

OFFICE OF NATIONAL MARINE SANCTUARIES COORDINATION REPORT (March 2022)

Introduction

The NOAA Office of National Marine Sanctuaries (ONMS) serves as trustee for the nation's system of marine protected areas (MPAs). Through active research, management and public engagement, national marine sanctuaries sustain healthy environments that are the foundation for thriving communities and stable ocean-dependent economies. The primary objective of the National Marine Sanctuaries Act (NMSA) is resource protection of marine areas (Great Lakes included) of special national significance, while promoting sustainable uses. Five national marine sanctuaries are located on the west coast: Olympic Coast, Greater Farallones, Cordell Bank, Monterey Bay, and Channel Islands (OCNMS, GFNMS, CBNMS, MBNMS and CINMS respectively)

Purpose of the Annual Coordination Report

The West Coast Regional Office (WCRO) within ONMS appreciates the invitation to provide this annual coordination report to the Pacific Fishery Management Council (PFMC or Council). Since the first invitation in 2017, our relationship has continued to improve through knowledge and recognition of our individual mandates and shared responsibilities. The report contains an update of the following activities implemented in 2021: nominations and designations, condition reports, management plan reviews, climate change, kelp research, black abalone translocation, salmonscape exhibit, and planning for the 50th anniversary of ONMS.

NOMINATIONS

- **Sanctuary Nomination Process – WCRO** (www.nominate.noaa.gov)
Purpose: In response to widespread interest from the public, in June 2014 NOAA launched a revised process to accept new national marine sanctuary nominations (79 FR 33851). ONMS reviews sanctuary nominations against 11 criteria that are derived in large part from the NMSA. Nominations that successfully pass this review are added to an inventory of areas NOAA may consider for potential designation as a national marine sanctuary. The preamble to the final rule establishing the sanctuary nomination process (SNP) states “if NOAA takes no action on the nomination in the inventory, the nomination will expire after five years from the time it is accepted to the inventory.” NOAA subsequently clarified the process for assessing the continuing viability of nominations that are nearing the five- year expiration mark (84 FR 61546; November 2019), in essence to determine if the nomination after five years is still responsive to the 11 SNP criteria described in the 2014 final rule. A sanctuary nomination is not the same as a sanctuary designation. Designation is a separate process that by law is highly public and participatory, and often takes several years to complete.

Outcome: ONMS's goal is to maintain a vibrant list of relevant nominations on the inventory. On the west coast, the second submission for a proposed Chumash Heritage National Marine Sanctuary (CHNMS), off central California, was added to the inventory in October 2015. A five-year review was completed for CHNMS in October, 2020 with the nomination remaining in the inventory. The St. George Unangan Heritage National Marine

Sanctuary nomination, surrounding St. George Island in the Bering Sea, was accepted and added to the inventory in January 2017. A five-year review was conducted in late-2021 and early-2022. NOAA decided to keep SGUHNMS in the inventory in late-January 2022. In addition, NOAA has received a new sanctuary nomination from the Aleut Community of St Paul Island, Alaska. The nomination, Alaġum Kanuuġ (Heart of the Ocean; Pribilof Islands Marine Ecosystem (PRIME) Initiative; pronounced ahl-ah-GOOM ka-NOH) was submitted in December, 2021 and is under review. As a reminder, there have been two other nominations on the west coast that were not accepted into the inventory: 1) Aleutian Islands National Marine Sanctuary, covering most of Western Alaska, the Bering Sea, and the Aleutian Islands (declined January, 2015); and 2) Southern California Offshore Banks proposal, representing Cortes, Tanner, Cherry and Northwest Banks, and Garret Ridge (declined in March, 2018).

Outcomes/Timelines for Designation: Malloys Bay – Potomac River in Maryland was designated in September, 2019; Wisconsin Shipwreck Coast was designated in August, 2021. Three nominations are in the designation process: Lake Ontario in New York (initiated in April 2019, Papahānaumokuākea in Hawaii (initiated in November, 2021) and Chumash Heritage, *see below* (initiated in November, 2021).

Other Nominations in the Inventory: Lake Erie Quadrangle (accepted in February, 2016); Hudson Canyon (accepted in February, 2017); and Marianas Trench (accepted in March, 2017). Hudson Canyon and Marianas Trench are undergoing five-year reviews presently.

