

# SCIENCE GUIDE TO CALIFORNIA'S MPA NETWORK



July 2026

## Table of Contents

|                                                                                                            |    |
|------------------------------------------------------------------------------------------------------------|----|
| MPA Planning Process Science Foundation.....                                                               | 4  |
| MPA Network Implementation .....                                                                           | 4  |
| Monitoring and Adaptive Management .....                                                                   | 7  |
| Foundational Documents and Reports.....                                                                    | 7  |
| MLPA Initiative Planning Process: Science Evaluation of MPA proposals.....                                 | 9  |
| Levels of Protection.....                                                                                  | 10 |
| Science Advisory Team Analyses.....                                                                        | 13 |
| Size.....                                                                                                  | 14 |
| Habitat Representation and Replication .....                                                               | 15 |
| Spacing.....                                                                                               | 16 |
| Socioeconomic considerations.....                                                                          | 16 |
| Design Outcomes of MLPA Planning Process Science Guidance.....                                             | 17 |
| What portion of MPAs currently meet SAT Science Guidelines to support Network-wide ecological Goals? ..... | 17 |
| LOP and MPA Size:.....                                                                                     | 17 |
| MPA Spacing: .....                                                                                         | 20 |
| Habitat Representation and Replication:.....                                                               | 21 |
| Habitat Spacing:.....                                                                                      | 23 |
| What percentages of key habitats are protected within the current MPA Network? .....                       | 24 |
| What percentage of the current extent of kelp canopy is included within the MPA Network?.....              | 28 |
| The Future of MPA Science .....                                                                            | 35 |
| Appendix A: Levels of Protection by Activity and MLPA Region.....                                          | 36 |
| Appendix B: MPA Attributes .....                                                                           | 42 |
| Appendix C: Habitat Spacing Maps.....                                                                      | 52 |

## Tables and Figures

|                                                                                                                                                                                                                                              |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 1. Overview of marine managed area classifications used in California’s MPA Network .....                                                                                                                                              | 5  |
| Table 2. Goals of the California Marine Life Protection Act. ....                                                                                                                                                                            | 6  |
| Table 3. Overview of SAT Science Guidelines.....                                                                                                                                                                                             | 14 |
| Table 4. Minimum habitat length or area of MPA considered sufficient to capture 90% of biodiversity.....                                                                                                                                     | 15 |
| Table 5. California MPAs that meet the criteria to qualify as backbone MPAs .....                                                                                                                                                            | 19 |
| Table 6. Number of replicates of each key habitat statewide and within each bioregion .....                                                                                                                                                  | 22 |
| Table 7. Percent and total amount of key habitats contained in MPAs by bioregion and statewide .....                                                                                                                                         | 25 |
|                                                                                                                                                                                                                                              |    |
| Figure 1. Percent of California state waters protected within the MPA Network.....                                                                                                                                                           | 7  |
| Figure 2. Map of the three bioregions defined in the MPA Monitoring Action Plan .....                                                                                                                                                        | 10 |
| Figure 3. Conceptual model used by the SAT during the California MLPA Initiative planning process to assign an MPA’s Level of Protection (LOP) based on proposed extractive activities .....                                                 | 12 |
| Figure 4. Conceptual diagram illustrating the number of MPAs that currently meet design criteria established by the Science Advisory Team .....                                                                                              | 17 |
| Figure 5. Number of California MPAs statewide and by bioregion that meet the Level of Protection (LOP) categories of Very High, High, or Moderate-High.....                                                                                  | 18 |
| Figure 6. Number of California MPAs statewide and by bioregion that meet the LOP and size criteria to serve as backbone MPAs .....                                                                                                           | 18 |
| Figure 7. Linear over-water distance (miles) between California backbone MPAs .....                                                                                                                                                          | 20 |
| Figure 8. Absolute and relative amounts of beach, rocky shores, maximum kelp canopy, estuarine habitat, and hard substrate at depths of 0–30 m and 30–100 m in MPAs and not in MPAs .....                                                    | 26 |
| Figure 9. Absolute and relative amounts of hard substrate at depths of 100–200 m and greater than 200 m, and soft substrate at depths of 0–30 m, 30–100 m, 100–200 m, and greater than 200 m that is contained in MPAs and not in MPAs ..... | 27 |
| Figure 10. Total and relative extent of maximum kelp canopy within MPAs and outside of MPAs statewide for the time periods 1984–2023, 2007–2013, 2014–2016, and 2017–2023. ....                                                              | 30 |
| Figure 11. Total and relative extent of persistent kelp canopy within MPAs and outside of MPAs statewide for the two 7-yr time periods before and after the 2014–2016 marine heat wave. ....                                                 | 31 |
| Figure 12. Absolute and relative extent of maximum kelp canopy within MPAs and outside of MPAs in California’s three bioregions during three timeframes, 2007–2013, 2014–2016, and 2017–2023.....                                            | 32 |
| Figure 13. Absolute and relative extent of persistent kelp canopy contained within MPAs and outside of MPAs in California’s three bioregions for the two 7-yr time periods before and after the 2014–2016 marine heat wave .....             | 33 |



## MPA PLANNING PROCESS SCIENCE FOUNDATION

In 2012, California made history by establishing the largest ecologically connected network of marine protected areas (MPAs) in the world. This document provides an overview of the scientific guidelines used during the Marine Life Protection Act (MLPA) Initiative planning process to design California's MPA Network and their utility in informing adaptive management and evaluation of MPAs today, as well as an analysis of the existing MPA Network's conformance to the scientific guidelines using the most recent habitat data available. This is a living document, intended to be updated periodically to reflect the best available science.

### MPA NETWORK IMPLEMENTATION

MPAs are spatially defined marine or estuarine areas that restrict certain human activities to protect the ecosystems contained within. California's MPAs are in state waters, which extend from the mean high tide line to the offshore limit (generally 3 nautical miles from shore) and include bays and estuaries. Each MPA has its own set of regulations, ranging from fully protected No-take marine reserves to areas where certain consumptive activities, such as fishing for specific species, are allowed (Table 1). MPAs do not limit non-consumptive activities, such as swimming, kayaking, wildlife viewing, or spiritual practices. Special closures are an additional type of marine managed area that prohibit human access year-round or seasonally to protect seabird or marine mammal populations.



*Table 1. Overview of marine managed area classifications used in California's MPA Network, including definitions and quantitative summary of protection levels, including map symbology and allowable uses for each designation.*

| Map Color                                                                                                                                                              | Classification                            | Number | % of State Waters | Description                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                       | State Marine Reserve                      | 49     | 9.0               | An MPA classification that prohibits damage or take of all marine resources (living, geologic, or cultural), including recreational and commercial take.                                                                         |
| <br> | State Marine Conservation Area (No-take)  | 10     | 0.6               | An MPA classification that generally prohibits the take of living, geologic, and cultural marine resources, but allows potentially affected and ongoing permitted activities such as dredging and maintenance to continue.       |
|                                                                                       | State Marine Conservation Area            | 60*    | 6.5               | An MPA classification that may allow some recreational and/or commercial take of marine resources (restrictions vary)                                                                                                            |
|                                                                                       | State Marine Recreational Management Area | 5      | 0.1               | A marine managed area classification that limits recreational and commercial take of marine resources while allowing for legal waterfowl hunting to occur; provides subtidal protection equivalent to an MPA (restrictions vary) |
|                                                                                     | State Marine Park                         | 1*     | <0.1              | An MPA classification that prohibits damage or take of any marine resources for commercial purposes (restrictions vary)                                                                                                          |
|                                                                                     | Special Closure                           | 14     | 0.1               | An area designated by the California Fish and Game Commission that prohibits access or restricts boating activities in waters adjacent to sea bird rookeries or marine mammal haul-out sites (restrictions vary)                 |

\*The California Fish and Game Commission designated Cambria State Marine Conservation Area, which was subsequently adopted as Cambria State Marine Park by the State Park and Recreation Commission with the same boundaries and no change to regulations. Therefore, this MPA has dual designations and is counted twice in the table. See Title 14, § 632 of the California Code of Regulations for specific MPA regulations.

The MLPA, passed in 1999, required California to redesign its existing collection of MPAs into a cohesive network based on the best available science and local knowledge. To guide development of the MPA Network, the law specified six goals focused on protecting marine ecosystems, supporting human uses, and strengthening long-term management (Table 2).

**California's MPAs are unique because they were intentionally designed to function as an ecologically connected network rather than as isolated protected areas.**

Table 2. Goals of the California Marine Life Protection Act.

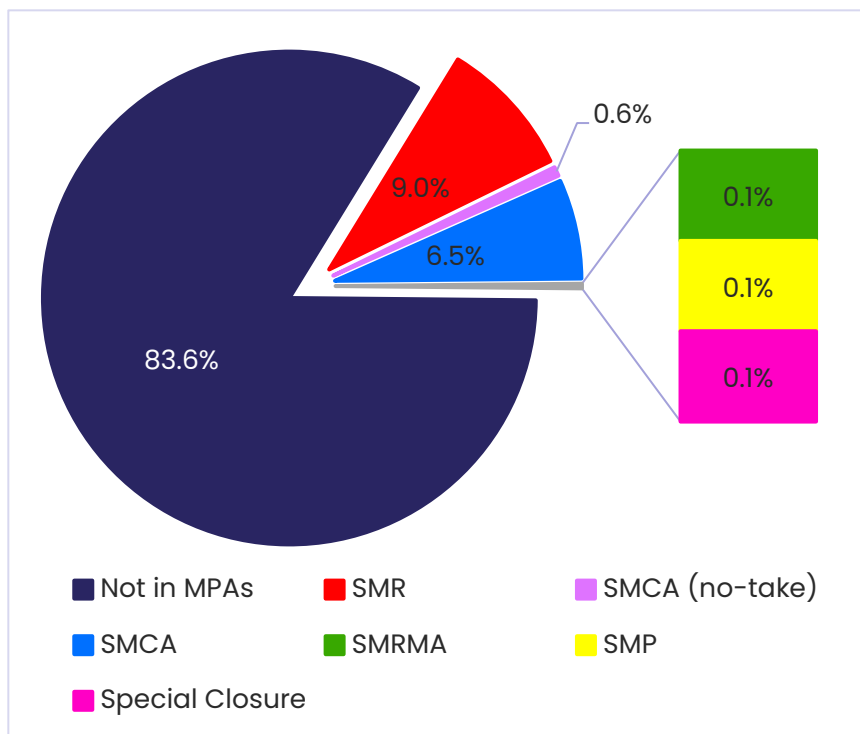
|                                                                                   |                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Goal 1: Protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.                                                                                          |
|  | Goal 2: Help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.                                                                                  |
|  | Goal 3: Improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity. |
|  | Goal 4: Protect marine natural heritage, including protection of representative and unique marine life habitats in California waters for their intrinsic value.                                                               |
|  | Goal 5: Ensure California's MPAs have clearly defined objectives, effective management measures, and adequate enforcement, and are based on sound scientific guidelines.                                                      |
|  | Goal 6: Ensure the state's MPAs are designed and managed, to the extent possible, as a network.                                                                                                                               |

The design of the MPA Network was rooted in Science Advisory Team (SAT) recommendations prioritizing individual MPA size and spacing to maintain critical ecological connections. By strategically placing MPAs along the coast, the MPA Network protects a full range of habitats to support higher biodiversity.

The SAT's recommendations provided the scientific foundation for an eight-year iterative planning process that relied on rigorous scientific analysis, extensive public engagement, and collaboration across a variety of perspectives. This effort culminated in 2012 when the MPA Network was fully implemented statewide, becoming the first ecologically connected MPA network of its kind in the United States (Figure 1).



Fort Bragg coast at sunset. (K. Gonzales)



*Figure 1. Percent of California state waters protected within the MPA Network, by MPA classification. The MPA Network includes 124 MPAs and 14 special closures spanning the entire California coastline and encompassing 16.2% of state waters. More than half of these protected waters are contained in fully protected No-take State Marine Reserves.*

## MONITORING AND ADAPTIVE MANAGEMENT

Monitoring of these areas and nearby reference areas began in 2007 to establish ecological baselines and it continues today to evaluate MPA performance and how marine species and ecosystems respond to MPA protection. Monitoring studies include surveys of fish, invertebrates, habitats, and ocean conditions both inside and outside MPAs, such that the effects of fishing and natural drivers of change can be distinguished. Results from long-term monitoring provide the foundation for evaluating MPA Network performance over time. Adaptive MPA management, required by the MLPA, is

informed by this periodic expert scientific evaluation, partner engagement, and review. The goal is to ensure that MPAs can continue to meet their individual and MPA Network-scale objectives in the face of anthropogenic stressors, such as climate change, and natural oceanographic change. Moving forward, the human dimensions of MPA management, seeking to understand how people use, value, and relate to MPAs, will also be monitored and evaluated as part of MPA Network adaptive management (DMR Priority Recommendation #12).

