *External Partners and Resources* No one region can address all their information needs internally. Furthermore, fully understanding the impacts of climate change is an active area of ongoing research for the scientific community at large.

This plan lays out discrete action items that will be implemented in support of climate-informed living marine resource management. It also includes metrics that are designed to assess progress toward successful outcomes, and specific activities that could be undertaken with increased resources.

Introduction

In 2016, regional staff drafted the Pacific Islands Regional Action Plan for Climate Science (PIRAP; Polovina et al. 2016). The PIRAP detailed the planned implementation of the NOAA Fisheries Climate Science Strategy (NCSS; Link et al. 2015) in the region for FY17–21. Other regions adopted plans with similar timelines. In 2020, NOAA Fisheries undertook a 5-year national synthesis of the NCSS and RAP implementation (Peterson et al. 2021). This synthesis highlighted both regional successes and the continued need to prioritize climate science and climate-informed living marine resource management. Furthermore, in January 2021, two executive orders that highlight the priority placed on addressing climate-related topics (Exec Order (EO) Nos. 13990 & 14008) were issued. These orders direct federal agencies to take immediate steps to address the cause and effects of climate change, in part by making it an "essential element" of existing and new policies. The culmination of these events makes this an ideal time to craft the next phase of RAPs.

The goals of PIRAP 2.0 are to continue ongoing work from the original PIRAP, identify and address new climate-related needs, and strengthen partnerships (both within NOAA and with external partners). PIRAP 2.0 also includes a greater effort to link science with management to the fullest extent possible, with the goals of adapting management actions to incorporate climate information to better meet regional climate information needs. Building on the 5 years covered by the initial RAPs, this phase of action plans covers the next 3 years: FY22–FY24. This shorter timeframe was chosen to align with other NOAA Fisheries initiatives (e.g., Integrated Ecosystem Assessment and Ecosystem-based Fishery Management reviews) and to allow for more realistic planning. Though PIRAP 2.0 covers only 3 years, many activities included in the plan extend beyond FY24. The plan was drafted with longer-term goals in mind.

Staff from the Pacific Islands Regional Office and Fisheries Science Center as well as the Western Pacific Fishery Management Council collaborated to draft the PIRAP 2.0, working first in focused small groups and then as a whole through several draft iterations. Authors developed goals that align with both regional and national priorities and incorporate region-specific responses to the administration's request for input on how to make fisheries and protected species more climate resilient (Exec. Order No. 14008, Section 216 (c), 2021). Action items that could help achieve those goals were crafted under two scenarios: (1) level funding and (2) realization of the Climate, Ecosytem and Fisheries Initiative (CEFI). Building on lessons learned from the initial PIRAP, specific metrics are assigned to each action item so that progress in implementing the NCSS in the Pacific Islands region can be quantified. Regional NOAA Fisheries staff had the opportunity to review and provide feedback on the draft goals, action items, and metrics. Going forward, these action items will be considered in regional activity planning and budget allocation processes.

Key Needs, Actions, and Metrics

The climate-related science and management needs are grouped into five themes:

- Baselines and Shifting Distributions
- Impacts to Life History and Biology
- Ecosystems, Habitats, and Humans
- Regional Coordination and Operations
- External Partners and Resources

The author team felt that these themes captured the region's climate-related goals. Grouping action items by theme also acknowledges the interconnected nature of the region's climate science and management needs. This section discusses each theme and its associated goals and action items. No effort was made to prioritize the five themes. Table 1 includes a detailed list of metrics associated with each action item, as well as the NCSS objective(s) addressed by the action item. The NCSS objectives represent a bottom-up approach to incorporating climate science into living marine resources management (Fig. 1). The approach begins with Objective 7 and progresses in reverse numerical order, building on previous objectives.

NCSS Objectives:

Objective 7: Build and maintain the science infrastructure needed to fulfill NOAA Fisheries mandates under changing climate conditions.

Objective 6: Track trends in ecosystems, living marine resources, and resource-dependent human communities and provide early warning of change.

Objective 5: Identify the mechanisms of climate impacts on ecosystems, living marine resources, and resource-dependent human communities.

Objective 4: Identify future states of marine, coastal, and freshwater ecosystems, living marine resources, and resource-dependent human communities in a changing climate.

Objective 3: Design adaptive decision processes that can incorporate and respond to changing climate conditions.

Objective 2: Identify robust strategies for managing living marine resources under changing climate conditions.

Objective 1: Identify appropriate, climate-informed reference points for managing marine resources.

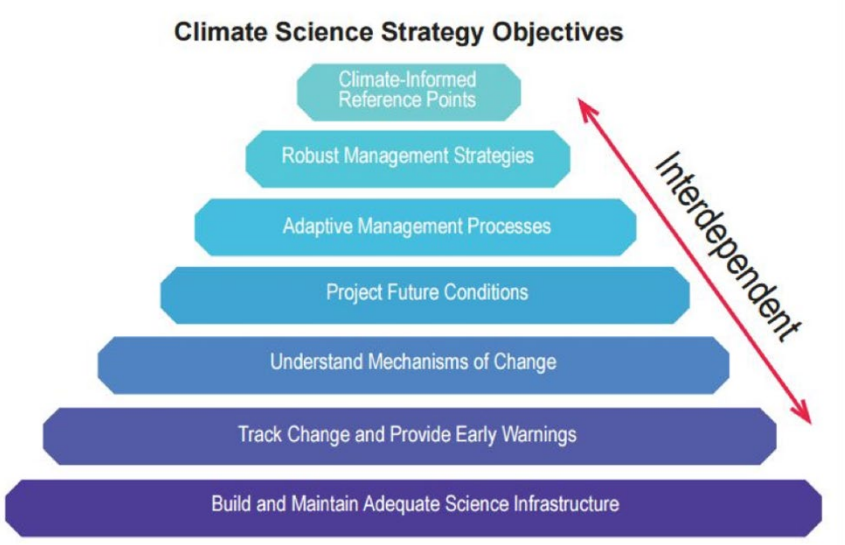

Figure 1. Schematic figure of the bottom-up and interdependent nature of the NOAA Fisheries Climate Science Strategy objectives.