- **Chumash Heritage National Marine Sanctuary Designation - WCRO**

Purpose/Outcome: The purpose of the CHNMS nomination is to protect, study and interpret the proposed area's abundant natural resources and maritime heritage, including the Chumash cultural heritage. The nomination stretches from Cambria along the San Luis Obispo County coast to Gaviota in Santa Barbara County, then offshore along the western edge of the Channel Islands, and back offshore to the north reconnecting near Cambria. It contains an internationally significant ecological transition zone, supporting high biological diversity and densities of numerous important species. Important features within the proposed sanctuary include Rodrigues Seamount, Arguello Canyon and the Santa Lucia Bank. The nomination submitted by a large community consortium led by the Northern Chumash Tribal Council stated their view that the proposed sanctuary should not impose future sanctuary regulations affecting commercial fisheries or recreational fishing. The nomination identified considerable threats to resources including existing and potentially future oil and gas development, offshore wind farms, fiber optic cables, potential marine transport of spent nuclear waste, and others for which a sanctuary could be ideal to address. The nomination recognized national marine sanctuaries can provide a single forum for comprehensive, ecosystem based planning of multiple uses. The nomination was added to the inventory of candidate sites for future designation with community support from the public, elected officials, businesses, scientists, and environmental groups. See the sanctuary designation website for more information: <https://sanctuaries.noaa.gov/chumash-heritage/>

NOAA announced on November 10, 2021 that the agency was initiating a process to consider designating CHNMS. Public scoping meetings were held (virtually) in December and early

January. The public comment period ended January 31, 2022. Comments were uploaded via [regulations.gov](https://www.regulations.gov) using docket # NOAA-NOS 2021-0080. ONMS staff are in the process of reviewing an enormous amount of public comments, nearly 22,500, received during the scoping period. That public input will help shape detailed plans for designating the sanctuary, what it will manage and focus on, its regulations and general management considerations. Scoping comments and input from tribes, federal agencies, state agencies and local governments will help NOAA determine what boundary and regulatory alternatives to evaluate in the draft environmental impact statement. Per the NMSA and past inter-agency agreements, if NOAA anticipates needing sanctuary regulations that would regulate fishing, ONMS staff will bring any such need back to the PFMC (or California Fish and Game Commission as relevant) for its consideration, feedback, or action.

Timeline: The process to designate will take roughly two years or more to complete. NOAA will distribute for public review and comment, a draft management plan, draft regulations, and draft environmental impact statement, possibly near the end of 2022. NOAA will consider all public comments prior to moving forward with a sanctuary designation. If NOAA decides to pursue, the agency will prepare final documents - management plan, regulations and EIS. The NMSA provides various consultation review periods for the governor and Congressional committees before a designation becomes final. For more information contact Paul Michel: paul.michel@noaa.gov.

CONDITION REPORTS

- **Condition Report Update – OCNMS**

Purpose/Process: In anticipation of kicking off the OCNMS management plan review process in 2022, sanctuary staff have completed an updated OCNMS condition report, which is in final review and clearance. The OCNMS condition report will provide a summary of resource conditions, specifically water quality, habitat, living resources and maritime archaeological resources in the sanctuary; describes pressures on those resources and the current status and trends of sanctuary resources; and summarizes management responses to pressures that threaten the integrity of the sanctuary's marine environment. The selection of indicators for condition report development, introduced in 2016, follows NOAA's California Current Integrated Ecosystem Assessment (IEA) framework. Use of common indicators across west coast sanctuaries and also shared by partners, greatly improves the ability to establish quantitative status and trends at different spatial scales. Use of confidence scores, also introduced in 2016, improves the certainty of the status and trend ratings. Since 2018, sanctuary condition reports also include a section on ecosystem services. The process to update a sanctuary condition report process is typically initiated with an orientation to the sanctuary advisory council and key partners, particularly from the science community. The completed report, which has undergone several reviews, is currently being formatted and is anticipated to be available to the public in the near future.

Outcome: The report is a comprehensive update to the 2008 condition report. We have made numerous improvements and changes to the report in order to enhance its utility for not only the sanctuary, but the Coastal Treaty Tribes, federal and state agency partners, scientists, resource managers, stakeholders, and the general public. For example, we

improved the ONMS framework to expand the ecosystem services assessed, adding subsistence harvest due to its high importance for communities within our region. Furthermore, we have enhanced the process to better represent the reciprocal relationship between humans and the ocean and to integrate Indigenous voices and perspectives more prominently into our report.