Today, responsibility for maintaining the integrity of the MPA Network is shared at the state level. The California Department of Fish and Wildlife (CDFW) serves as the lead managing agency for MPAs, the California Fish and Game Commission holds regulatory authority for the MPA Network, and the Ocean Protection Council provides statewide MPA policy leadership and funding for essential research and monitoring. CDFW works in partnership with state and federal agencies, California Native American Tribes (tribes), community partners, researchers, and more across four core programmatic pillars: outreach and education, enforcement and compliance, policy and permitting, and research and monitoring.

## FOUNDATIONAL DOCUMENTS AND REPORTS<sup>1</sup>

- Master Plan for MPAs, CDFW (2008, 2016): Initially developed to guide regional MPA design during the MLPA Initiative planning process (2008), and later revised to reflect a shift to statewide management of the MPA Network as a whole (2016)

<sup>1</sup> MLPA Initiative documents, including regional SAT methodologies on which this guide is based, are available upon request.



- [MPA Monitoring Action Plan](#), CDFW (2018): Guides long-term ecological monitoring of the MPA Network to inform adaptive management and lays the groundwork for a Network-wide evaluation framework
- [Climate Resilience and California's Marine Protected Area Network](#), Climate Resilience Working Group (2021): Provides an overview of climate change impacts to California's coastal and marine ecosystems, explores mechanisms by which MPA designation may confer resilience to climate change, and offers recommendations for research and investment
- [Science Guidance for Evaluating California's Marine Protected Area Network](#), Decadal Evaluation Working Group (2021): Provides scientific guidance in support of decadal management reviews of the MPA Network, including performance evaluation questions and metrics, as well as recommendations for filling key information gaps
- [A Synthesis of Ecological and Social Outcomes from the California Marine Protected Area \(MPA\) Network](#), National Center for Ecological Analysis and Synthesis (NCEAS) Working Group (2022): Integrates a diverse set of long-term monitoring data to evaluate four key aspects of MPA performance against the goals of the MLPA
- [Decadal Management Review](#) (DMR), CDFW (2022): The first ever comprehensive evaluation of the entire statewide MPA Network



Bull kelp in shallow water. (E. Pope)



# MLPA INITIATIVE PLANNING PROCESS: SCIENCE EVALUATION OF MPA PROPOSALS

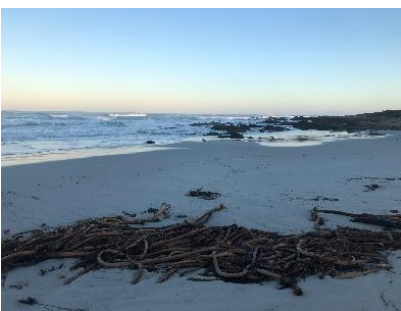
The MPA Network was legislatively mandated (MLPA, Fish & G. Code § 2850 (1999)) to be designed using the best available science and to function as an ecologically connected system (for more information, see Appendix A of the 2016 Master Plan for MPAs). During the MLPA Initiative planning process, the coast was divided into four planning regions to support MPA Network design based on local characteristics and conditions. As prescribed in the 2008 Master Plan, a SAT was convened during each region's individual planning process to develop scientific guidelines for MPA design, evaluate alternative proposals against these guidelines, and provide a scientific perspective if relevant questions arose. The SAT was composed of scientists with expertise in marine ecology, oceanography, fisheries, and socioeconomics, and was responsible for translating scientific knowledge into practical MPA Network design guidance. The SAT operated independently throughout the process and its members did not design or propose MPAs.

For each planning region, science-based guidelines developed by the SAT (hereafter, SAT Science Guidelines) were used by the Regional Stakeholder Groups for iterative MPA array design, and by the SAT to compare and evaluate alternative proposals. The SAT Science Guidelines were linked to the six MLPA goals and ensured that MPA proposals were assessed consistently and objectively. Additional analyses in support of the MLPA planning process were conducted by the SAT, MLPA Initiative staff and contractors, CDFW, and California State Parks.

The SAT Science Guidelines focused on several principles central to building a connected MPA Network:

- Each key marine habitat should be represented, to the extent feasible given uneven distribution of habitats in state waters, in multiple MPAs to protect the diversity of species living in and moving among different habitats. These habitats include rocky reefs, intertidal zones, sandy or soft ocean bottoms, kelp forests, submarine canyons, and seagrass beds.
- The MPA Network should contain multiple examples, or replicates, of each key marine habitat to protect the diverse species and communities occurring across large environmental and geographic gradients. This also helps buffer against loss or local disturbance in any single MPA.
- MPAs should be large enough to protect adult populations, accounting for biological factors such as home range size and movement patterns across depth zones.
- MPAs should be spaced close enough together to allow movement and dispersal of larvae and juveniles between MPAs.

*Key marine habitats include beach (K. Gonzales), kelp forest (S. Wertz), deep water soft and hard substrate (CDFW/MARE), and rocky intertidal (E. Pope).*



These principles were intentionally precautionary; by incorporating elements such as replication, connectivity, and spatial distribution, the MPA Network was designed to protect biodiversity and support ecosystem resilience under uncertain and changing environmental conditions stemming from both natural disturbances and broader ocean stressors. Fundamental to the success of incorporating these principles was adherence to guidance from the 2008 Master Plan, particularly that the array of MPAs in each region include No-take marine reserves that met size and spacing criteria to function as the 'backbone' of a connected MPA Network.

The four regional planning efforts were integrated into a single statewide MPA Network once the

final regional networks of MPAs were adopted by the California Fish and Game Commission in 2012. Following the MPA Network's implementation, the focus moved from regional planning to statewide adaptive management. This was reflected in a shift from baseline monitoring at the planning region level to long-term monitoring scaled to bioregions (Figure 2). These bioregions reflect large-scale distinctions in biota, ecological communities, and key habitats, and help contextualize ongoing monitoring and evaluation of the MPA Network.

## LEVELS OF PROTECTION

The MPA Network was designed to bolster ecological goals while still supporting a variety of human uses. To achieve this, MPAs were established with different classifications that restrict some or all consumptive uses (Table 1). For example, some MPAs are fully protected No-take State Marine Reserves (SMRs) that prohibit all extractive activities. These areas provide the highest level of ecological protection. Other classifications, namely State



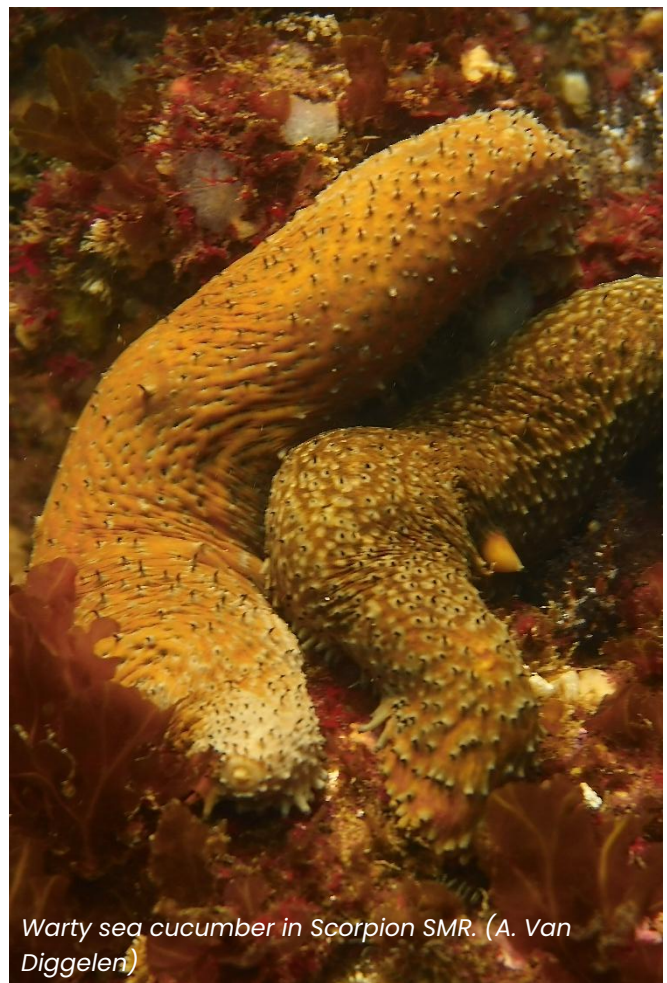
*Figure 2. Map of the three bioregions defined in the MPA Monitoring Action Plan, delineated by distinct changes in ecological communities: North (California/Oregon border to San Francisco Bay, including the Farallon Islands), Central (San Francisco Bay to Point Conception), and South (Point Conception to the California/Mexico border, including the Channel Islands). These bioregions were identified based primarily on patterns observed in baseline monitoring data.*

Marine Conservation Areas (SMCAs) and State Marine Parks (SMPs), allow certain forms of take<sup>2</sup> to accommodate specific uses while still contributing to the goals of the MLPA. The regulations in these partial-take MPAs are specific to the objectives of the individual MPA and therefore vary by MPA; consequently, even though they share a designation, two SMCAs may permit very different take allowances.

This limited set of MPA classifications provided both simplicity and flexibility during the regional planning processes. At the same time, it created a challenge in comparing alternative MPA proposals. The types of fishing gear and extractive activities allowed within an MPA can influence the marine ecosystem in different ways depending on the species targeted, methods used, and habitats affected. As a result, two arrays of MPAs with otherwise similar numbers, sizes, and types of MPAs could markedly differ in their overall conservation value depending on the specific activities allowed within each proposed MPA.

To address this challenge, the SAT developed the Level of Protection (LOP) framework to assess an MPA's overall contribution to broader ecosystem protection goals given differing allowed uses (Figure 3). The framework was used to assign one of six<sup>3</sup> values (Low, Moderate-low, Moderate, Moderate-high, High, and Very High) to extractive activities based on their potential ecological impacts. This approach helped facilitate comparisons among MPA proposals and gauge a proposed array's likelihood of achieving the ecological goals of the MLPA, such as habitat and biodiversity protection.

Activities expected to have greater impacts on marine ecosystems received lower LOPs, while less permissive MPAs received higher LOPs. In developing LOPs, the SAT incorporated an assessment of both direct impacts (such as removal of target species, incidental take of non-target species, or habitat alteration resulting directly from the gear used) and indirect impacts (such as changes to food webs, community structure, or ecosystem function resulting from species removal) of an activity<sup>4</sup>.



*Warty sea cucumber in Scorpion SMR. (A. Van Diggelen)*

---

<sup>2</sup> "Take" means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (Fish and Game Code § 86)

<sup>3</sup> In the Central Coast, the first of the four study regions, only Very High, High, Moderate, and Low LOPs were applied.

<sup>4</sup> "Activity" refers to the take of a particular species, by a particular method, at a particular range of depths. The SAT acknowledged that other extractive or ecosystem-altering activities could affect ecosystem condition; however, these non-fishing activities were not incorporated into the SAT LOP framework because the impacts were difficult to quantify.