Baselines and Shifting Distributions

The top regional priority that emerged while implementing the first phase of the PIRAP was the need to establish baseline (or present-day) species distributions and understand how they may shift in the future. This is a priority for coral reef ecosystems, bottomfish, protected species, and target, non-target, and bycatch species in both pelagic and nearshore fisheries. Establishing baseline habitat and environmental conditions (i.e., climatologies) is a component of this priority. It also touches upon all seven of the NCSS objectives, as discussed below.

The first step in establishing baselines and understanding changing distributions is to assess our regional capacity for both monitoring and analyzing environmental conditions, processes, and species distributions, as well as consulting with historical documents and holders of local and traditional ecological knowledge. This assessment will note critical gaps and be used to craft a monitoring and analysis strategy with input from regional management staff to ensure it aligns with their needs. We note that, given the declining capacity for regional monitoring (Peterson et al. 2021), fully implementing this strategy will require additional resources and will extend beyond the PIRAP 2.0 timeframe.

There are already a number of long-term time series and monitoring efforts underway in the Pacific Islands region (Peterson et al. 2021). Continued maintenance of these time series is included in PIRAP 2.0. Here, we note a few specific efforts that span the region's geography and species. The first is a multi-partner effort to use telemetry data from a number of highly migratory pelagic species to construct present-day species distribution maps. These maps will then be combined with estimates of historical oceanographic conditions and with projections offered by earth system model output from the sixth phase of the Coupled Model Intercomparison Project (CMIP6; Eyring et al. 2016) to project future species distributions. Additionally, there are a number of ongoing efforts to monitor the effects of climate change on protected species. These include tagging and surveying sea turtles to assess shifts in behavior and/or habitat and monitoring nest incubation temperature across the Hawaiian archipelago,

continuation of multidecadal monk seal demographic monitoring, and establishing baseline distributions of regional cetacean stocks.

The Pacific Islands region has planned a number of action items to identify mechanisms of climate impacts on living marine resources and fisheries. These efforts include identifying statistical relationships between environmental data and species abundance and distribution in order to detect predictive relationships. Such approaches can be applied to both coral reef and pelagic environments. With additional resources for enhanced sampling, such methods could also be applied to bottomfish habitat in future years. This improved ecological understanding addresses not only the NCSS but also related issues such as essential fish habitat and ecosystem-based fisheries management.

With regard to human dimensions of fisheries, action items include developing fishing location decision models for Hawaii's longline fishery and examining communities' vulnerability to climate change based on cultural keystone species. The location decision models can be paired with CMIP6 model output, and potentially the above-mentioned species distribution maps, to project future fishery distributions and catch. Together, these efforts can contribute to plans for building a climate-resilient fishing industry.

The above science-focused actions will contribute to regional climate-informed management in several ways. In terms of adaptive management, a small working group will be convened to explore risk levels and potential thresholds for targeted and protected species, as well as the ecosystem. The working group will also explore incorporating environmental indicators into the Council's harvest control rules to supplement traditional stock status indicators. The harvest control rules may inform future amendments to the Council's Fishery Ecosystem Plans (FEPs).

A planned workshop to develop strategies for climate-resilient markets will contribute to robust management strategies to address shifting baselines. It is anticipated that the recent responses to COVID-19 can inform these strategies. There are also plans to investigate impacts of climate-driven shifting distributions of fishery resources and domestic and international fishing effort. These impacts may include potential economic impacts by fishery sector (i.e., longline, purse seine, small boat fisheries) and regions in the western and central Pacific Ocean.

These efforts to establish baselines, identify mechanisms linking environmental conditions to species distributions, and project future change, are expected to contribute to climate-informed reference points for living marine resource management. However, establishing these reference points will take longer than the PIRAP 2.0 timeframe. Our first step will be to identify species that are most likely to require adaptive management, as well as levels of acceptable risk. These climate-informed reference points can be used in the development of dynamic harvest control rules for species that require adaptive management. To maximize the efficiency of climate-informed harvest control rules, regional staff will work toward developing a fishery management decision tool that allows tracking of the environmental variable and the condition in the ecosystem to inform the Council's fishery management decision.

Implementing PIRAP 2.0 will generate numerous scientific products to inform fishery management. These products should be designed to fit into existing fishery management frameworks where possible. New frameworks will be established to increase use of new

scientific information as needed. Developing fishery management decision tools that use these products is essential for maximizing these scientific products.

Impacts to Life History and Biology

Implementing the first phase of PIRAP clarified gaps in our regional understanding of how environmental conditions affect species' life history and biology. Filling these gaps is a critical step in developing climate-informed stock assessments and climate-based reference points for management.

Regional staff have started what will be a decade-plus effort to better understand species' life history and how it is affected by the environment. This work includes working with international partners to standardize otolith and gonad collection and analysis of life history parameters of striped marlin, blue marlin, and swordfish in the North Pacific. Regional staff are also expanding sampling efforts for bottomfish management unit species in the main Hawaiian Islands, the Mariana Islands, and American Samoa. Specifically, the 7° of latitude spanned by the Mariana Archipelago provides the opportunity to examine temperature effects on bottomfish and coral reef fishes' life history attributes as well as distinguish fishing effects from climate effects. Once sufficient data are collected, it will be possible to establish relationships, or lack thereof, between environmental conditions and life history attributes. These relationships can then be used in multiple applications: projecting demographic changes and assessing population viability, incorporation into stock assessments that are in turn used to set catch limits and contribute to resilient markets, and establishing species-specific reference points where applicable. We note that "sufficient data" is likely to be a species- and location-specific threshold and expect that work to establish biophysical relationships and incorporate them into regional management will occur beyond the timeframe of PIRAP 2.0.