While many aspects of the sanctuary, including water quality, seafloor habitat, many fish and marine mammal species, the condition of maritime archaeological resources, and several ecosystem services appear healthy and stable, we believe that current and projected impacts from climate change pose significant threats to the sanctuary. During this assessment period, starting in 2008, we have observed impacts from climate change that have influenced many of the status and trends presented throughout the report, e.g., the 2014-2016 marine heatwave that triggered a large harmful algal bloom that affected the Dungeness crab fishery as well as hypoxic events that resulted in fish kills on some Olympic Coast beaches.

Timeline: The release of the OCNMS condition report is expected in winter 2022.

Partners: Olympic Coast Intergovernmental Policy Council, Makah Tribe, Quileute Tribe, Hoh Tribe, Quinault Indian Nation, State of Washington, OCNMS Advisory Council, NMFS/Northwest and Southwest Fisheries Science Centers (NWFSC and SWFSC), California Current IEA Program, Washington Sea Grant, NOAA's Pacific Marine Environmental Laboratory, Olympic National Park, and academic partners.

- **Condition Report Update – CBNMS**

Purpose/Process: In advance of a management plan review planned in 2023, CBNMS staff are updating the 2009 CBNMS Condition Report. The condition report will inform sanctuary managers of the status and trends of conditions over the past 10 years, and the management plan will identify strategies and activities in response to those conditions to be conducted over the next 10 years. CBNMS staff kicked off the condition report process with a presentation to their advisory council in 2020, followed by staff identifying appropriate indicators for natural and cultural resources of the sanctuary. Because of COVID restrictions, CBNMS staff held virtual workshops with experts to select data indicators for the status and trends ratings. In spring 2021, CBNMS held workshops for experts to assist in rating the status and trends of resources, human activities, and ecosystem services. Approximately 50 experts from government, academia, and non-governmental organizations contributed time and expertise to the process. Staff then drafted report content based on the workshop material and discussions. See timeline below for remaining tasks.

Outcome: The updated condition report will provide an assessment of conditions in the sanctuary from 2009 to 2021. Approximately 125 data indicators were used to assess the status and trends of water quality, habitat integrity, living resources, levels of human activities, maritime heritage, and ecosystem services in the sanctuary. The CBNMS condition report resource questions are strongly informed by long term monitoring conducted by sanctuary staff and partners including benthic surveys, oceanographic and acoustic moorings, and the Applied California Current Ecosystem Studies project. In

addition, projects and analysis by the National Marine Fisheries Service including oceanographic assessments, integrated ecosystem assessments, bottom trawl, juvenile rockfish, and aerial survey data have been critical to the project and will provide a robust assessment of sanctuary conditions. Other state, local, and non-governmental organizations contributed valuable data and information.

Timeline: In spring 2022, sections of the report will be reviewed by experts including NMFS science center scientists. Sanctuary staff will then edit the full document, which will then be peer-reviewed. The target date for completion of the full report is early 2023.

Partners: CBNMS Advisory Council, National Centers for Coastal Ocean Science (NCCOS), California Current IEA Program, NMFS NWFSC/SWFSC, UC Davis Bodega Marine Lab, Point Blue Conservation Science (PBCS), Central and Northern California Ocean Observing System (CeNCOOS), Farallon Institute, San Francisco State University, Point Reyes National Seashore, The Marine Mammal Center, Cascadia Research, San Francisco State University, California Academy of Sciences, California Department of Fish and Wildlife (CDFW), Smithsonian Institute, Sonoma County Regional Parks, and GFNMS, among others.

- **Condition Report Update – GFNMS**

Purpose: GFNMS staff are in the process of updating their 2010 Condition Report. The condition report provides a basis for the next management plan revision, set to begin in 2023.

Outcome: GFNMS is implementing a similar process to update their condition report as the other national marine sanctuaries have followed. GFNMS staff will hold a series of status and trends workshops. We anticipate more than 30 experts will be invited to participate in the status and trends workshops, rating 13 natural resource questions, two maritime and cultural resource questions, and eight ecosystem services questions. The GFNMS Condition Report will have a focus on how human and climate stressors can be managed.

Timeline: In January 2022 GFNMS science staff convened a research symposium, which generated new and current information relevant to the status and trend questions in the Condition Report. In the summer of 2022, sanctuary staff will consult with approximately 30 experts to help evaluate the status and trends of sanctuary resources. At this time, ONMS expects completion of the final condition report in mid-2023.