### Conceptual Model for Determining Levels of Protection

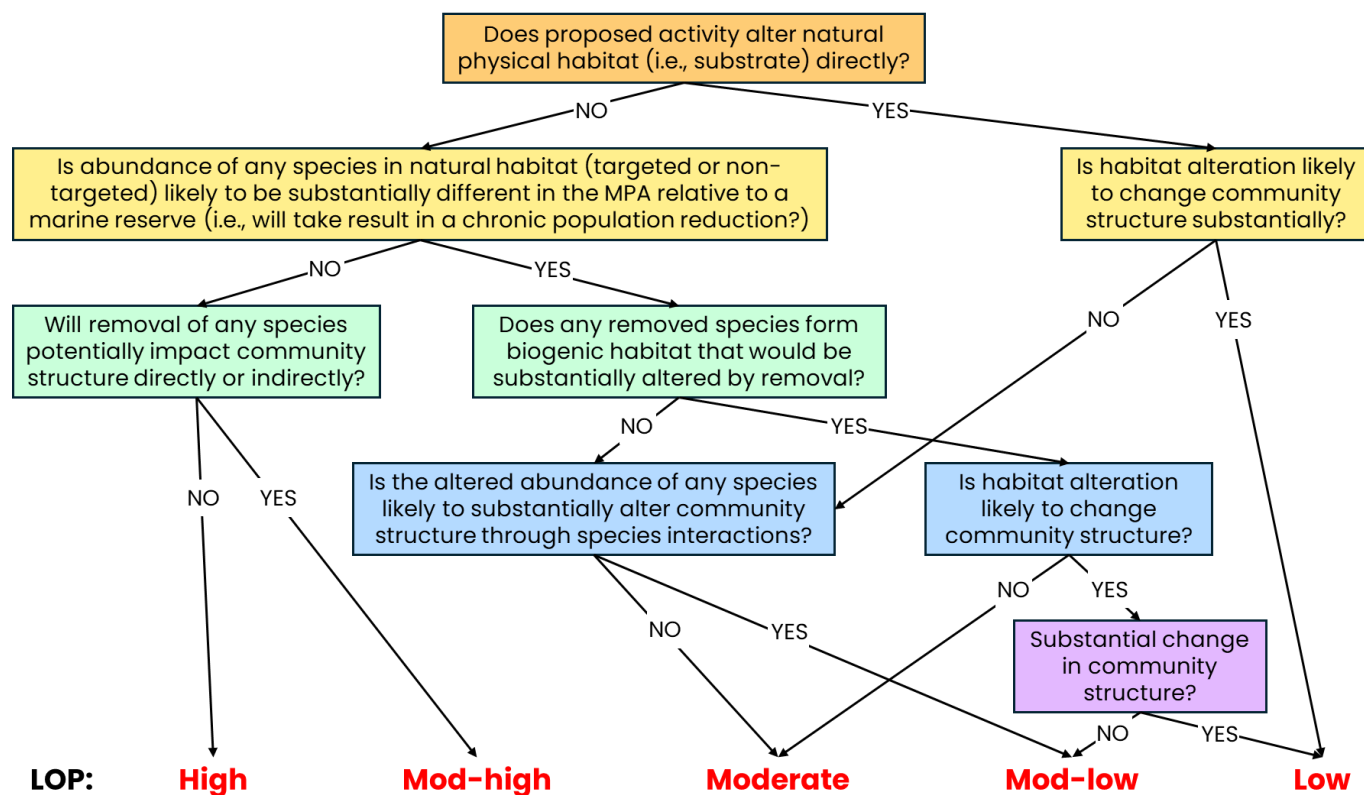


Figure 3. Conceptual model used by the SAT during the California MLPA Initiative planning process to assign an MPA's Level of Protection (LOP) based on proposed extractive activities (figure recreated from the SAT's Methods Used to Evaluate MPA Proposals in the MLPA North Coast Study Region). State Marine Reserves, which are No-take MPAs, were automatically assigned a Very High LOP (not shown here).

LOPs were developed by the SAT using recreational and commercial fishing data from CDFW, supplemented where needed by scientific literature and local knowledge for each planning region. The resultant LOPs were thus highly tailored to the specific fisheries, gear types, and species-habitat interactions in each planning region.

Each proposed MPA was assigned an LOP based on its allowable uses. When multiple extractive activities were proposed within a single MPA, the overall LOP for that MPA corresponded to the activity with the greatest potential ecological impact (i.e., the activity with the lowest LOP).

Conceptually, the framework assessed how much an ecosystem within an MPA might differ from a comparable No-take area if a given extractive activity were allowed. More restrictive MPAs received higher LOPs, whereas MPAs that allowed activities expected to substantially<sup>5</sup> alter species abundance, habitat condition, or community structure relative to a No-take area received lower LOPs. Although MPAs assigned low LOPs likely provide less conservation value than more restrictive MPAs, they may contribute toward achieving other MLPA goals.

<sup>5</sup> A 'substantial' change in the abundance of a species is one that is likely to be persistent and detectable through comparison with a No-take area.

Fishing regulations are implemented at scales larger than individual MPAs, so the actual level and distribution of take within an MPA is inherently uncertain. For this reason, the SAT developed LOPs conservatively based on the potential impacts of an activity occurring at its maximum allowable intensity under existing regulations, rather than on actual fishing effort, stock status, or realized ecological conditions within an MPA. The LOP framework therefore focuses on the certainty that an MPA would achieve the ecological goals of the MLPA regardless of existing or future patterns of take. As a result, an MPA with a High LOP is likely to resemble an unfished system even if allowed activities are locally intense or increase in the future.

This framework provided a transparent, consistent, and stable method for comparing MPA proposals and evaluating their potential contribution to the MLPA's ecosystem protection goals. Barring a few changes to MPA designations and take regulations, LOP designations have remained largely the same since implementation of the MPA Network.

## SCIENCE ADVISORY TEAM ANALYSES

In analyzing the proposals for MPA arrays put forward by regional stakeholder groups, the SAT used LOPs in conjunction with other science-based guidelines to evaluate whether MPAs would contribute to Network-scale objectives. Per the principles behind the SAT Science Guidelines, MPAs were required to be of sufficient size to support marine populations, be spaced such that both adult and larval movement between protected areas could occur, and that key habitats were represented and spatially replicated regionwide. To be able to count towards ecological connectivity and habitat replication goals, MPAs need to meet a set of criteria based on these principles (Table 3).

## Levels of Protection

The SAT developed a Level of Protection (LOP) framework highly tailored to the specific fisheries, gear types, and species-habitat interactions in each planning region.

Each proposed MPA was assigned an LOP based on its allowed uses with the assumption that allowed activities could occur at maximum plausible intensity. When multiple extractive activities were proposed within a single MPA, the overall LOP for that MPA corresponded to the activity with the lowest LOP.



*A scuba diver encounters a school of blacksmith. (M. Haggerty)*

Table 3. Overview of SAT Science Guidelines for MPA size, habitat representation and replication, and spacing.

| Evaluation Area                                                                                                                                                                                                                                                               | SAT Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Size</b>                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Size analyses are conducted at three protection levels: <b>Moderate-High, High, and Very High.</b> *</li> <li>MPAs must be at least <b>9 square miles</b>, with at least <b>18 square miles preferred.</b></li> <li>Combines contiguous MPAs at or above the three highest levels of protection into <b>MPA clusters.</b></li> </ul>                                                                      |
| <b>Habitat Representation</b>                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>To ensure that MPAs encompass a variety of marine habitat types and communities across a range of depths and environmental conditions, <b>the percentage and distribution of key habitats</b> protected in MPAs across all six levels of protection is evaluated.</li> </ul>                                                                                                                              |
| <b>Habitat Replication</b>                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>MPAs must include enough habitat to encompass <b>90% of the biodiversity</b> associated with that habitat (based on biological surveys).</li> <li>MPAs must have an LOP of at least <b>Moderate-High</b> and meet <b>minimum size guidance.</b></li> <li>Bioregions should include at least <b>3 to 5 replicates</b>, with at least one replicate within each planning region's sub-bioregion.</li> </ul> |
| <b>Spacing</b>                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>MPAs include enough habitat to serve as <b>habitat replicates.</b></li> <li>MPAs or MPA clusters must have an LOP of at least <b>Moderate-High</b> and meet <b>minimum size guidance.</b></li> <li>Replicate MPAs for a given habitat should be placed at most <b>31 to 62 miles apart but can be closer.</b></li> </ul>                                                                                  |
| <p>* Though the BRTF recommended that proposed MPA arrays prioritize MPAs with Very High and High LOPs, the SAT typically performed size, spacing, and habitat replication analyses at each of the three highest LOPs to facilitate comparisons of alternative proposals.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## SIZE

First is size. Except for estuarine MPAs, to count towards Network-wide objectives, an MPA must have a minimum size of nine square miles (sq. mi), with a preferred size of 18 sq. mi. Estuarine MPAs were not required to meet a minimum size guideline, with the SAT instead recommending protection of the entire estuary, if possible. Second is LOP. To count towards Network-wide objectives, an MPA must have one of the three highest LOPs (Very High, High, or Moderate-High)<sup>6</sup>. Regardless of their individual sizes, adjacent MPAs that meet the LOP criteria and have a collective footprint of nine square miles or more are termed MPA clusters and are grouped together to count towards these goals. MPAs that meet these thresholds of size and protection, whether individually or in a cluster, are the backbone of the MPA Network.

**MPAs that meet SAT guidance thresholds for size and protection form the backbone of the MPA Network.**

<sup>6</sup> During the Central Coast planning region only MPAs with Very High and High LOPs were included within the LOP threshold for backbone MPAs because the Moderate-high LOP was not established until subsequent planning regions.



## HABITAT REPRESENTATION AND REPLICATION

The MLPA stipulated that a variety of marine habitat types and communities across a range of depths and environmental conditions should be represented in MPAs in each bioregion, and that similar habitats should be replicated in at least one SMR per bioregion. This guidance was refined in the Master Plan, which recommended that key marine habitats be represented in the MPA Network and replicated in at least three to five MPAs per bioregion. While representation analyses include all MPAs, regardless of size or LOP (see Table C1 for habitat quantities in individual MPAs), only MPAs that meet the size and protection thresholds are included in habitat replication analyses. Because of this, these backbone MPAs are sometimes referred to as ‘replicate MPAs’. However, not all replicate MPAs are replicates of each other (i.e., replication is habitat specific). For an MPA to count as a replicate for a given habitat, it must contain enough of the habitat to capture 90% of the associated biodiversity. The minimum coverage needed to encompass this amount of biodiversity varies by habitat type (Table 4). This is intended to ensure meaningful protection rather than minimal coverage.

*Table 4. Minimum habitat length, area, or percent of MPA required to count towards habitat replication in MPAs. Values shown are based on regional biological survey and represent the spatial extent necessary to capture 90% of the habitat's biodiversity in each of California's MLPA Initiative planning regions.*

| Habitat                                       | Units           | MLPA Initiative Planning Region |               |                    |       |
|-----------------------------------------------|-----------------|---------------------------------|---------------|--------------------|-------|
|                                               |                 | North                           | North Central | Central (% of MPA) | South |
| Beach                                         | mi <sup>a</sup> | 1.1                             | ~1            | 20%                | ~1.14 |
| Rocky shores, including offshore rock         | mi <sup>a</sup> | 0.55                            | ~0.5          | 20%                | 0.48  |
| Kelp                                          | mi <sup>b</sup> | 1.1                             | ~1            | 10%                | ~1.14 |
| Estuaries                                     | sq mi           | 0.12                            | ~0.12         |                    | 0.12  |
| Hard Substrate, 0–30 m                        | mi <sup>b</sup> | 1.1                             | ~1            | 15%                | ~1.14 |
| Hard Substrate, 30–100 m                      | sq mi           | 0.13                            | ~0.1          | 10%                | ~0.20 |
| Hard Substrate, >100 m                        | sq mi           | 0.13                            |               |                    | ~0.22 |
| Soft Substrate, depth zones not combined      |                 |                                 |               |                    |       |
| 0–30 m                                        | mi <sup>b</sup> | 1.1                             |               | 20%                |       |
| 30–100 m                                      | sq mi           | 7                               |               | 15%                |       |
| >100 m                                        | sq mi           |                                 |               | 10%                |       |
| Soft Substrate, multiple depth zones combined |                 |                                 |               |                    |       |
| Total                                         | sq mi           | ~7                              |               |                    | ~8    |
| Minimum preferred:                            |                 |                                 |               |                    |       |
| 0–30 m                                        | mi <sup>b</sup> | 1.1                             | ~1            |                    | ~1.14 |
| 30–100 m                                      | sq mi           | 5                               | ~10           |                    | ~2.24 |
| >100 m                                        | sq mi           | 1                               |               |                    |       |
| 100–200 m                                     | sq mi           |                                 |               |                    | ~1.10 |
| >200 m                                        | sq mi           |                                 |               |                    | ~0.46 |

<sup>a</sup>indicates metric corresponds to shoreline distance

<sup>b</sup>indicates metric corresponds to alongshore span

## SPACING

To support ecological connectivity and facilitate the dispersal of larvae from bottom-dwelling fish and invertebrates, the SAT advised a maximum spacing interval of 31 to 62 miles between replicate MPAs for a given habitat. This guideline was based on the best available science regarding larval dispersal distances. However, the SAT emphasized that this guideline was intended as a practical design tool rather than a strict ecological threshold. Ecological connectivity varies continuously and is influenced by many factors, including coastline shape, ocean currents, habitat distribution, and species-specific dispersal patterns. Although simple spacing thresholds cannot fully capture the complexity of oceanographic and ecological connectivity along California's coast, the spacing guideline was a valuable proxy tool during the MLPA planning process.