Ecosystem modeling work will examine and project food web and fishery sensitivity to expanding oxygen minimum zones (OMZs) in the central and eastern Tropical Pacific. A vertically resolved end-to-end ecosystem model will simulate fishes' interactions with regional OMZs which in turn will provide insight into possible fishery impacts of expanding OMZs.

We will also work with local fishing communities to monitor community observations of any changes in species biology over time (shifts in phenology, koas shifting to deeper waters, etc.).

Ecosystems, Habitats, and Humans

In addition to understanding climate change effects at the species level, it is vital to understand them at the system level. This includes understanding how ecosystems and habitats will change, and how human communities will respond to change.

Action items to expand the science infrastructure needed to assess climate change at the system level fall into three main groups: expanding capacity for diet work in order to understand ecosystem structure and function, building capacity for local data collection, and coordination between scientists and managers for monitoring and recovery of coral reefs. The Pacific Islands region has recently hired additional laboratory staff and acquired equipment to increase the ability to conduct diet analyses by traditional and genetic approaches. As this work progresses, we will identify any further needs which may require additional resources.

Regional staff will also assess the current and needed capacity for local data collection and develop island-/territory-specific plan(s) to expand this capacity[1]. Expanding this capacity will support early identification of local climate impacts. It will also inform place-based management of marine resources. For example, collaborative habitat restoration and research through the Habitat Focus Areas (HFA) program would increase our ability to understand and address the climate impacts in our region. In addition to local data collection, staff will work towards exploring whether additional factors can or need to be included in control rules.

As work gets underway to expand efforts to monitor regional coral reef recovery, scientists and managers will meet to ensure that the data collected meet managers' needs. Planned work includes using photogrammetry and other survey techniques to track carbonate budgets and assess accretion/erosion at sites across the Pacific Islands region. These data will be downscaled to assess patterns of changing coral cover, and colony-level demographic modeling will be conducted to support federal and regional management needs.

The diet analyses described above will provide data for tracking change in ecosystem community composition. Additional action items to track ecosystem- and habitat-level change include updating the West Hawaii Integrated Ecosystem Assessment's (IEA's) Ecosystem Status Report (ESR) and completing the marine mammal climate vulnerability assessment. The West Hawaii IEA also plans to include a "look ahead" section in the ESR and complete a report on the climate vulnerability of coral reefs.

With additional funding, the West Hawaii IEA plans to conduct a multi-platform assessment of bioslicks and their role in enhancing regional productivity. This work will also include a climate change component, projecting how the relationship between slicks and productivity will change over the coming decades.

Regional staff are working to include environmental justice, equity, and gender representation in government climate mitigation efforts. Action items include investigating gender representation in socioeconomic surveys and initiating demographic collections to facilitate environmental justice/equity analyses of climate change mitigation measures. Such analyses will ensure that management measures are robust at the community level as well as the marine resource level.

Looking beyond the timeframe of PIRAP 2.0, we note that energy development, aquaculture, deep-sea mineral extraction, and shoreline adaptation and mitigation will likely be areas requiring regional attention.

Regional Coordination and Operations

The PIRAP 2.0 authors recognize a continued need to enhance regional coordination of the NCSS implementation. Action items toward this goal include annual meetings between the PIFSC, PIRO, and Council Directorates to provide top-down guidance on coordinated priorities including how climate change is incorporated into other regional initiatives. The decisions from

[1] In the Pacific Islands region, fisheries-dependent data collection for bottomfish fisheries in the territories of American Samoa, Guam, and CNMI is limited, and efforts are underway to ensure data integrity through building local capacity for data collection.

these meetings will be communicated to all hands (at the region level). To facilitate incorporating climate change into the region's work, the NCSS will be integrated with priority initiatives such as the Ecosystem-based Fisheries Management Road Map (NOAA Fisheries Procedure 01-120-01) and biological opinions. The Annual Collaborative Climate Science Workshops that began during the initial phase of the PIRAP will continue. These annual workshops brought together regional NOAA Fisheries and Council staff to ensure regional climate science evolved to meet management needs. During PIRAP 2.0, these workshops will be expanded to include climate collaborators outside of NOAA Fisheries.

PIRAP 2.0 will also continue climate change mitigation work at Lalo/French Frigate Shoals where low-lying islets provide crucial habitat for both Hawaiian monk seals and Hawaiian green sea turtles. In addition to continuing terrestrial habitat and coastline surveys, action items include collaborating with external partners to project future conditions and identify alternative terrestrial habitat for turtles and seals. Regional NOAA Fisheries staff are collaborating with other line offices and agencies to expand the breadth of species considered (e.g., seabirds, corals) and expedite mitigation efforts. Lalo/French Frigate Shoals is also a candidate location for the region's new Habitat Focus Area (HFA). If the site is designated an HFA, work would address a range of climate change issues, including coastal erosion, storm damage, coral bleaching, and habitat loss.

PIRAP 2.0 includes several action items to address our regional carbon footprint. These are divided into actions to address regional fisheries and NOAA Fisheries operations. With regard to the former, regional staff will assess the carbon emissions associated with commercial fishing in the region and, where possible, examine the potential for emissions reductions.

To address the carbon footprint of NOAA Fisheries' regional operations, an annual emissions inventory will be conducted for Pacific Islands facilities. The emissions inventory will establish a baseline of the region's emissions associated with transportation and travel, energy use in facilities and field operations, and solid waste generation. Results from the inventory will be used to craft and implement a green operations plan. It is anticipated that this operations plan will include guidance on travel, on-site vs. remote work, energy efficiency, recycling, composting, and other areas with the potential for significant emissions reductions.

External Partners and Resources

While drafting the PIRAP 2.0, the authors identified several critical regional needs that will need to be addressed with external partnerships and resources. Our region faces challenges related to lack of local computational capacity and expertise that severely limits dynamical downscaling of climate model output across all domains of regional interest. A general lack of scientific understanding of the consequences of ocean acidification on non-coral organisms (e.g., fish, zooplankton, and cephalopods) is a source of uncertainty affecting marine ecosystems at a global scale. Additional research on coral reef restoration is required to direct management actions.