Anticipated Partners: GFNMS Advisory Council, Greater Farallones Association, NCCOS, California Current IEA Program, NMFS NWFSC/SWFSC, Restoration Center and Deep-sea Coral Research and Technology Program, UC Davis Bodega Marine Lab, UC Santa Cruz, Moss Landing Marine Laboratories, PBCS, Farallon Institute, San Francisco State University, Point Reyes National Seashore, Golden Gate National Recreation Area, USFWS, CDFW, NOAA Restoration Center, ORR Marine Debris Program, MBNMS and CBNMS.

MANAGEMENT PLAN REVIEWS

The NMSA requires NOAA to “evaluate the substantive progress toward implementing the management plan and goals for the sanctuary” and “revise the management plan and regulations as necessary to fulfill the purposes and policies of this chapter” at intervals not exceeding five years (NMSA 304(e)). Over the last decade, ONMS has strived to complete a sanctuary condition report, which describes the conditions of the sanctuary ecosystem in advance of a comprehensive management plan review. The condition report sets the stage for evaluating previous management efforts as well as the relevance of existing goals and objectives of the sanctuary. When a sanctuary pairs the condition report with the onset of sanctuary management plan review it helps create a clear link between resource protection needs and management priorities.

Nearly all national marine sanctuaries on the west coast are currently engaged with condition report development or management plan review, yet at different stages of the process. MBNMS completed their management plan review process in 2021 by publishing the final documents and regulatory changes. Here follows a summary of regional progress with the sites furthest along in the process (i.e., finalizing management plan review) mentioned first.

- **Management Plan Review – MBNMS**

(<https://montereybay.noaa.gov/intro/mp/welcome.html>)

Purpose/Process: In November 2021, NOAA published the final revised management plan, regulations and associated final environmental assessment for MBNMS. These documents were produced after a six-year process with input from the MBNMS Advisory Council, stakeholders, and federal, state and local agencies and partners. The updated management plan is organized into 13 issue- and program-based action plans to guide NOAA in understanding and protecting sanctuary resources over the coming decade. Action plans focus on climate change, coastal erosion and sediment management, Davidson Seamount research and protection, emerging issue response, introduced species, marine debris, water quality, and wildlife disturbance. The management plan also provides guidance for education and outreach activities, maritime heritage, resource protection, research, and facility operations.

The regulatory changes are minor and designed to facilitate habitat protection and restoration activities providing ecological and economic benefits to coastal resources, residents, and businesses, improve access for users of motorized personal watercraft (MPWC) in the sanctuary, and reduce disturbances of sensitive wildlife. Specifically, NOAA expanded the use of motorized personal watercraft (MPWC; e.g., jetski) seasonally at Mavericks by reducing the required condition to operate from high surf warning to a high surf advisory; and move the boundaries for year-round MPWC zones closer to shore. Additionally, NOAA added new regulatory language to clarify NOAA’s ability to approve the beneficial use of suitable dredged material for habitat protection or restoration purposes within the sanctuary. This provided an additional means for Pillar Point Harbor to conduct dredging and reuse of appropriate materials for nearby beach nourishment (other harbors adjacent to MBNMS already have those means in place). No regulations addressing commercial fisheries or recreational fishing were included in the final (or draft) action.

Outcome: Final management plan, final environmental assessment, and final regulations.

Timeline: The MBNMS management plan was released in November 2022 and will be a guiding document for approximately 5-10 years.

Partners: The MBNMS and GFNMS advisory councils and countless others from local, state and federal partner agencies, such as the California Department of Fish and Wildlife (CDFW), US Fish and Wildlife Service and National Marine Fisheries Service (NMFS).

- **Management Plan Review – CINMS**
(<https://channelislands.noaa.gov/manage/plan/revision.html>)

Purpose/Process: An updated management plan is being developed for CINMS. On December 17, 2021, a Draft Management Plan (DMP) and Draft Environmental Assessment (DEA) were released for public review, with a comment period closing on February 24, 2022. CINMS initiated the public process in October 2019 to update the site's 2009 management plan. The process to review the management plan has also been informed by findings within an updated CINMS Condition Report, released in 2019.

With the release of the DMP/DEA, NOAA is not proposing any revised or new sanctuary regulations, nor any changes to sanctuary boundaries or the network of federal marine reserves and marine conservation areas within CINMS.

The DMP includes ten action plans that address priority management issues and core sanctuary programs: climate change; marine debris; vessel traffic; introduced species; zone management; cultural resources and maritime heritage; education & outreach; research & monitoring; resource protection; and administration & operations.