## SOCIOECONOMIC CONSIDERATIONS

While not part of the formal evaluations conducted by the SAT, fishery impacts were also considered in evaluating alternative MPA proposals. The MLPA's ecological goals were not intended to be at odds with the state's commercial and recreational fisheries. Rather, MPAs were viewed as complementary to other fisheries management measures as part of a comprehensive framework to sustain marine life, habitats, and, by extension, fisheries. The MLPA specifically requires consultation with local communities and interested parties regarding the socioeconomic and environmental impacts of various MPA alternatives (Fish & G. Code § 2855(c)). To that end, socioeconomic analyses in each planning region incorporated local knowledge interviews with fishermen, along with extensive economic data on region-specific fisheries, including mapping, landings, and ex-vessel revenue. The results of these analyses informed both the design of individual MPAs and comparisons of alternative MPA arrays.



Surfer on shore. (K. Gonz les)

# DESIGN OUTCOMES OF MLPA PLANNING PROCESS SCIENCE GUIDANCE

The following analyses were conducted on the existing MPA Network at a statewide or bioregion scale using best currently available statewide data.

## WHAT PORTION OF MPAS CURRENTLY MEET SAT SCIENCE GUIDELINES TO SUPPORT NETWORK-WIDE ECOLOGICAL GOALS?

**LOP AND MPA SIZE:** Most (89 of 124, or 72%) MPAs within the MPA Network have one of the three highest LOPs (Very High, High, or Moderate-high; Figure 4). This percentage is similar across the three bioregions (Figure 5).

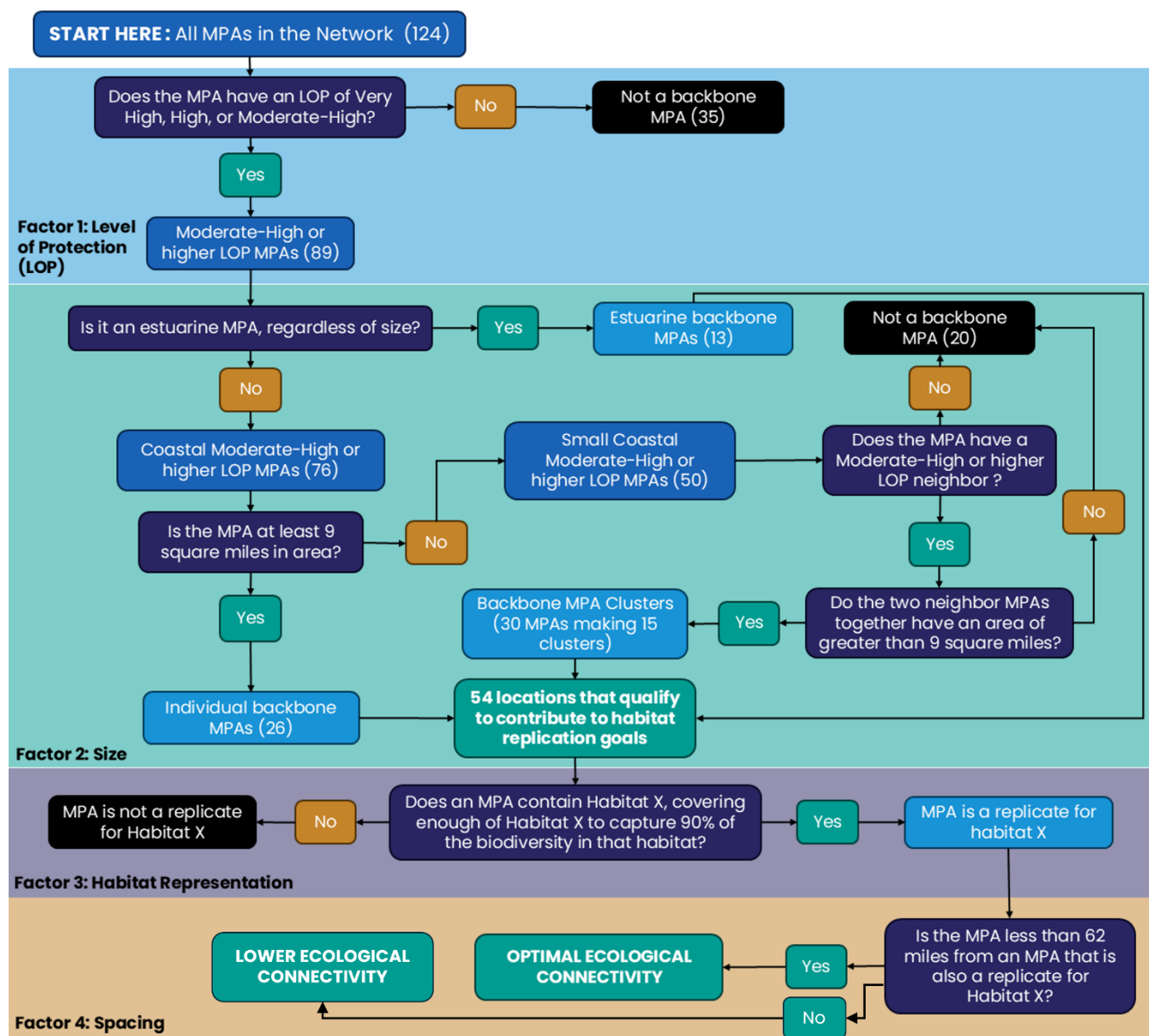


Figure 4. Conceptual diagram illustrating the number of MPAs that currently meet design criteria established by the Science Advisory Team during the MLPA Initiative planning process (e.g., Level of Protection, size, habitat representation and replication, and spacing).



Of the 89 MPAs that meet the LOP requirement as determined by the SAT during the MLPA Initiative planning process (Very High, High, or Moderate-high), 13 are estuarine MPAs (Figure 6). Estuarine MPAs that meet the LOP criteria are considered in replication analyses regardless of their size. This is because applying the minimum size requirement or requiring co-location with another contiguous MPA to create a cluster would have greatly limited siting possibilities.

When contiguous MPAs each had an LOP greater than Moderate-high, the SAT grouped them into an MPA cluster. Regardless of each MPA's individual area, if the cluster has a total area greater than 9 sq. mi., it functions as a backbone MPA and is counted in replication analyses (Figure 4). Apart from the 13 estuarine MPAs, of the remaining 76 MPAs that meet the LOP requirement, 26 have an area greater than 9 sq. mi. and do not have a neighboring MPA (i.e., not a cluster MPA). Thirty MPAs comprise 15 clusters of contiguous MPAs, and each individual cluster has a total area greater than 9 sq. mi. (Figure 6).

The remaining 20 of the 89 MPAs that meet one of the three highest LOPs are either smaller than the 9-sq. mi. minimum size guideline or are not clustered with an adjacent MPA to collectively meet that guideline. While these MPAs may not serve as

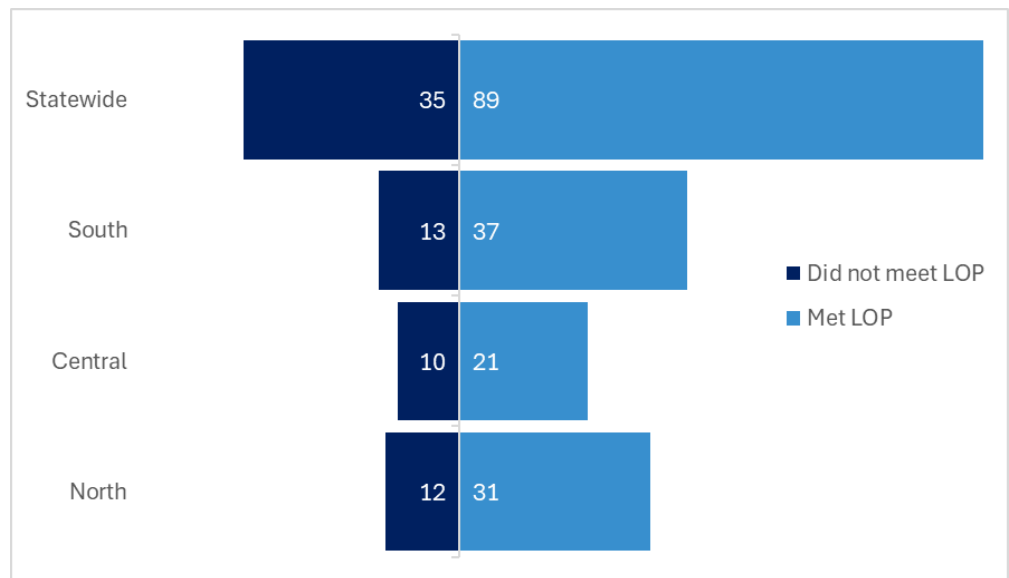


Figure 5. Number of California MPAs statewide and by bioregion that meet the Level of Protection (LOP) categories of Very High, High, or Moderate-High. Most (72%) were designed with at least a Moderate-high LOP.

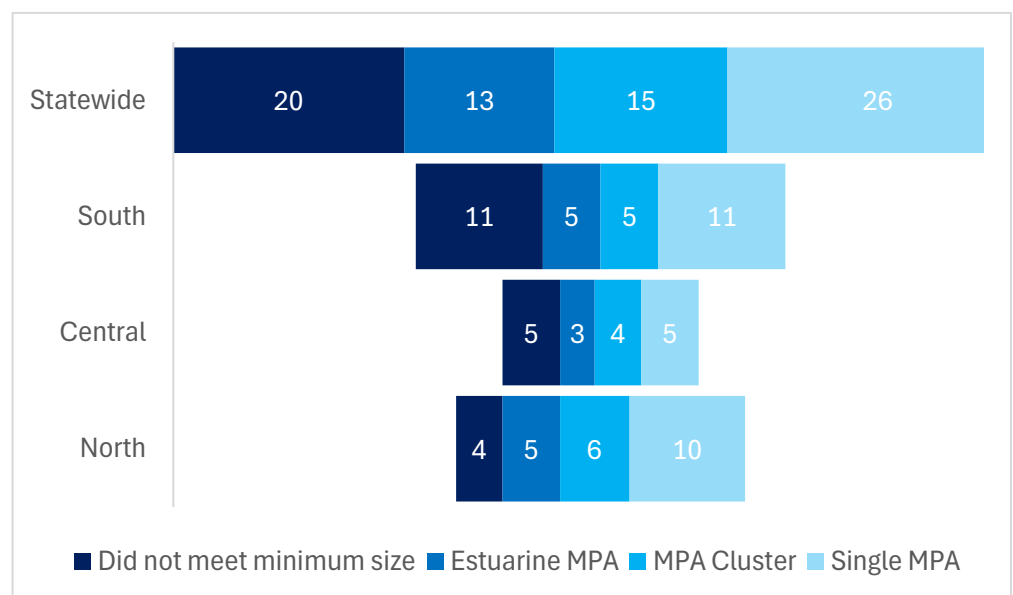


Figure 6. Number of California MPAs statewide and by bioregion that meet the LOP and size criteria to serve as backbone MPAs (e.g., at least Moderate-high LOP and 9 sq. mi.). Most (78%) MPAs meeting the LOP criteria also meet the size guideline or are estuarine MPAs.

backbone components of the MPA Network, they were often designed to achieve local conservation objectives. For example, some smaller MPAs were specifically designed to protect nearshore habitats such as rocky intertidal areas and shallow reef systems. In these cases, maximizing the size of the MPA by increasing the offshore extent would not necessarily have improved achievement of the individual MPA's intended objectives and may have introduced additional undesirable tradeoffs.

In combination, these 13 estuarine MPAs, 26 individual MPAs, and 30 MPA clusters make up the ecological backbone of the MPA Network and strengthen the likelihood that the MPA Network will achieve the MLPA's ecological objectives (Table 5).