Expanded research on the effects of ocean acidification on species beyond corals is essential, though outside the expertise of regional staff. Particularly concerning is how ocean acidification may affect pelagic fish larvae. Any negative impacts of ocean acidification to pelagic fish are expected to similarly affect the region's largest commercial fishery—a pelagic longline fishery for bigeye tuna. Furthermore, these effects are unlikely to be confined to pelagic fish, placing

other regionally important bottomfish and reef fish species at risk as well. Given regional capacity and expertise, this extended research will have to be met through collaborations with academia and other NOAA line offices and regions.

Another critical need is for downscaled global climate model projections. The Pacific Islands region is made up entirely of small islands, atolls, and reefs, nearly all of which are too small to be represented in global models. Downscaling is required to capture the complex dynamic processes around islands and over coral reefs. Given that the Pacific Islands region encompasses nearly half the United States' Exclusive Economic Zone, this is a tall order. The increased monitoring and staff capacity included in the CEFI would begin to address this need.

While there are some coral reef restoration efforts underway in the region, far more research on the topic is needed. Coordinating with universities and partners, such as The Restoration Center, will help accomplish this goal. With improved understanding of restoration, management actions can be taken to address climate-driven coral reef declines.

Metrics for Measuring Success

In response to a report from the Government Accountability Office (GAO-16-827) on the initial Regional Action Plans for climate science which included PIRAP, the metrics used to measure success in implementing PIRAP 2.0 are selected to be concrete, quantifiable, and time-bound. They are detailed in Table 1. Broadly, metrics fall into the following categories: reports and other publications, computational models, biophysical sampling/data collection, and planning and coordination meetings between scientists and managers. These metrics will be used in annual progress updates to the NOAA Fisheries Science Board.

Table 1. PIRAP 2.0 action items and associated metrics, grouped by theme.

	Theme: Baselines and Shifting Distributions				
	Description of Action Item and Purpose: Expand staff capacity and resources for establishing current conditions and species distributions and for projecting shifts in these distributions as a result of changing conditions. **Longer-term Goal:** Continue to assess capacity and resources needed to monitor conditions and species distributions; respond as needed.				
	Metrics	**NCSS Objective**	**PIFSC POC**	**PIRO POC**	**Council POC**
	FY22: Draft an internal report assessing current and needed staff capacity and resources.	7	Director's Office	Directorate	Executive Director or designee
	FY23: Fill at least 50% of the capacity and resource gaps identified in FY22. (May require additional resources)	7	Director's Office	Directorate	Executive Director or designee
	FY24: Fill 100% of the capacity and resource gaps identified in FY22. (Will require additional resources)	7	Director's Office	Directorate	Executive Director or designee

Description of Action Item and Purpose:
Regional baseline mapping to assess current conditions and species' ranges and track changing conditions and ranges (e.g., temperature, pH, oxygen concentration; ocean currents and stratification; prey availability; migratory routes; species presence; subsurface biogeochemical data that are known to influence the vertical distribution of HMS and their prey and primary production; micronekton data; and monitoring of phyto- and zooplankton size structure).

Longer-term Goal:
Implementation of the sampling plan listed in the metrics below will extend past FY24.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Assess currently available data streams that can be used to track conditions and species distributions, both PIFSC and externally maintained, identify critical gaps, and craft sampling plan to fill these gaps.	7	Kisei Tanaka, Réka Domokos	Jarad Makaiau, Layne Bolen, Lillian Raz	Mark Fitchett
FY23: Implement sampling plan. (Will require additional resources)	7	Kisei Tanaka, Réka Domokos	Jarad Makaiau	Mark Fitchett
FY24: Maintain sampling plan. (Will require additional resources).	6	Kisei Tanaka, Réka Domokos	Jarad Makaiau, Steve McKagan	Mark Fitchett
FY22–24: Work with plan teams to have the baseline mapping effort considered for inclusion in the annual SAFE reports and overlay the fishery dependent information.	6	Donald Kobayashi, Todd Jones		Mark Fitchett, Marlowe Sabater

FY24: Conduct Hawaii cetacean survey. (May require additional resources)	6	Erin Oleson		

Description of Action Item and Purpose:
Developing species distribution models for a number of pelagic species for which telemetry (bigeye tuna, yellowfin tuna, striped marlin, oceanic white-tip shark, blue shark) and survey (cetaceans) data are available.

Longer-Term Goal:
Periodic model improvement and development of additional models as more data become available and methodologies advance.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY23: In collaboration with SWFSC, complete fish models, peer-reviewed paper(s), presentation, and meeting with appropriate PIR managers to share results and solicit input on most useful application of models.	6	Melanie Hutchinson, Johanna Wren	Jarad Makaiau, Chelsey Young, Richard Hall	Mark Fitchett
FY24: Incorporate passive acoustic data into cetacean models. (Will require additional resources)	6	Erin Oleson		

Description of Action Item and Purpose:
Assess shifts in green sea turtle behaviors and habitat across the Hawaiian Archipelago

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC

FY22–24: Satellite tag ~12 turtles across the Hawaiian Archipelago each year.	6	Camryn Allen	Irene Kelly	Asuka Ishizaki
FY22–24: Conduct weekly surveys of basking/nesting beaches within the main Hawaiian Islands each year. (Will require additional resources).	6	Camryn Allen	Irene Kelly	Asuka Ishizaki
FY22–24: assess nest incubation temperature at ~100 nests of each species across the Hawaiian Archipelago.	6	Camryn Allen	Irene Kelly, Steve Kolinski	Asuka Ishizaki

Description of Action Item and Purpose:
Examine how changing conditions affect species distributions including commercially valuable species, non-target species, protected species, prey, and fisher location choice, and how these shifts affect species' and communities' vulnerability to climate change.