Strategies and activities within these action plans will not adversely affect fishing activities, but will support productive fishing habitats and are expected to strengthen fishing community partnerships. New initiatives within the DMP include:

- A focused effort to better understand and address the effects of climate change on sanctuary ecosystems and human uses. This will include assessing vulnerabilities, developing an adaptation plan, tracking effects on deep sea coral communities, and understanding the role played by protective zones within the sanctuary.
- Addressing marine debris in the sanctuary, including a focus on assessing and reducing shore-cast
- debris and balloons, and teaming up with local lobster fishermen to remove shore-cast lost traps.
- Increasing efforts to respond to and limit the impacts of marine introduced (non-native) species.
- Enhanced outreach and programming to work collaboratively with the recreational fishing community in support of the responsible enjoyment of fishing within the sanctuary.
- Calling for a future review of the performance of the jointly designated NOAA/State marine reserves and conservation areas within the sanctuary to assess the need for any

network modifications.

- Inviting and including a broader diversity of individuals to gain access to the benefits provided by sanctuary programming.
- Enhancing collaborations with Chumash community partners, including respectfully inviting greater involvement and supporting use of traditional ecological knowledge.

PFMC leadership (Executive Director and Deputy Director) received notice of the DMP/DEA on December 17, 2022. PFMC agenda time on this matter is not anticipated, but CINMS staff are available to provide additional information if needed or requested.

Outcome: An updated CINMS Final Management Plan containing programmatic strategies to guide sanctuary activities for 5-10 years, supported by a Final Environmental Assessment. The updated plan will strategically orient sanctuary programs to meet priority issues relevant to current and future management needs.

Timeline: Public comments on the Draft Management Plan and Draft Environmental Assessment are being taken through February 24, 2022. Beyond that, depending on the extent of public comment, staff estimate that final documents can be prepared and published by late summer, 2022.

Partners: The CINMS Advisory Council and other experts from local, state and federal partner agencies.

- **Management Plan Review – OCNMS**

Purpose/Process: OCNMS's current management plan was completed in 2011, administratively reviewed in 2017, and is due for a complete public review. The administrative review evaluated progress made toward implementing the 2011 plan, as well as reviewing priorities. Based on the review, ONMS determined that no immediate or urgent revisions to the management plan or the regulations were needed. Since that time we have concentrated on completing a revised condition report. Upon publication of the completed condition report in early 2022, we will start planning for a more rigorous management plan review (MPR).

Plans for the next year include discussions with the Olympic Coast Intergovernmental Policy Council on the MPR process, and Advisory Council briefings on the current management plan, implementation and current priorities.

OCNMS plans to initiate the public process to update the site's 2011 management plan in mid to late 2022.

Outcome: An updated sanctuary management plan containing programmatic strategies to guide sanctuary activities for 5-10 years, supported by an environmental assessment. The updated plan is expected to strategically orient sanctuary programs to meet priority issues relevant to current and future management needs over the next 5-10 years.

Timeline: Looking ahead, staff hopes to begin discussions on preliminary priority issues to be addressed and process planning in 2022. Management scoping is anticipated in late 2022 or early 2023.

Partners: The Olympic Coast Intergovernmental Policy Council, Makah Tribe, Quileute Tribe, Hoh Tribe, Quinault Indian Nation, State of Washington, OCNMS Advisory Council and other experts from local, state and federal partner agencies.

CLIMATE CHANGE

- **Climate Vulnerability Assessment (CVA)**

Purpose:

Climate vulnerability is a measure of how vulnerable a given resource (e.g. species, habitat, ecosystem service) is to the cumulative impacts of climate change and non-climate stressors. It is a function of the sensitivity of a particular resource to climate changes, its exposure to those changes, and its capacity to adapt to those changes (IPCC 2007). A CVA is a process used to qualitatively describe and evaluate how climate and non-climate stressors impact a protected area's vulnerability to climate change in order to improve management approaches for long-term success. The CVA is composed of worksheets with specific questions for participants to answer, as well as rankings in order to provide vulnerability ratings for each resource assessed. CVAs can help managers prioritize resources and systems for management actions, develop management strategies to address climate change by more specifically targeting the mechanism(s) identified to be causing the vulnerability, and efficiently allocate resources.