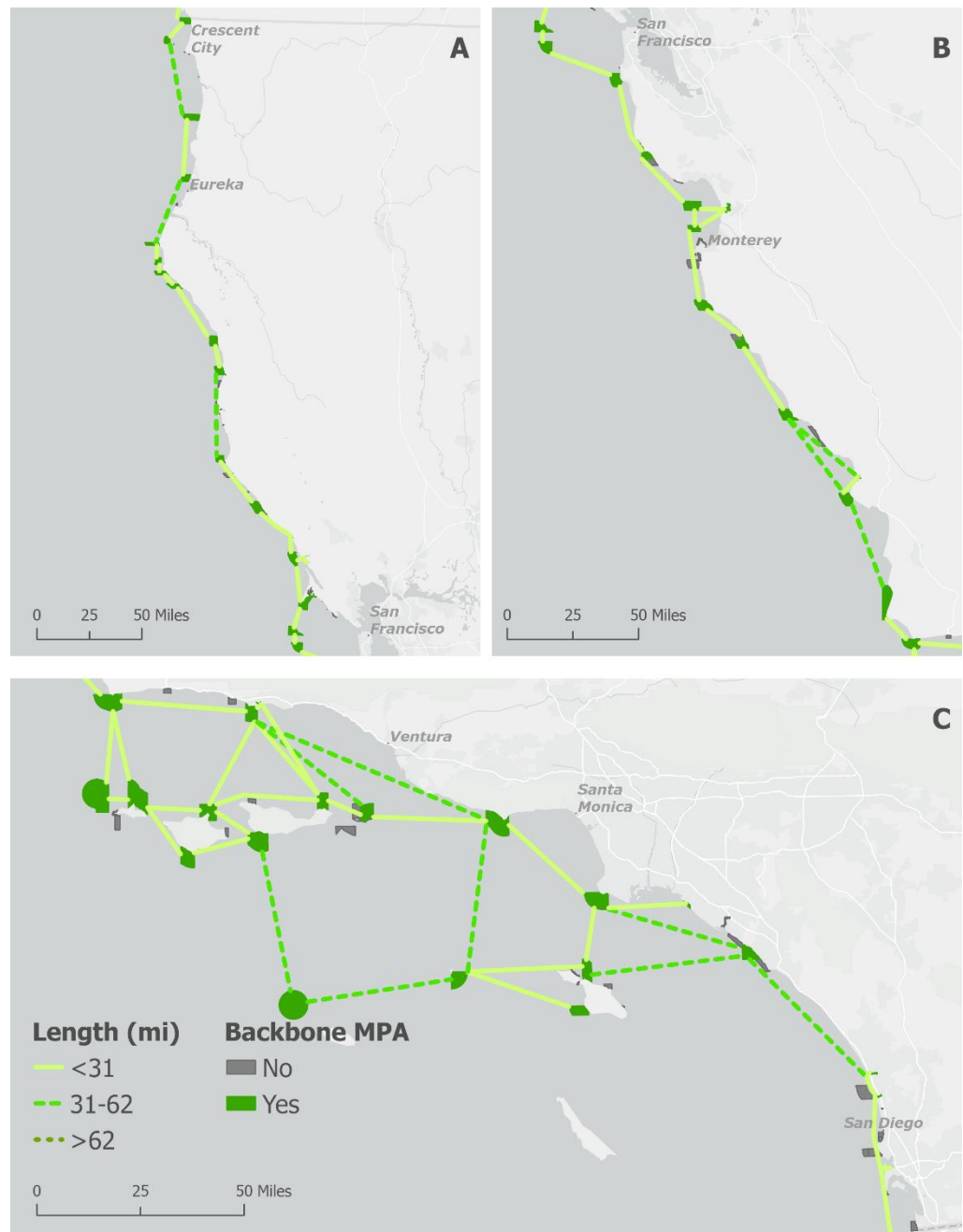
*Table 5. California MPAs that meet the Level of Protection and size criteria to qualify as backbone MPAs (e.g., at least Moderate-high LOP and 9 sq. mi.).*

| Individual MPAs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | MPA Clusters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Estuary MPAs                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Pyramid Point SMCA</li> <li>Point St. George Reef SMCA</li> <li>Samoa SMCA</li> <li>South Cape Mendocino SMR</li> <li>Mattole Canyon SMR</li> <li>Sea Lion Gulch SMR</li> <li>Big Flat SMCA</li> <li>Double Cone Rock SMCA</li> <li>Stewarts Point SMR</li> <li>North Farallon Islands SMR</li> <li>Año Nuevo SMR</li> <li>Soquel Canyon SMCA</li> <li>Portuguese Ledge SMCA</li> <li>Big Creek SMR</li> <li>Vandenberg SMR</li> <li>Point Conception SMR</li> <li>Campus Point No-Take SMCA</li> <li>Richardson Rock SMR</li> <li>Harris Point SMR</li> <li>Carrington Point SMR</li> <li>South Point SMR</li> <li>Gull Island SMR</li> <li>Scorpion SMR</li> <li>Anacapa Island SMR</li> <li>Begg Rock SMR</li> <li>Santa Barbara Island SMR</li> </ul> | <ul style="list-style-type: none"> <li>Reading Rock SMR/SMCA</li> <li>Ten Mile Beach SMCA/Ten Mile SMR</li> <li>Point Arena SMR/SMCA</li> <li>Bodega Head SMR/SMCA</li> <li>Point Reyes SMR/SMCA</li> <li>Southeast Farallon Islands SMR/SMCA</li> <li>Montara SMR/Pillar Point SMCA</li> <li>Point Sur SMR/SMCA</li> <li>Piedras Blancas SMR/SMCA</li> <li>Point Buchon SMR/SMCA</li> <li>Point Dume SMR/SMCA</li> <li>Point Vicente No-Take SMCA/Abalone Cove SMCA</li> <li>Blue Cavern Onshore No-Take SMCA/Blue Cavern Offshore SMCA</li> <li>Farnsworth Onshore/Offshore SMCA</li> <li>Laguna Beach SMR/No-Take SMCA</li> </ul> | <ul style="list-style-type: none"> <li>Ten Mile Estuary SMCA</li> <li>Russian River SMRMA</li> <li>Estero Americano SMRMA</li> <li>Estero de San Antonio SMRMA</li> <li>Estero de Limantour SMR</li> <li>Elkhorn Slough SMR</li> <li>Moro Cojo Slough SMR</li> <li>Morro Bay SMR</li> <li>Goleta Slough No-Take SMCA</li> <li>Bolsa Chica Basin No-Take SMCA</li> <li>Batiquitos Lagoon No-Take SMCA</li> <li>San Elijo Lagoon No-Take SMCA</li> <li>Famosa Slough No-Take SMCA</li> </ul> |

### MPA SPACING:

Backbone MPAs (those individual MPAs and MPA clusters that meet the size and LOP criteria) were strategically placed within a maximum spacing interval of 31 to 62 miles to facilitate larval dispersal (Figure 7). This maximum range was intended as a guideline to support ecological connectivity, not a strict cutoff beyond which larvae are unable to disperse. Because MPA spacing methodologies (i.e., between edges or midpoints) were inconsistently applied across regions during the initial planning phases, we used the nearest edge-to-edge over-water distance between adjacent backbone MPAs. Adopting this metric establishes a uniform baseline that reflects the absolute

minimum dispersal gap between protected habitats.<sup>7</sup> Over-water distances between backbone MPAs ranged from 1.5 to 60.3 miles, with an average ( $\pm$  SD) distance of  $16.45 \pm 10.6$  miles between nearest MPA backbone neighbors. Distances between Channel Islands backbone MPAs were included in this calculation, though the SAT advised during the South Coast regional planning



*Figure 7. Linear over-water distance (miles) between California backbone MPAs in the (a) North, (b) Central, and (c) South bioregions. All backbone MPAs are within 62 miles of at least two neighboring backbone MPAs. The northernmost and southernmost lines extend to the borders with Oregon and Mexico, respectively, to indicate the nearest potential replicate outside of the state.*

<sup>7</sup> Evaluating MPA spacing via nearest edge-to-edge distance provides the minimum geographic gap between habitats. While this method reflects the shortest potential dispersal path for marine organisms, it is less conservative when testing network compliance against maximum spacing thresholds than a midpoint-to-midpoint calculation.



process that, due to the complex geography and ocean currents around the Channel Islands, guidelines other than spacing may be more relevant to their design.

**HABITAT REPRESENTATION AND REPLICATION:** Key habitats that should be represented in the MPA Network were outlined in the MLPA and refined in the Master Plan for MPAs. The Master Plan recommended at least three to five replicate MPAs be designed for each habitat type within a biogeographical region. The SAT further advised that key marine habitats be replicated in at least one MPA within each planning region's sub-bioregions. California's marine habitats are diverse and not evenly distributed throughout state waters. Some habitat types may only be available (i.e., present) in certain areas and/or depths. Therefore, the capacity to meet habitat representation and replication guidelines during the planning process was sometimes constrained by habitat availability, habitat spatial heterogeneity, and bathymetry. For example, the SAT explicitly stated in their methodology for the North Central Coast Study Region that habitats deeper than 100 m did not need to be represented or replicated in that region because they are generally less available.

The key habitats analyzed in this document include rocky shore, sandy beach, estuarine, and kelp forest, as well as hard and soft substrate in four depth zones (0–30 m, 30–100 m, 100–200 m, and >200 m). Each of these habitats is represented in each bioregion in the MPA Network, and the replication guideline was met within each bioregion for all habitats analyzed here (Table 6).



Table 6. Number\* of replicates of each key habitat statewide and within each bioregion per SAT Science Guidelines developed during the MLPA Initiative planning process. Shaded boxes indicate habitats within bioregions that met the recommendation of at least 3–5 replicates of a given habitat per bioregion. For each habitat, areas of coastline (and corresponding bioregion) representing a distance >62 miles between habitat replicates are listed.

| Habitat                                 | Statewide | North | Central <sup>1</sup> | South | Distance >62 miles between habitat replicates (Bioregion)                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------|-----------|-------|----------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Beach                                   | 31        | 13    | 7                    | 11    | <ul style="list-style-type: none"> <li>Ten Mile Cluster to Stewarts Point SMR (North)</li> <li>South of Orange County/Catalina Island MPAs (South)</li> </ul>                                                                                                                                                                                                                                   |
| Rocky shore, inc. offshore rocks        | 36        | 15    | 7                    | 14    | <ul style="list-style-type: none"> <li>South of Orange County/Catalina Island MPAs (South)</li> </ul>                                                                                                                                                                                                                                                                                           |
| Kelp                                    | 22        | 3     | 6                    | 13    | <ul style="list-style-type: none"> <li>North of Ten Mile Cluster (North)</li> <li>Stewarts Point SMR to Año Nuevo SMR (North/Central)</li> <li>South of Orange County/Catalina Island MPAs (South)</li> </ul>                                                                                                                                                                                   |
| Estuary                                 | 11        | 4     | 3                    | 4     | <ul style="list-style-type: none"> <li>Ten Mile Estuary SMCA to Russian River SMRMA (North)</li> <li>Estero de Limantour SMR to Elkhorn Slough SMR (North/Central)</li> <li>Moro Cojo Slough SMR to Morro Bay SMR (Central)</li> <li>Morro Bay SMR to Goleta Slough (No-Take) SMCA (Central/South)</li> <li>Goleta Slough (No-Take) SMCA to Bolsa Chica Basin (No-Take) SMCA (South)</li> </ul> |
| Hard substrate, 0–30 m                  | 25        | 9     | 7                    | 9     | <ul style="list-style-type: none"> <li>Pyramid Point SMCA to Double Cone Rock SMCA (North)</li> <li>Point Vicente/Abalone Cove Cluster to Campus Point (No-Take) SMCA and to Gull Island SMR (South)</li> </ul>                                                                                                                                                                                 |
| Hard substrate, 30–100 m                | 27        | 11    | 7                    | 9     | <ul style="list-style-type: none"> <li>South of Catalina Island (South)</li> <li>East of the Northern Channel Islands (South)</li> </ul>                                                                                                                                                                                                                                                        |
| Hard substrate, >100 m <sup>2</sup>     | 5         | 1     | 1                    | 3     | <ul style="list-style-type: none"> <li>North of Mattole Canyon SMR (North)</li> <li>Mattole Canyon SMR to Soquel Canyon SMCA (North/Central)</li> <li>Soquel Canyon SMCA to Harris Point SMR (Central/South)</li> <li>South and east of Begg Rock SMR (South)</li> </ul>                                                                                                                        |
| Soft substrate, all depths <sup>3</sup> | 33        | 12    | 8                    | 13    | <ul style="list-style-type: none"> <li>Ten Mile Cluster to Stewarts Point SMR (North)</li> </ul>                                                                                                                                                                                                                                                                                                |

\* Potential discrepancies with historical planning data are attributed to refinements in data accuracy and resolution.

<sup>1</sup> In this analysis, the habitat minimums established for the North Central Coast Study Region were used to determine habitat replication for MPAs in the Central Coast Study Region.