Longer-Term Goal:
Much of the work encompassed in this action item builds on other action items and will extend beyond the PIRAP 2.0 timeframe.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22–24: Continue efforts to standardize fisher's observations section of the SAFE reports, engaging with local communities to document fisher/fishing community observations of changes in species biology and phenology. (With additional resources, a larger oral history/indigenous science component could be added.)	6	Kirsten Leong		Marlowe Sabater

	FY22–24: Examine the temporal scales and resolutions of environmental variability that can best hindcast species' spatial abundance across the PIR by, for example, decomposing remote sensing environmental variables and cross-validating each covariate's contribution to predictive skill for spatially and temporally explicit abundance. Determine taxa-specific temporal resolutions of environmental variability that provide the best predictive skills for model-based essential fish habitat delineations. Meet with appropriate PIR managers to ensure management applicability of research, peer-reviewed publication of results. Share results with appropriate PIR managers and stakeholders.	5	Kisei Tanaka	Jarad Makaiau, Layne Bolen, Lillian Raz	Mark Fitchett
	FY22: Develop model of longline fishers' location decisions to project the spatial distribution of effort under CMIP6 climate scenarios, peer-reviewed publication describing model, presentation, and meeting with appropriate PIR managers to share model and solicit feedback.	5	Jonathan Sweeney	Jarad Makaiau, Steve McKagan	Mark Fitchett
	FY23: Refine location decision model as needed based on reviewer and manager feedback.	5	Jonathan Sweeney	Jarad Makaiau	Mark Fitchett
	FY23: Examine how climate change and fisher location decision may affect protected species interactions, presentation, and meeting with appropriate PIR managers to share results and solicit feedback.	5	Robert Ahrens	Jarad Makaiau, Layne Bolen	Mark Fitchett

FY22: Examine community vulnerability to climate change through impacts to on cultural keystone species, and climate vulnerable species, share results with appropriate PIR managers and stakeholders.	5	Mia Iwane	Jarad Makaiau, Hoku Kaaekuahiwa Pousima	Marlowe Sabater

Description of Action Item and Purpose:
Project future species distributions based on future climate conditions.

Longer-Term Goal:
Periodic updates as underlying models improve and additional models developed as more data become available and methodologies advance.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY24: Using completed habitat maps, work with PIR managers to project future habitat and distributions of a suite of pelagic species, summarize in peer-reviewed paper, share with appropriate PIR managers.	4	Phoebe Woodworth-Jefcoats	Mark Fox, Richard Hall	Josh DeMello
FY24: Using fisher location decision models and projections of future habitat, project future fishery catch composition, peer-reviewed paper(s), meeting with appropriate PIR managers to share results and solicit feedback on continued refinement and application of modeling approach.	4	Jonathan Sweeney, Phoebe Woodworth-Jefcoats	Mark Fox	Josh DeMello

Description of Action Item and Purpose:
Work toward developing tools to inform future FEP amendments regarding catch and/or effort controls that are more adaptive to new data and/or environmental variables (both current and future conditions), acknowledging management benchmarks (e.g., fishing mortality or catch related to MSY) may be dynamic. Recognizing that climate change may result in non-stationary production relationships, determine if current management procedures and harvest control rules are sufficiently responsive to achieve the objectives of the MSA and current FEPs.

Longer-Term Goal:
Develop an efficient science-policy framework that allows managers to respond to an increasingly rapidly changing environment in a timely manner, using the Pacific Northwest as a model.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Convene a small working group which the intention of fostering discussions with the appropriate PIR managers and stakeholders to determine if current management procedures are sufficiently responsive to the impacts of climate change.	3	Robert Ahrens	Mark Fox	Marlowe Sabater
FY23: Should the findings of the above working group indicate a concern with respect to the suitability of current management procedures, a desktop MSE will be developed to highlight the impact of current procedures as well as a suite of potential changes to current control rules.	3	Robert Ahrens	Mark Fox, Bob Schroeder	Marlowe Sabater

FY24: Conduct a gap analysis to determine if any additional factors are needed to implement dynamic harvest control rules. Explore whether additional data streams can provide information that allows management to be more responsive relative to the generation-time-dependent update of the production function in a stock assessment. Share results with appropriate PIR managers and stakeholders.	3	Robert Ahrens	Mark Fox, Mike Lameier	Marlowe Sabater
FY23: Develop a fishery management decision framework.	3	Todd Jones	Mark Fox	Marlowe Sabater
FY24: Collaborate on an FEP amendment adopting the fishery management decision framework.	3	Todd Jones	Mark Fox	Marlowe Sabater
FY23: Develop and share a table of species that requires adaptable management with respect to climate impacts, management objectives, and acceptable risk levels.	1	Todd Jones, Charles Littnan	Mark Fox	Marlowe Sabater, Asuka Ishizaki

Description of Action Item and Purpose:
Investigate area-based or adaptive management tools, gear configurations, and other means to reduce the composition of non-target species relative to performance of target catch (i.e., tunas) in U.S. Pacific fisheries.

Longer-Term Goal:
Continued refinement of tools as new data become available and new climate-based relationships are identified.