Outcome:

GFNMS/CBNMS completed a climate vulnerability assessment in 2015. Using the results of the assessment, GFNMS developed its 2016 Climate Action Plan, which targets the specific vulnerabilities identified for the 3 most impacted habitats in the sanctuary: beaches, rocky intertidal, and estuaries. The Plan has guided a suite of projects, including regional sediment management, implementation of living shorelines, assessment of blue carbon, and restoration of bull kelp forests. The goal for the WCR is to complete climate vulnerability assessments for every site and to update these assessments on a regular basis.

OCNMS is currently conducting a climate vulnerability assessment through an Advisory Council working group. This CVA is leveraging and expanding on the GFNMS methodology as well as information from the recently completed condition report. OCNMS is piloting this sequence of conducting a vulnerability assessment between the condition report and management plan review, to allow the sanctuary to better incorporate climate change in our management plan. To this end, OCNMS will assess the vulnerability of 49 species (fish, invertebrates, marine mammals, birds, marine plants), 6 habitats (rocky shore, beaches, sandy nearshore, kelp forests and rocky reefs, deep-sea/benthic seafloor, and pelagic/open ocean), several tangible maritime heritage resources, and 11 ecosystem services. This process will also leverage efforts by NOAA Fisheries on fish and marine mammal vulnerability assessments underway. OCNMS is also working to expand our understanding of ecosystem

services to better weave pluralistic worldviews in this assessment. Finally, we plan to develop adaptation and mitigation recommendations that OCNMS should consider as part of our management plan review.

Timeline: Olympic Coast NMS is currently conducting a climate vulnerability assessment, with anticipated completion of fall 2022. GFNMS/CBNMS will conduct a limited update to their [2015 Climate Vulnerability Assessment](#) in Spring/Summer 2022. Monterey Bay and Channel Islands national marine sanctuaries will conduct their first climate vulnerability assessment in 2023/2024.

Partners: Greater Farallones Association, OCNMS Advisory Council working group - ~30 members from tribal, federal, state agency staff, academia, and others.

- **Blue Carbon Science and Management in GFNMS**

Purpose:

Marine ecosystems can mitigate climate change by removing carbon dioxide from the atmosphere and transporting it into sediments or deep waters, where it can be stored indefinitely - hence the name “blue carbon ecosystems”. Marine protected areas (MPAs), including national marine sanctuaries, protect blue carbon ecosystems that are essential for achieving global carbon mitigation and emission reduction goals. Greater Farallones Association and Greater Farallones National Marine Sanctuary are working together to better understand the amount of carbon currently stored in sanctuary habitats and sediments, and the amount of carbon that is annually sequestered through various processes, including through kelp growth and export to the deep-sea, whale falls (the sinking of whale carcasses to the seafloor), and plant (e.g. seagrass) growth and burial in coastal habitats.

Outcome:

In the fall of 2021, GFNMS published “[Conservation Science Series: Blue Carbon in Marine Protected Areas](#)”, a two-part report series, with accompanying [storymap](#), to inform and guide MPA managers in the assessment, protection, and management of blue carbon habitats and processes. Part 2 of this report series provides the methods and results of a first-of-its-kind assessment of coastal and marine carbon sequestration processes within GFNMS. The sanctuary is now working to incorporate the findings of the assessment into sanctuary planning documents and processes.

These reports and storymap have been the focus of extensive outreach and engagement with local, regional, national and international audiences. We have reached over 800 people via presentations and interviews, and have presented this information to members of US Congress, senior NOAA staff, the International Blue Carbon Conference in Edinburgh, Scotland, and the UNFCCC Conference of the Parties (COP26) in Glasgow, Scotland.

Timeline:

Building on these achievements, Year 2 of the project includes an expanded assessment of sediment carbon, focusing on the quantification of carbon in offshore marine sediments

within GFNMS and CBNMS, and an assessment of the potential for disturbance events to release and remineralize carbon into the water column. We will also continue additional product development, including a concept paper that details the best methods and analysis for quantifying marine sediment carbon, and outreach and engagement both within sanctuaries and with international audiences.

Partners: Greater Farallones Association, Scottish Blue Carbon Forum

RESEARCH

- **Kelp Research in GFNMS - Kelp Canopy Mapping and Restoration Site Assessment**

Purpose: Since 2014, GFNMS has experienced a period of severe kelp forest habitat loss, with the majority of areas transitioning to urchin-dominated conditions. The Greater Farallones Kelp Restoration Program continues to implement research, restoration and monitoring strategies developed by the Greater Farallones Sanctuary Advisory Council and outlined in the Bull Kelp Restoration Plan. A significant area of focus is determining how best to strategically focus kelp forest recovery efforts by identifying areas of increased kelp resilience and persistence where kelp restoration may be more successful. In 2021, for the third year in a row, the Kelp Restoration Program co-led a drone mapping project to capture data on kelp forest canopy presence and extent at the sites outlined in the Restoration Plan. These data are vital for informing restoration and management decision-making. The state of California used to fund aerial plane-based surveys of kelp canopy, yet these surveys ceased in 2016 due to funding and logistical limitations, leaving a critical information gap for researchers and managers to assess kelp forest presence and extent on the north coast. With incredibly low surface biomass, bull kelp is challenging to detect using lower resolution satellite imaging platforms.