<sup>2</sup> The SAT explicitly stated that habitats deeper than 100 m did not need to be represented or replicated in the North Central Coast Study Region because they are generally less available (California Marine Life Protection Act Initiative. 2008. Methods Used to Evaluate MPA Proposals in the North Central Coast Study Region. California Natural Resources Agency, Sacramento, CA)



<sup>3</sup> To ease comparison among regions, the total area of soft substrate across a range of depths was assessed, without prioritizing preferred depth-specific minimums.

**HABITAT SPACING:** The SAT advised a maximum spacing interval of 31 to 62 miles between replicate MPAs of a given habitat (i.e., MPAs that meet the size, LOP, and minimum habitat criteria).

Overall, most key habitats in California's MPA Network meet this spacing guidance (Table 6). Replicates for beach (Figure C1), rocky shore (Figure C2), and soft

substrate (Figure C3) habitats are generally well distributed along the coast statewide.

In some cases, apparent spacing gaps between habitat replicates (Figures C4-6) reflect the distribution of the habitat itself, rather than limitations of the MPA Network design. For example, hard substrate habitat is relatively limited compared to soft substrate habitat, and deeper habitats (>100 m) often occur beyond the limit of state waters, where state MPAs cannot be designated. Bull kelp (*Nereocystis luetkeana*) canopy is also naturally patchy along the northern California coast, sometimes resulting in relatively large gaps between canopy areas (Figure C7).

Unlike open coastal habitats, estuaries may be more influenced by upstream dynamics and human activities than by ocean currents. As a result, estuaries are not expected to be connected to each other in the same way as other habitats. For estuarine MPAs, connections to surrounding marine habitats, which support species that move between these habitats over their lifetimes, may be more important than spacing between estuarine replicates (Figure C8).

In southern California, particularly in San Diego County, spacing between habitat replicates was not met for all key habitats (excluding estuaries, Table 6). This reflects intentional design decisions made during the planning process to balance MPA Network ecological goals with continued human uses. For instance, some No-take MPAs were designed to be smaller than the recommended size threshold, and in one case, an MPA lost its backbone status when a Moderate-low take allowance was later adopted to avoid conflicts with existing California State Parks uses.

Overall, habitat spacing across the MPA Network is generally consistent with SAT Science Guidelines. Where gaps occur, they often reflect heterogeneity in habitat distributions or represent intentional design tradeoffs made during the planning process. These patterns provide important context for evaluation and management of the MPA Network today.



## WHAT PERCENTAGES OF KEY HABITATS ARE PROTECTED WITHIN THE CURRENT MPA NETWORK?

CDFW conducted an analysis in 2026 using the best available comprehensive statewide data for 12 of the key habitats considered during the MLPA Planning process and found that, on average, approximately

one-quarter of the total mapped extent of those habitats is contained within MPAs statewide (proportion:  $0.24 \pm 0.11$  SD). The two habitats with the highest percentages represented within MPAs statewide are hard substrate from depths of 100–200 m (58%) and 30–100 m (29%; Table 6). The two habitats with the lowest percentages contained within MPAs statewide are estuaries (12%) and soft substrate from depths of 0–30 m (15%; Table 7).

Across bioregions, the percentages of kelp, beach, rocky intertidal, estuarine, and soft substrate habitats within MPAs are generally similar, despite regional differences in availability of habitat (Figures 8–9; Table 7). The same pattern is true for shallower hard substrate (Figure 8). However, in deeper waters, the percentage of hard substrate within MPAs varies widely across bioregions (Figure 9; Table 7).



*Estuary at the Santa Ynez River mouth. (K. Gonzales, CDFW)*



*Rockfish swimming near the ocean floor. (CDFW/MARE)*

Table 7. Percent and total amount of key habitats contained in MPAs by bioregion and statewide. Values include all MPAs, regardless of LOP, size, or classification. Potential discrepancies with historical data are attributed to ongoing updates in data availability.

| Habitat                                                  | Metric | Statewide | North | Central | South |
|----------------------------------------------------------|--------|-----------|-------|---------|-------|
| Beach (mi <sup>a</sup> )                                 | %      | 17        | 15    | 24      | 14    |
|                                                          | Total  | 185.3     | 59.2  | 64.9    | 61.1  |
| Rocky shore, excluding offshore rocks (mi <sup>a</sup> ) | %      | 27        | 26    | 33      | 24    |
|                                                          | Total  | 223.2     | 77.7  | 77.3    | 68.2  |
| Maximum kelp canopy, 1984-2023 (mi <sup>b</sup> )        | %      | 22        | 21    | 30      | 18    |
|                                                          | Total  | 121.4     | 18.9  | 46.5    | 55.9  |
| Estuaries (sq mi)                                        | %      | 12        | 9     | 56      | 6     |
|                                                          | Total  | 16.0      | 5.7   | 7.0     | 3.3   |
| Hard substrate                                           |        |           |       |         |       |
| 0-30 m (mi <sup>b</sup> )                                | %      | 23        | 25    | 31      | 17    |
|                                                          | Total  | 111.8     | 33.4  | 43.6    | 34.8  |
| 30-100 m (sq mi)                                         | %      | 29        | 28    | 22      | 35    |
|                                                          | Total  | 43.4      | 18.8  | 9.1     | 15.6  |
| 100-200 m (sq mi)                                        | %      | 58        | 37    | 45      | 66    |
|                                                          | Total  | 6.5       | 0.29  | 1.5     | 4.8   |
| >200 m (sq mi)                                           | %      | 22        | 44    | 15      | 29    |
|                                                          | Total  | 3.6       | 0.03  | 1.3     | 2.3   |
| Soft substrate                                           |        |           |       |         |       |
| 0-30 m (mi <sup>b</sup> )                                | %      | 15        | 13    | 16      | 16    |
|                                                          | Total  | 120.0     | 31.8  | 29.1    | 59.1  |
| 30-100 m (sq mi)                                         | %      | 17        | 19    | 15      | 16    |
|                                                          | Total  | 363.3     | 157.8 | 86.6    | 119.0 |
| 100-200 m (sq mi)                                        | %      | 22        | 20    | 24      | 23    |
|                                                          | Total  | 76.1      | 12.7  | 19.0    | 44.4  |
| >200 m (sq mi)                                           | %      | 18        | 28    | 21      | 16    |
|                                                          | Total  | 79.3      | 2.2   | 25.3    | 51.8  |

<sup>a</sup>indicates metric corresponds to shoreline distance

<sup>b</sup>indicates metric corresponds to alongshore span



Fishing boat offshore of Point Pinos. (S. Worden)

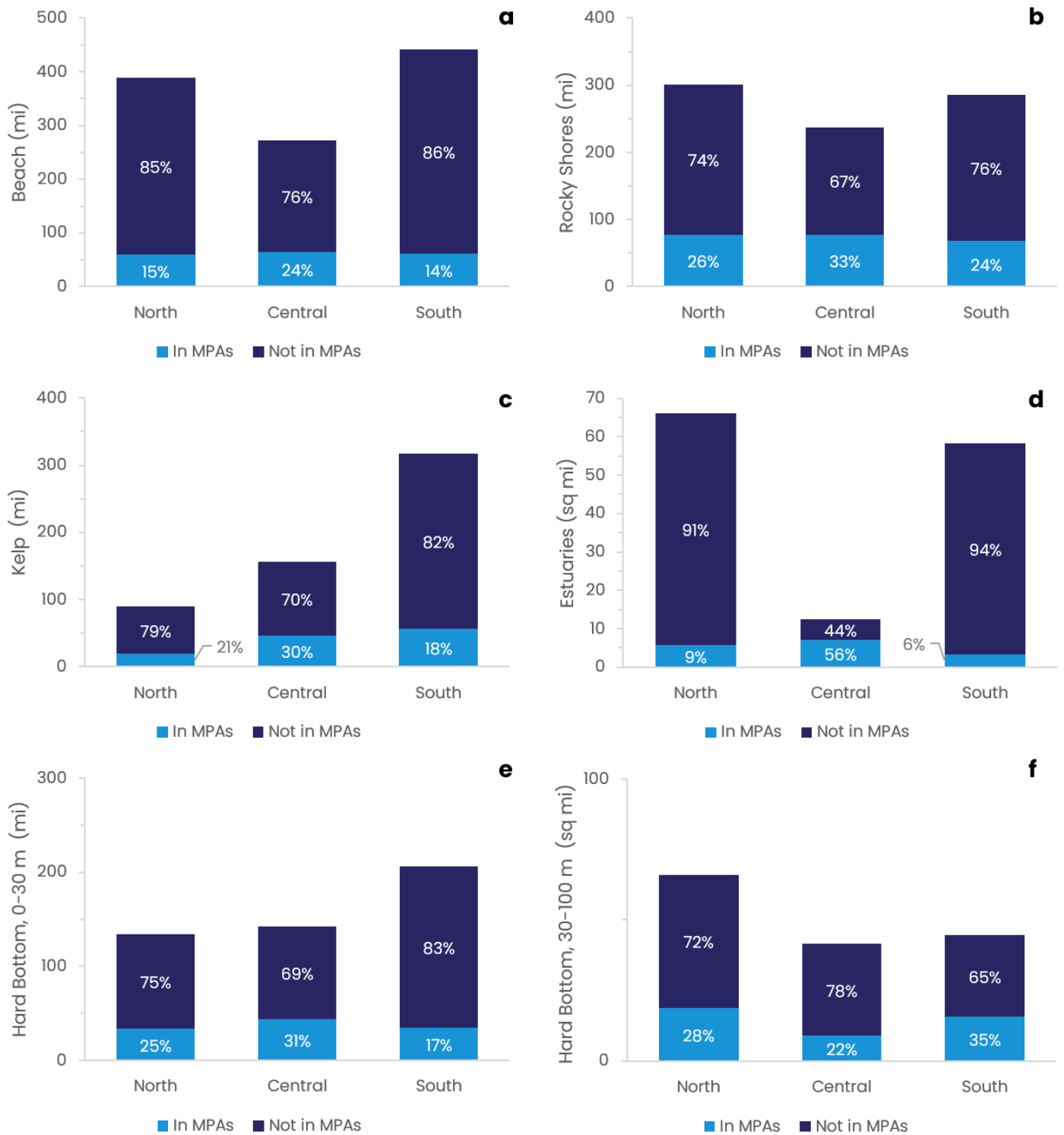


Figure 8. Absolute and relative (%) amounts of (a) beach, (b) rocky shores (not including offshore rock), (c) maximum kelp canopy (1984–2023), (d) estuarine habitat, and hard substrate at depths of (e) 0–30 m and (f) 30–100 m in MPAs (light blue) and not in MPAs (dark blue) by California bioregion.