Metrics	**NCSS Objective**	**PIFSC POC**	**PIRO POC**	**Council POC**

FY22–23: Ongoing examination of spatial distribution of catch, conversations between appropriate PIR managers, scientists, and stakeholders will dictate tools that are needed and could be used.	2	Robert Ahrens, Jonathan Sweeney	Mark Fox, Mike Lameier	Mark Fitchett

Description of Action Item and Purpose:
Investigate impacts of shifting distributions of fishery resources and fishing effort due to climate change and/or management scenarios. These impacts may include potential economic impacts by fishery sector (i.e., longline, purse seine, small boat fisheries) and regions in the western and central Pacific Ocean.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Engage international science providers to identify areas of research collaboration related to shifting fishery resources. Identify resources to support domestic research into effects on U.S. fisheries.	2	Beth Lumsden, Todd Jones	Emily Crigler, Mike Lameier	Mark Fitchett
FY23: Explore domestic effects on U.S. fisheries from shifting resources. Collaborate with international science providers on regional analyses.	2	Beth Lumsden, Todd Jones	Emily Crigler, Mike Lameier	Mark Fitchett
FY22–FY24: Track international progress and collaborate with international partners to explore changes in stock production and access to fishery resources due to the impacts of climate change.	2	Beth Lumsden, Todd Jones	Emily Crigler	Mark Fitchett

Description of Action Item and Purpose:
Contribute to development of climate resilient markets and policies. This can include MSEs as well as specific market designs learned from COVID-19.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Hold workshop to design robust strategies for developing climate-resilient markets.	2	Jonathan Sweeney	Jarad Makaiau	Mark Fitchett

Theme: Impacts to Life History and Biology

Description of Action Item and Purpose:
Life history attributes (length-at-age, maximum age and size, somatic growth, age- and size-at maturity, natural mortality) are driven by metabolism which, in turn, is impacted by temperature. Understanding climate change impacts is dependent on establishing a temporal baseline at the appropriate spatial scale and separating fishing impacts from temperature on these attributes. Documenting spatial variability along a temperature gradient combined with dendrochronology that identifies impactful past climate events will provide insights on how climate change will affect a species life history across its distribution. After establishing a temporal baseline, monitoring life history attributes during periods of observed climate change and determining whether/how climate affects these attributes.

Longer-Term Goal:
This work is part of an ongoing, decade+ effort to better understand life history and how it is affected by the environment. However, it is highly dependent on biological samples that are acquired on research cruises and through territorial biosampling program funding.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC

	FY22: Establish gonad and otolith sampling plan for striped marlin, blue marlin, swordfish, and bottomfish management unit species across the region (MHI, AS, CNMI).	7	Joseph O'Malley	Dawn Golden, Mark Fox, Jarad Makaiu	Mark Fitchett
	FY22–24: Continued annual collection and analyses of otolith and gonad samples from North Pacific striped marlin, blue marlin, and swordfish, and MHI, AS, and Mariana Archipelago bottomfish management unit species; continued engagement with PIROP and biosampling programs in conjunction with annual cruises.	6	Joseph O'Malley	Dawn Golden, Mark Fox, Jarad Makaiu	Mark Fitchett
	FY23–24: Publish baseline life history attributes as they are determined.	6	Joseph O'Malley	Dawn Golden, Mark Fox, Jarad Makaiu	Mark Fitchett
	FY24: Peer-reviewed publications of any links between changing life history attributes and climate (or the lack thereof); present results to appropriate PIR managers.	5	Joseph O'Malley	Dawn Golden, Mark Fox, Jarad Makaiu	Mark Fitchett

Description of Action Item and Purpose:
Continue work to identify predictive environmental and food web attributes that can be incorporated into stock assessments and other productivity projections.

Longer-Term Goal:
Use these climate-informed stock assessments in a management context. This will likely not be possible until after the PIRAP2.0 timeframe.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Meeting among appropriate PIR managers, stock assessment scientists, and biophysical scientists to identify candidate species and variables.	5	Ryan Rykaczewsk, Felipe Carvalho	Jarad Makaiau	Marlowe Sabater
FY23–24: Publish results of meaningful relationships in peer-reviewed paper, share results with appropriate PIR managers.	5	Ryan Rykaczewsk, Felipe Carvalho	Jarad Makaiau	Marlowe Sabater
FY24: Where possible, conduct climate-informed stock assessments, noting that this will likely be after the PIRAP 2.0 timeframe.	3 2 1	Felipe Carvalho	Jarad Makaiau	Marlowe Sabater, Mark Fitchett
FY24: Use nest temperature data in green sea turtle population viability assessments and others where possible.	4	Camryn Allen	Irene Kelly, Steve Kolinski	Asuka Ishizaki

Description of Action Item and Purpose:
Examine and project food web and fishery sensitivity to the changing extent of the oxygen minimum zones (OMZs) in the central North Pacific (CNP) and eastern tropical Pacific (ETP) ecosystems. The subsurface OMZs of tropical oceanic regions play an important role in trophic connectivity between depth zones, the transport of carbon from surface waters, and the foraging environment of ecologically and economically valuable fish such as tunas and billfishes. The extent and severity of the Pacific oxygen minimum zone is expected to increase as a consequence of climate change over the next century.

Longer-Term Goal:
During the FY22–24 period, simulations and analyses will focus upon OMZ-driven changes in vertical distribution and diel vertical migration patterns of micronekton and upon the foraging depth range of larger, predatory fishes. Continuing work beyond the PIRAP 2.0 timeframe will focus on incorporating and simulating the physiological effects of OMZ changes upon specific functional groups within the CNP and ETP models.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Develop vertically resolved end-to-end ecosystem models for the central north Pacific (CNP) and eastern tropical Pacific (ETP).	5	Jim Ruzicka	Mark Fox	Mark Fitchett
FY23–24: Use developed models to simulate how changes in mesopelagic community composition and production and changes in diel vertical migration (DVM) patterns propagate throughout the food web and affect fisheries. Employ the ECOTRAN end-to-end model platform to run time-dynamic simulations of the CNP and ETP ecosystems under alternate OMZ and DVM scenarios; meet with appropriate PIR managers while developing simulations to maximize management relevancy.	4	Jim Ruzicka	Mark Fox, Gerry Davis	Mark Fitchett

FY24: Manuscript submitted for peer-review presenting model development and simulation results, presentation(s) to appropriate PIR managers.	4	Jim Ruzicka	Mark Fox, Gerry Davis	Mark Fitchett