There is also an essential need to understand kelp forest community dynamics, assess urchin population densities and determine benthic characteristics at restoration sites. To address this need, in the fall of 2021 the Kelp Restoration Program led a collaborative Kelp Restoration and Research Cruise aboard the R/V *Fulmar*, and from the shore during inclement weather, to conduct an assessment of four primary kelp restoration sites in the sanctuary. The primary objectives of this cruise were to:

1. Collect data on population densities of invertebrates, fish and algae with subtidal SCUBA-based surveys using PISCO protocols.
2. Describe benthic characteristics conducive for active restoration including natural barriers such as sand bars and pinnacles.
3. Evaluate biotic/abiotic factors of each site that may contribute to kelp persistence.
4. Map kelp canopy cover using Unoccupied Aerial Systems (UAS).

Outcome: UAS flights were conducted at 400 ft Above Ground Level (AGL) to capture kelp canopy at 25 sites in the sanctuary in 2021, over 4,000 acres at most areas accessible from the coast where kelp historically occurred frequently on an annual basis. These data will be added to the 2019 and 2020 drone survey data and overlaid with historical aerial data taken

by plane surveys to determine areas of greatest kelp persistence. This will inform restoration site selection and fine-scale restoration efforts, as well as form a baseline with which kelp canopy dynamics may be compared once restoration efforts are underway. Subtidal surveys were completed at two of the four sites initially selected, as inclement weather reduced time on the vessel and in the field. Divers collected data on population densities of invertebrates, fish and algae in areas of high kelp persistence.

Timeline: Processing of kelp canopy data is expected to be done at all primary sites by February 2022, and all secondary sites by March 2022. These data will then be collated into a report alongside the subtidal data to define site characteristics and outline a restoration plan for each of the four primary kelp restoration sites.

Partners: Greater Farallones Association, Monterey Bay National Marine Sanctuary, Channel Islands National Marine Sanctuary, California Department of Fish and Wildlife, The Nature Conservancy, California State University Monterey Bay, University of California Los Angeles, Woods Hole Oceanographic Institute.

- **Kelp Research in MBNMS - Tanker Reef Targeted Monitoring**

Purpose: There is considerable scientific evidence that the reduction of sea urchin grazing pressure can facilitate kelp regrowth in urchin-dominated habitats. In-water urchin culling (i.e. smashing or crushing sea urchins *in situ*) has the potential to be an effective method of kelp restoration, if sufficient focused effort can be sustained and ocean conditions are favorable for kelp regrowth. This concept has strong support within the California recreational dive community. However, large-scale efforts to cull urchins through an amendment to sport fishing regulations has not been conducted in Monterey Bay to date.

In December 2020, the California Fish and Game Commission (FGC) adopted a regulatory amendment to the sport harvest regulations for sea urchin. Specifically, the adopted amendment allows divers with valid California sport fishing licenses to take unlimited purple sea urchin (*Strongylocentrotus purpuratus*) and red sea urchin (*Mesocentrotus franciscanus*) via in-water culling at Tanker Reef in Monterey County, a system historically dominated by giant kelp (*Macrocystis pyrifera*). As outlined in joint comments on Petition 2020-001, submitted to the FGC in August 2020, the California Department of Fish and Wildlife (CDFW), California Ocean Protection Council (OPC), and Monterey Bay National Marine Sanctuary (MBNMS), it is expected that regulatory amendments approved at Tanker Reef will provide an improved understanding of the following key management questions:

- Can divers operating under the proposed sea urchin sport harvest regulations reduce sea urchin densities to levels expected to facilitate kelp regrowth (<2 urchins / m²) via in-water urchin culling?
- Does reduction of sea urchin grazing pressure via in-water urchin culling facilitate natural kelp regrowth?
- Are there negative impacts associated with in-water urchin culling (e.g. bycatch, damage to underlying reef structure, disturbance to marine mammal populations)?