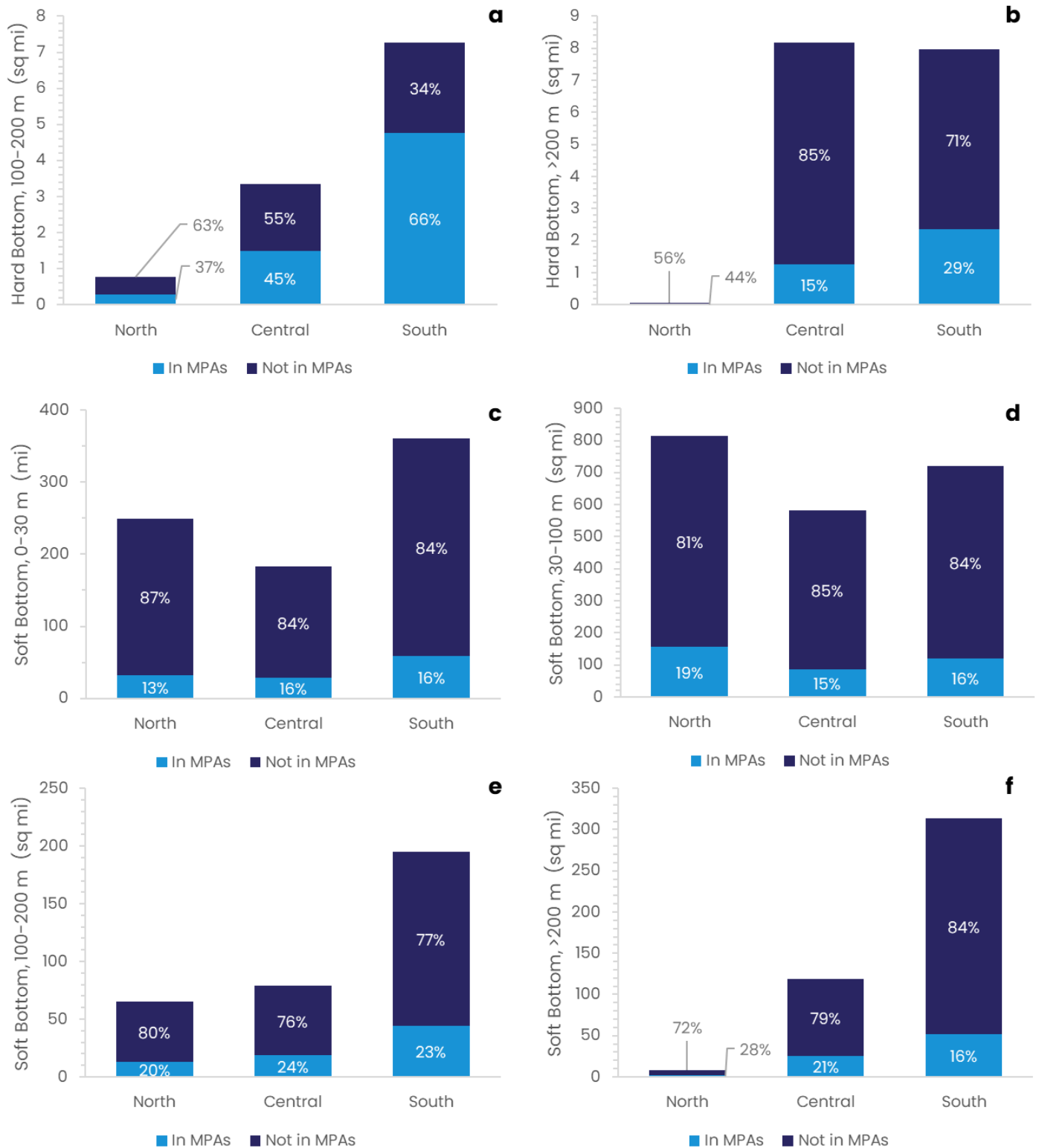
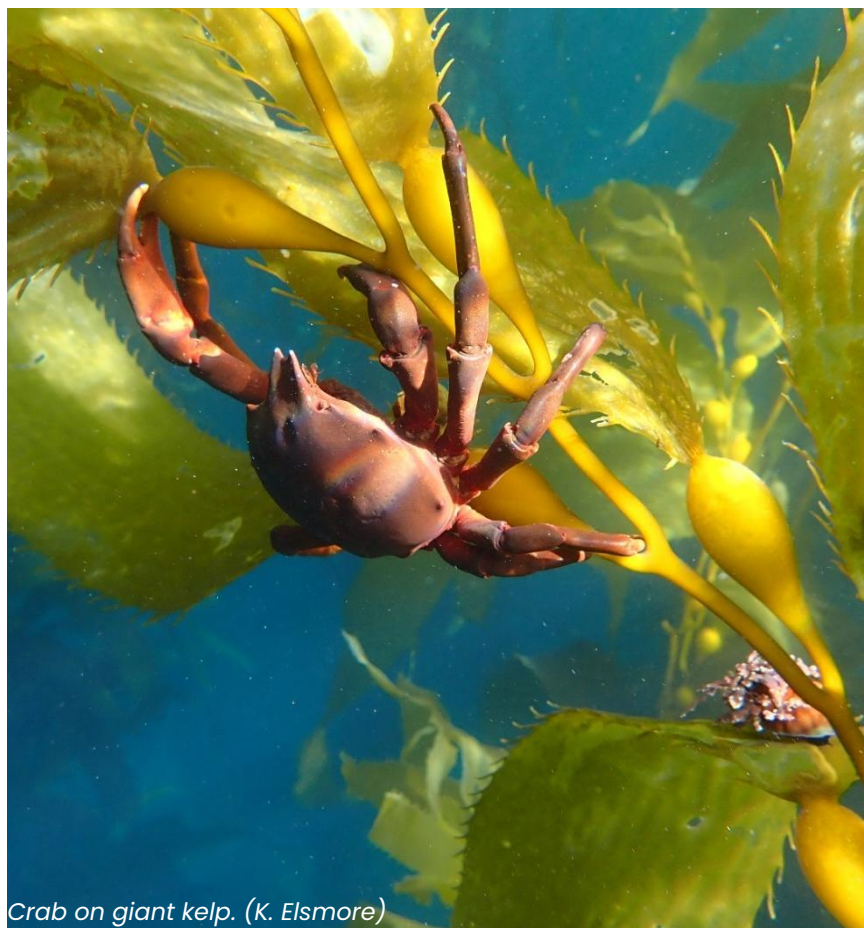


Figure 9. Absolute and relative (%) amounts of hard substrate at depths of (a) 100–200 m and (b) greater than 200 m, and soft substrate at depths of (c) 0–30 m, (d) 30–100 m, (e) 100–200 m, and (f) greater than 200 m that is contained in MPAs (light blue) and not in MPAs (dark blue) by California bioregion.



Crab on giant kelp. (K. Elsmore)

## WHAT PERCENTAGE OF THE CURRENT EXTENT OF KELP CANOPY IS INCLUDED WITHIN THE MPA NETWORK?

Kelp forests are one of California's most productive and biodiverse marine ecosystems, dominated by giant kelp (*Macrocystis pyrifera*) in southern California and bull kelp (*Nereocystis luetkeana*) in northern California, with a mix of both species in central California. Accordingly, kelp forests were among the key habitats explicitly identified for protection during the MLPA Initiative planning process. The statewide MPA Network was fully implemented in 2012, shortly before an unprecedented marine heatwave (MHW) and associated ecological stressors

resulted in widespread, but regionally variable, declines in kelp cover<sup>8</sup>. Because kelp abundance and distribution naturally fluctuate across a range of spatial and temporal scales, distinguishing the influence of MPAs from broader environmental drivers remains an active area of research. Nevertheless, long-term datasets provide an opportunity to quantify changes in the proportion of kelp canopy occurring within the MPA Network over time.

During the MLPA Initiative planning process, the kelp canopy data used to inform MPA design were derived from 2-meter spatial resolution CDFW aerial surveys conducted in multiple years between 1989 and 2008 (the specific survey years used varied among regional planning processes). These surveys continued after MPA Network implementation but have not occurred since 2016, limiting their ability to characterize more recent changes in kelp canopy extent. Landsat imagery<sup>9</sup> was thus selected for this analysis because it offers a consistent long-term statewide time series of kelp canopy observations extending from before MPA Network implementation through recent years, including the period following the 2014–2016 MHW.

---

<sup>8</sup> CDFW. 2021. Giant Kelp and Bull Kelp Enhanced Status Report. CDFW, Marine Region.

<sup>9</sup> Note that Landsat's spatial resolution (30 m) is coarser than that of CDFW's aerial imagery (~2 m), which may increase the likelihood that small or sparse patches of kelp canopy are not detected. This limitation is particularly relevant in northern California, where bull kelp, the dominant canopy-forming species, exhibits lower surface biomass than giant kelp, which is dominant in southern California. As a result, fragmented or low-density patches of bull kelp are more likely to be missed, and overall extent of bull kelp canopy may be underestimated. This may occur in both datasets, though the effect is likely more pronounced in the coarser-resolution Landsat imagery.

Annual third-quarter Landsat-derived kelp canopy observations<sup>10</sup> were compiled for 1984–2023 and converted into annual presence-absence spatial datasets. For selected time periods, annual observations were combined to identify the maximum observed extent of kelp canopy across all selected years (i.e., maximum extent of all areas where kelp was detected during at least one year of the selected timeframe). To align with the methodology used during the MLPA Initiative planning process, kelp extent was evaluated as an alongshore linear, rather than areal, measure spanning the alongshore length of kelp canopy from a composite of all relevant years of data. This was done to ensure that both steep and gently sloping kelp beds are considered equally in analyses, since a narrow band of kelp along a steep shore and a broader bed along a gently sloping shore are likely to encompass similar biological richness so long as they extend along a similar length of shoreline. The linear distance was drawn to encompass the full kelp extent following the shape of the shoreline, bathymetric contours, and the canopy itself. Therefore, the cumulative length of kelp canopy is not directly comparable to the length of the state’s coastline.

This linear maximum extent metric was then used to quantify the proportion of statewide kelp canopy extent occurring within MPAs during four time periods selected to capture different ecological and management contexts. The 2007–2013 timeframe provides a reference period encompassing conditions spanning regional implementation of the MPA Network, which occurred between September 2007 and



*Bull kelp under water. (CDFW)*

December 2012. The 2014–2016 period captures the major MHW and its immediate effects on kelp extent. Although elevated ocean temperatures and additional heatwaves occurred beyond 2016 and ecological responses may continue to emerge in subsequent years, these years were analyzed separately to isolate the initial disturbance. The 2017–2023 period represents post-MPA implementation conditions following the MHW through the release of the DMR and the start of the MPA petition process. Finally, 1984–2023 provides a long-term baseline for comparison.

To evaluate areas of recurring kelp presence using similar timeframes, 7-year kelp persistence was also assessed for the time periods 2007–2013 and 2017–2023. Consistent with the methodology used during the MLPA Initiative planning process, persistent kelp was defined as areas where kelp was detected in at least three of the seven years in the selected time frame.

---

<sup>10</sup> Santa Barbara Coastal LTER; Bell, T.; Cavanaugh, K., and Siegel, D. (2023) *SBC LTER: Time series of quarterly NetCDF files of kelp biomass in the canopy from Landsat 5, 7 and 8, since 1984 (ongoing)* ver 13. Environmental Data Initiative. In: Environ. Data Initiat. <https://doi.org/10.6073/pasta/93b47266b20bc1782c8df9c36169e372>.



Persistence was not determined for the 2014–2016 or 1984–2023 periods because they encompassed different numbers of years and would not be comparable to the two seven-year periods.

These analyses are descriptive and intended to characterize broad patterns in kelp canopy extent and representation within the MPA Network. No formal analyses were conducted to evaluate the statistical significance of observed differences. Likewise, these analyses do not evaluate the ecological importance of observed differences or identify the processes driving them. Additional exploration into the influences of environmental variability, species interactions, management, and other factors would be required to evaluate the ecological significance of observed trends.

The maximum alongshore linear extent of kelp canopy observed between 1984 and 2023 spanned 563 miles statewide, with 122 miles occurring within MPAs (21.6%; Figure 10). Maximum kelp canopy observed pre-MPA implementation (2007–2013) totaled 537 miles statewide, representing 95% of the full 1984–2023 maximum extent. During the 2014–2016 MHW, maximum kelp extent declined to 430 miles before increasing modestly to 454 miles in more recent years (2017–2023). Despite these substantial changes in total observed kelp extent, the proportion of kelp extent occurring within MPAs remained consistent across all time periods analyzed, ranging from 21.4–21.6%.