Theme: Ecosystems, Habitats, and Humans

Description of Action Item and Purpose:
Combine UxS, satellite data, aircraft hyperspectral data, and ecosystem modeling to assess the role of bioslicks in driving fisheries and ecosystem productivity across the MHI.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Secure resources needed to undertake sampling and research. (Will require additional resources.)	7	Jamison Gove	Jarad Makaiau	Marlowe Sabater
FY23: Sample slicks within 50 nm of each of the main Hawaiian Islands, expanding out to the full EEZ as computational power allows. (Will require additional resources.)	6	Jamison Gove	Jarad Makaiau, Anne Chung	Marlowe Sabater
FY23: Examine relationship(s) between bioslicks and food web productivity, publish results in peer-reviewed paper, share results with appropriate PIR managers. (Will require additional resources.)	5	Jamison Gove	Jarad Makaiau, Anne Chung	Marlowe Sabater

FY23–24: Where possible, use identified relationships between bioslicks and food web productivity to project future regional productivity, peer-review paper and presentations to appropriate PIR managers. (Will require additional resources.)	4	Jamison Gove	Jarad Makaiau, Anne Chung	Marlowe Sabater

Description of Action Item and Purpose:
Expand capacity for regular diet studies for managed, protected, frequently bycaught, cultural keystone, and other species of interest.

Longer-Term Goal:
Continue to assess needed capacity for diet work and respond when necessary.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Draft an internal report assessing current and needed staff capacity and resources.	7	Jonathan Whitney	Mark Fox	Asuka Ishizaki
FY23: Fill at least 50% of the capacity and resource gaps identified in FY22. (May require additional resources.)	7	Jonathan Whitney	Mark Fox	Asuka Ishizaki
FY24: Fill 100% of the capacity and resource gaps identified in FY22. (May require additional resources.)	7	Jonathan Whitney	Mark Fox	Asuka Ishizaki

Description of Action Item and Purpose:
To support early identification of local climate impacts, build local capacity for data collection and analysis of climate-relevant data streams. Ensure data integrity through building local capacity for data collection so that climate related data streams are captured.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Assess current capacity and draft island-/territory-specific coral reef fishery management plan(s) to expand capacity.	7	Frank Parrish	Mark Fox	Joshua DeMello
FY22–24: Conduct baseline work that moves toward developing tools in the next iteration of PIRAP, coordination between appropriate PIR manager, scientists, and stakeholders.	7	Todd Jones	Fatima Sauafea-Leau	Joshua DeMello
FY23–24: Implement plan to expand capacity thereby beginning and maintaining data collection. (May require additional resources.)	6	Todd Jones		Joshua DeMello

Description of Action Item and Purpose:
Update the West Hawaii Ecosystem Status Report (ESR). This includes indicators at both the West Hawaii and MHI spatial scales. The report will also include subsections that are similar to an 'Outlook Report'—a prognosis or projection for ecosystem and cultural services based on potential climate impacts to coral reefs and the marine environment and the strength of the connection between these impacts and the provision of ecosystem and cultural services.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC

FY22: Complete report.	6 4	Jamison Gove	Gerry Davis, Lani Watson, Anne Chung	Marlowe Sabater

Description of Action Items and Purpose:
Conduct Climate Vulnerability Assessments.

Longer-Term Goal:
Use climate-informed vulnerability assessments in a management context. This will likely not be possible until after the PIRAP2.0 timeframe.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Contribute to marine mammal climate vulnerability assessments, publish results in a NOAA tech memo.	6	Erin Oleson	Krista Graham, Steve McKagan	Asuka Ishizaki
FY22: Present results of the marine mammal climate vulnerability assessments at the 24th Biennial Conference on the Biology of Marine Mammals.	6	Erin Oleson	Krista Graham	Asuka Ishizaki
FY22–24: Track communities' vulnerability to climate change.	6	Jonathan Sweeney	Michelle McGregor, Fatima Saufea-Leau	Asuka Ishizaki

FY23: Complete updated Climate Vulnerability to Coral Reefs report.	6 4	Jamison Gove	Gerry Davis, Steve Kolinski	Joshua DeMello

Description of Action Item and Purpose:
Ensuring environmental justice, equity, and gender representation in government climate mitigation measures.

Longer-Term Goal:
This work will extend beyond the PIRAP 2.0 timeframe.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Investigate gender representation in socio-economic surveys and summarize findings, share results with appropriate PIR managers and stakeholders.	2	Danika Kleiber	Mark Fox, Michelle McGregor	Asuka Ishizaki
FY23: Initiate demographic data collections to facilitate environmental justice/equity analyses of climate change mitigation measures.	2	Danika Kleiber	Mark Fox, Michelle McGregor	Asuka Ishizaki
FY24: Maintain demographic data collections to facilitate environmental justice/equity analyses of climate change mitigation measures.	2	Danika Kleiber	Mark Fox, Michelle McGregor	Asuka Ishizaki

Description of Action Item and Purpose:
Understanding and monitoring coral recovery and degradation.

Longer-Term Goal:
Incorporate results into management where possible.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22–24: Meet with appropriate PIR managers to ensure research aligns with management needs.	7	Frank Parrish	Anne Chung	Marlowe Sabater
FY22–24: Use photogrammetry and other survey techniques to track carbonate budgets and assess accretion/erosion balance at 20 sites each year across western and central Pacific reefs, share results with appropriate PIR managers and stakeholders.	6	Hannah Barkley	Heidi Hirsh	Joshua DeMello
FY22–24: Use photogrammetry to track coral reef structural change and fish habitat at 100 sites each year across central Pacific reefs, share results with appropriate PIR managers and stakeholders.	6	Thomas Oliver	Lillian Raz	Joshua DeMello
FY22–23: Spatially refine (i.e., downscale) ecological coral reef trends from > 300 sites across central Pacific reefs, reporting trends at smallest scale that is statistically responsible. Share results with appropriate PIR managers and stakeholders.	6	Thomas Oliver	Gerry Davis, Lani Watson, Lance Smith, Steve McKagan, Steve Kolinski	Joshua DeMello

FY22–24: Conduct colony-level demographic modeling at 30 sites across the Central Pacific.	4	Thomas Oliver	Gerry Davis, Lani Watson, Lance Smith	Joshua DeMello

Theme: Regional Coordination and Operations

Action Item Description and Purpose:
Higher-level collaboration between science and management on setting climate priorities in order to provide top-down guidance on issues coordinated between the Science Center, Regional Office, and the Council, including streamlining how climate change is incorporated in other regional initiatives (e.g., EBFM, BiOps).