Outcome: Subtidal surveys by MBNMS and CDFW research divers were completed in April 2021, prior to the onset of culling activities on a 100 x 100 m grid. Divers collected counts and sizes (first 100 per 30 m transect, 2 m wide) of all urchins encountered, and stipe counts of all stipitate algae. Repeat surveys were completed in October 2021, after culling had effectively ceased on the grid. Purple urchin densities declined from over 7 to below 2 per square meter. Giant kelp appeared, as it does seasonally, in the spring/summer, but was declining with the onset of fall.

Timeline: This amendment to fishing regulations at Tanker Reef will last 3 years, and the end of the first year is April 2022. OPC, CDFW, and MBNMS plan to have a summary of their findings for the first year of effort available in May 2022.

Partners: California Department of Fish and Wildlife, California Ocean Protection Council, and Reef Check California, and the Giant Kelp Restoration (G2KR) Project.

- **Black Abalone Translocation**

Purpose: Endangered black abalone (*Haliotis cracherodii*) in Big Sur, California were rescued in the winter (Feb-March 2021) after a combination of the Dolan Fire and an atmospheric river (AR; January 2021) event generated debris flows in multiple watersheds, burying several hundred meters of rocky intertidal habitat under terrestrial sediment. This effort was led by UC Santa Cruz and a team of researchers from MBNMS, UC Santa Cruz, and the Multi-Agency Rocky Intertidal Network (MARINe).

Outcome: Scientists unburied dozens of black abalone from multiple creek outlets in Big Sur. Most black abalone were still alive despite being wholly or partially buried, and all were transported to a facility with running seawater systems to recuperate. Working with multiple agencies that oversee the management of the endangered black abalone, scientists rescued almost 200 black abalone from several sites in Big Sur. Although some of the black abalone succumbed to injuries while in the holding facility, about 75% survived, and during July 2021 nearly 150 black abalone were returned to sites in Big Sur that had not experienced debris flows.

Timeline: Monitoring at multiple sites in Big Sur continues, with the addition of the outplant sites that were located in different sections of the coast, beyond the current influence of the debris flows. Drone surveillance, sediment height measurements, and intertidal surveys for native and translocated black abalone continue on a ~monthly basis throughout 2022, tides permitting.

Partners: NMFS PRD Long Beach, UC Santa Cruz, Multi-Agency Rocky Intertidal Network, CA Department of Fish and Wildlife, National Marine Sanctuary Foundation, the Esalen Institute, and private landowners in Big Sur providing access across their properties.

OUTREACH

- **Salmonscape exhibit**

Purpose: The *California Salmonscape* exhibit is an interactive display for the public with an overview of salmon diversity, life history, threats, and information on what you can do in your everyday life to protect salmon populations. Currently on display at Monterey Bay National Marine Sanctuary’s Exploration Center in Santa Cruz, California, the exhibit is designed to travel and can move to other educational facilities for public display. In addition to the exhibit description, the following outreach materials (poster and playing cards) were produced and are described [here](#).

Outcome: To effectively communicate the California salmon story to the public through an engaging and interactive exhibit. While sanctuary visitor centers have been closed during the COVID pandemic, we hope they will open by Summer ‘22 to allow greater outreach to the public about salmon in California.

Timeline: The exhibit is complete and will be on display at the MBNMS Exploration Center in Santa Cruz, CA and will ultimately travel to other partner locations in California to share the California Salmonscape story.

Partners: California Salmonscape exhibit is a creative collaboration between artist [Ray Troll](#), the [MBNMS](#), [Southwest Fisheries Science Center](#), and the U.S. Forest Service.

- **50th anniversary of ONMS**

Purpose: ONMS is participating in a joint-agency campaign with our U.S. Fish and Wildlife Service and Marine Mammal Commission partners to celebrate the 50th anniversaries of four momentous pieces of legislation that are founding elements of our Nation’s conservation missions—the Clean Water Act, the Coastal Zone Management Act, the Marine Mammal Protection Act, and the National Marine Sanctuaries Act. The National Marine Sanctuary System turns 50 on October 23, 2022, and a number of planned events are being developed, including “Enjoy Spectacular/Get Into Your Sanctuary” activities that will be open to all members of the public.

Outcome: The planned outcome is improved engagement with sanctuary communities through a celebration of these significant milestones.

Timeline: 50th Anniversary events from January through December 2022.

Partners: Advisory Councils, Schools, Visitor Centers