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22–24: Annual meetings between PIFSC, PIRO, and Council directorates to coordinate climate-related priorities and needs, additional coordination meetings between PIRO and PIFSC throughout the year.	7	Director's Office	Directorate	Executive Director
FY22–24: All-hands communication of decisions made at above coordination meetings.	7	Director's Office	Directorate	Executive Director
FY22–24: Crosswalk NCSS and PIRAP 2.0 with regional initiatives that include a climate-related element.	7	Director's Office	Directorate	Executive Director
FY22–24: Hold an annual collaborative climate science workshop to bring together regional scientists and managers.	7	Phoebe Woodworth-Jefcoats	Ann Barlow, Bob Schroeder	Marlowe Sabater, Mark Fitchett

FY24: Conduct tabletop scenario planning exercise to determine "no regrets" strategies under different potential futures, summary meeting report.	2	Kirsten Leong		

Description of Action Item and Purpose:
Improve the regional reporting of climate variables through the Archipelagic and Pelagic Plan Team's Annual Stock Assessment and Fishery Evaluation Report. The Ecosystem Consideration Chapter of the report includes the state of the environment to which the stock is exposed and the location of fishery operations. The purpose of this action is to enhance the reporting and communication of the climate variables to fishery managers and fishing community. Regulations require these reports be published on June 30 of each year, and the information from the report must be processed for fishery management use.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22: Convene meeting of the Archipelagic and Pelagic Plan Teams to discuss ways to incorporate the climate information in Council management decisions noting that the final decision on actions rests with the Plan Teams.	6 3	Donald Kobayashi, Todd Jones	Directorate	Marlowe Sabater, Mark Fitchett
FY23: Develop fishery management framework that will incorporate climate information in the Council's conservation and management measures.	6 3	Director's Office	Directorate	Marlowe Sabater, Mark Fitchett
FY24: Finalize potential amendments.	6 3	Director's Office	Directorate ; Jonathan Brown	Marlowe Sabater, Mark Fitchett

	Description of Action Item and Purpose: Reduce the NOAA Fisheries Pacific Island region's carbon footprint.				
	Metrics	**NCSS Objective**	**PIFSC POC**	**PIRO POC**	**Council POC**
	FY22–24: In partnership with the Inouye Regional Center Facility Management Board, complete annual emissions inventories for PIR facilities and operations. Note those emissions which are within NMFS's control and those which are not. The emissions inventory is the first step in taking a baseline on the region's use of cars and travel, use of energy in offices and other facilities, and reduction of waste with on-site recycling and composting, as well as water conservation.	7	Director's Office	Directorate	Executive Director
	FY22: Develop a green operations plan with the goal of reducing our region's carbon footprint, including through both PIR facilities as well as travel/remote work. The Plan will directly address those elements of the region's carbon footprint which are within NMFS's control, and include partnership strategies for those elements which are not.	7	Director's Office	Directorate	Executive Director
	FY23: Implement green operations plan.	7	Director's Office	Directorate	Executive Director
	FY24: Evaluate and, refine green operations plan as needed.	7	Director's Office	Directorate	Executive Director

FY24: Estimate carbon emissions associated with commercial fishing activity in the PIR, and, where possible, examine potential for emissions reductions. Share results in a peer-reviewed publication with the fishing industry and with appropriate PIR managers.	7	Jonathan Sweeney	Jarad Makaiau	Marlowe Sabater, Mark Fitchett

Description of Action Item and Purpose:
Monitoring climate impacts to protected species habitat at French Frigate Shoals. Habitat loss is a concern at French Frigate Shoals where small low-lying islets provide crucial habitat (especially for breeding) to both Hawaiian monk seals and Hawaiian green sea turtles.

Metrics	NCSS Objective	PIFSC POC	PIRO POC	Council POC
FY22–24: Conduct climate-focused restoration work and research in coordination with co-managers to tackle issues of coastal erosion, storm damage, coral bleaching, and habitat loss. This may include coastal surveying at FFS and identification of alternate terrestrial sites for seals and turtles, incorporate marine environmental parameters, and other species of interest, such as corals and seabirds, as well as use of quality LIDAR. (May require additional resources.)	6	Jason Baker	Irene Kelly, Ann Barlow	Asuka Ishizaki
FY22–24: Participate in a broad workshop to assess management next steps for FFS that will include NESDIS, ONMS, FWS, OHA, and State of HI, in addition to PIFSC/PIRO for NMFS.	6	Jason Baker	Irene Kelly, Ann Barlow	Asuka Ishizaki

	FY22–24: HMSRP team will survey monk seal populations each year (these surveys will occur on the terrestrial portion of seal habitat) at FFS as well as throughout the NWHI and MHI.	6	Jason Baker	Angela Amlin	Asuka Ishizaki
	FY23: HMSRP will identify appropriate partners and model/simulation methods, complete simulation of future conditions (in collaboration with external partners), share results in peer-reviewed publication and in presentation(s) to appropriate PIR managers. (Will require additional resources.)	4	Jason Baker	Angela Amlin	Asuka Ishizaki
	FY22–24: Designation of FFS as a new Habitat Focus Areas (HFA). New HFAs will be chosen within the Pacific Islands region with the goal of solving habitat degradation problems through increased NOAA collaboration and work with partners. An HFS designation at FFS there within the next year would bring a climate focus, tackling issues of coastal erosion, storm damage, coral bleaching, and habitat loss.	3 2 1	Jason Baker	Anne Chung, Lani Watson, Irene Kelly, Lance Smith	Asuka Ishizaki

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