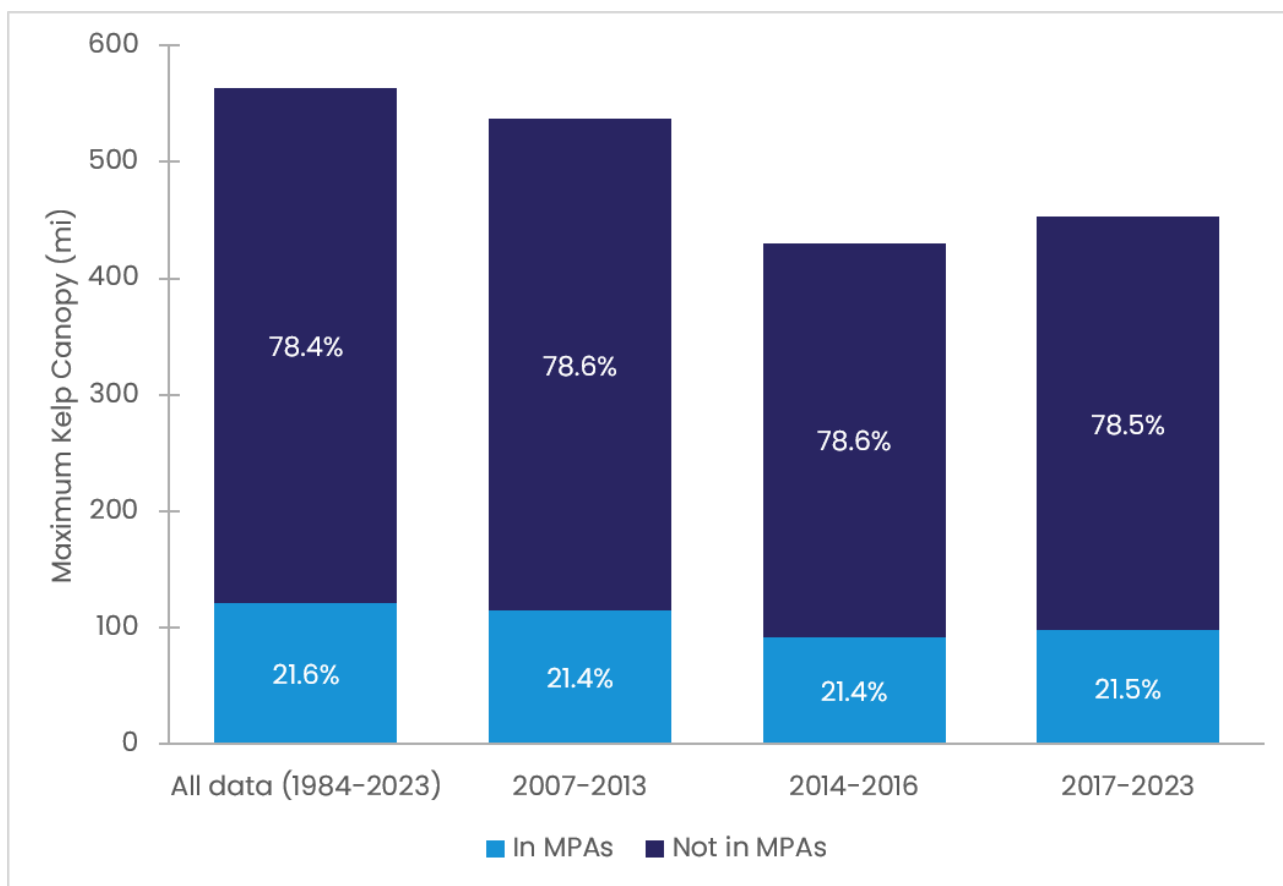


Figure 10. Total and relative (%) extent of maximum kelp canopy within MPAs (light blue) and outside of MPAs (dark blue) statewide for the time periods 1984–2023, 2007–2013, the 2014–2016 marine heat wave, and 2017–2023.



Persistent kelp canopy decreased from 462 miles during 2007–2013 to 302 miles during 2017–2023 (Figure 11). Despite the 34.7% decline of persistent kelp statewide following the MHW, the proportion of persistent kelp occurring within MPAs remained fairly stable, with a 0.9% increase in the 2017–2023 period, indicating the MPA Network may have afforded limited benefits to persistent kelp. In contrast, during this same period, persistent kelp represented a substantially smaller proportion of total maximum kelp extent. For example, during 2007–2013,

approximately 86% of the maximum observed kelp extent was persistent (i.e., detected in at least three of seven years), compared to 66% during 2017–2023. This indicates that while kelp continued to occur across much of its historical range, it was present less consistently across years following the 2014–2016 MHW.

Overall, the proportion of the state's maximum and persistent kelp captured within the MPA Network did not appreciably change following implementation and large-scale disturbance, though the slight increase in persistent kelp warrants further study.

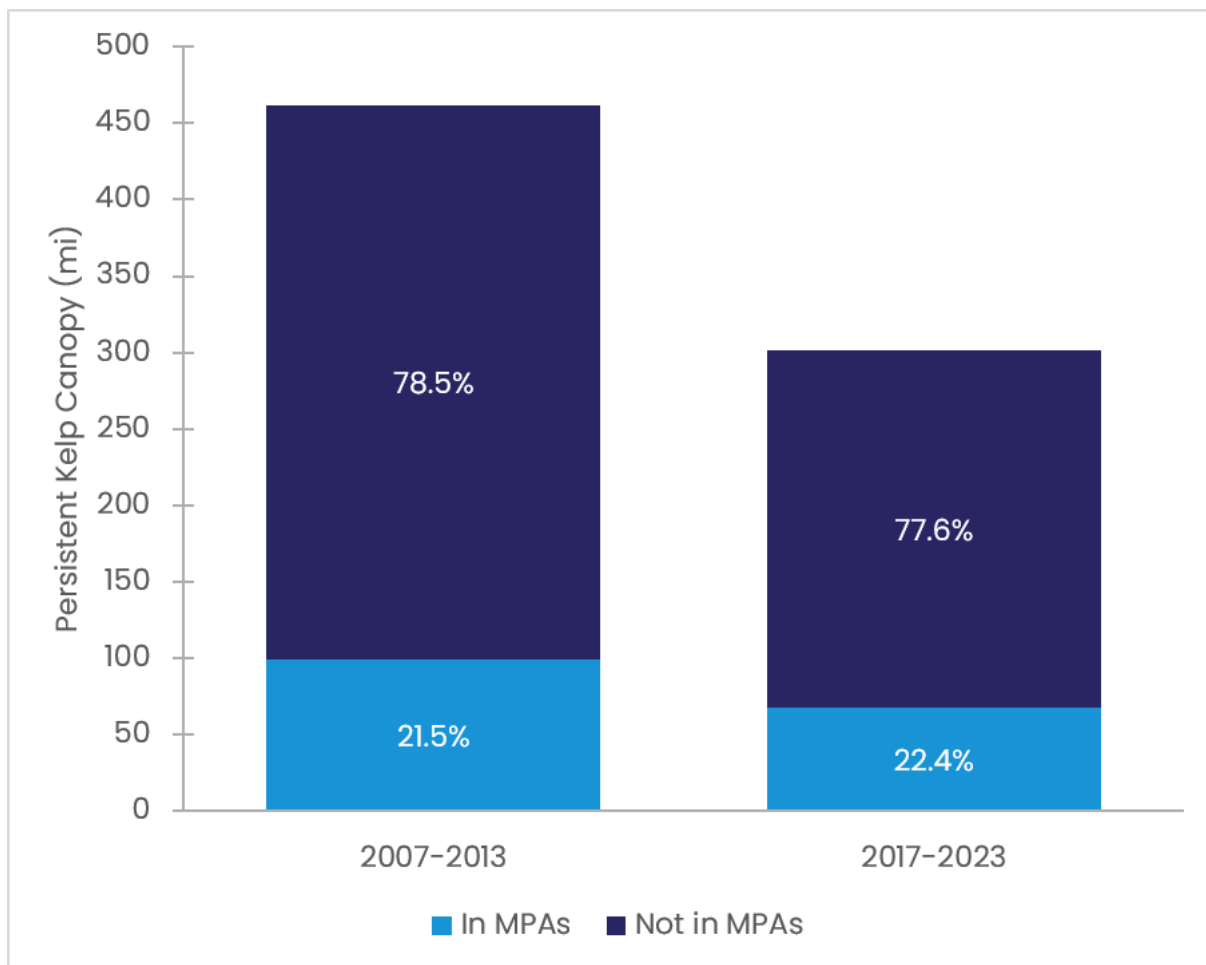


Figure 11. Total and relative (%) extent of persistent kelp canopy within MPAs (light blue) and outside of MPAs (dark blue) statewide for the two 7-yr time periods before (2007–2013) and after (2017–2023) the 2014–2016 marine heat wave.

Within the three bioregions, the maximum extent of kelp canopy varied considerably across all time periods, with the South bioregion containing the greatest extent of both maximum and persistent kelp canopy and the North bioregion the least (Figures 12–13). This is consistent with observations of patchy declines in southern California, localized declines in central California, and extreme and persistent declines in northern California (CDFW 2021). Maximum kelp extent declined during the 2014–2016 MHW in all three bioregions and increased somewhat during 2017–2023, but the magnitude of recovery differed substantially. By 2017–2023, maximum kelp extent in the Central bioregion had returned to 99% of its 2007–2013 extent, whereas the North bioregion recovered to only 51%. Persistent kelp exhibited an even stronger regional contrast, declining by 10% in the Central bioregion compared to 87% in the North bioregion.

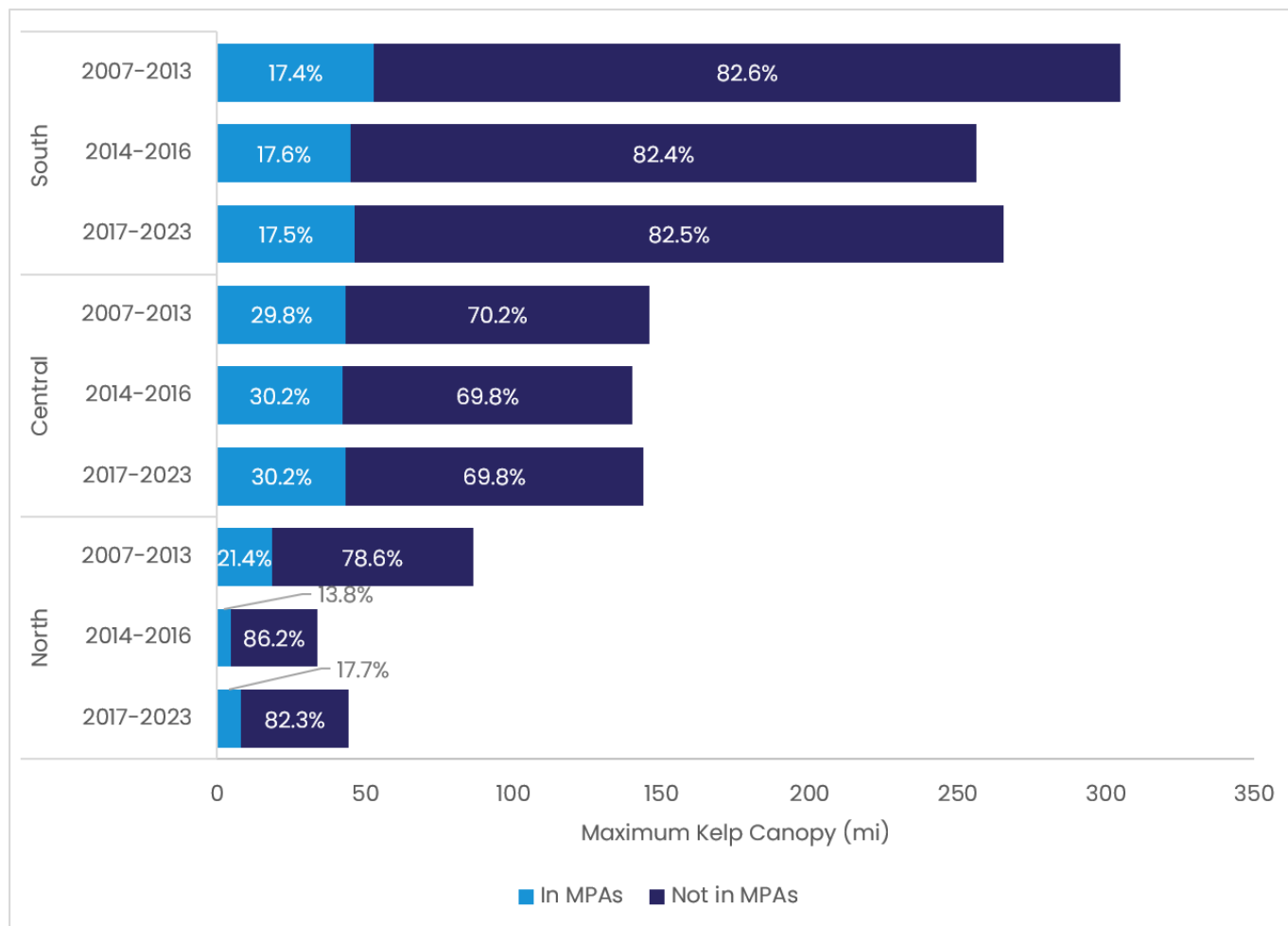


Figure 12. Absolute and relative (%) extent of maximum kelp canopy within MPAs (light blue) and outside of MPAs (dark blue) in California's three bioregions during three timeframes, 2007–2013, the 2014–2016 marine heat wave, and 2017–2023.





Regional differences were also evident in the relative proportion of kelp within MPAs versus outside of MPAs. Across time periods, MPAs consistently represented approximately 17–18% of maximum kelp in the South bioregion and approximately 30% in the Central bioregion, indicating that regional representation remained stable despite substantial fluctuations in total kelp extent (Figure 12). A similar pattern was observed for persistent kelp (Figure 13). Notably, the Central bioregion consistently contained the highest proportion of kelp within MPAs, with approximately 30% of both maximum and persistent kelp occurring within MPAs.

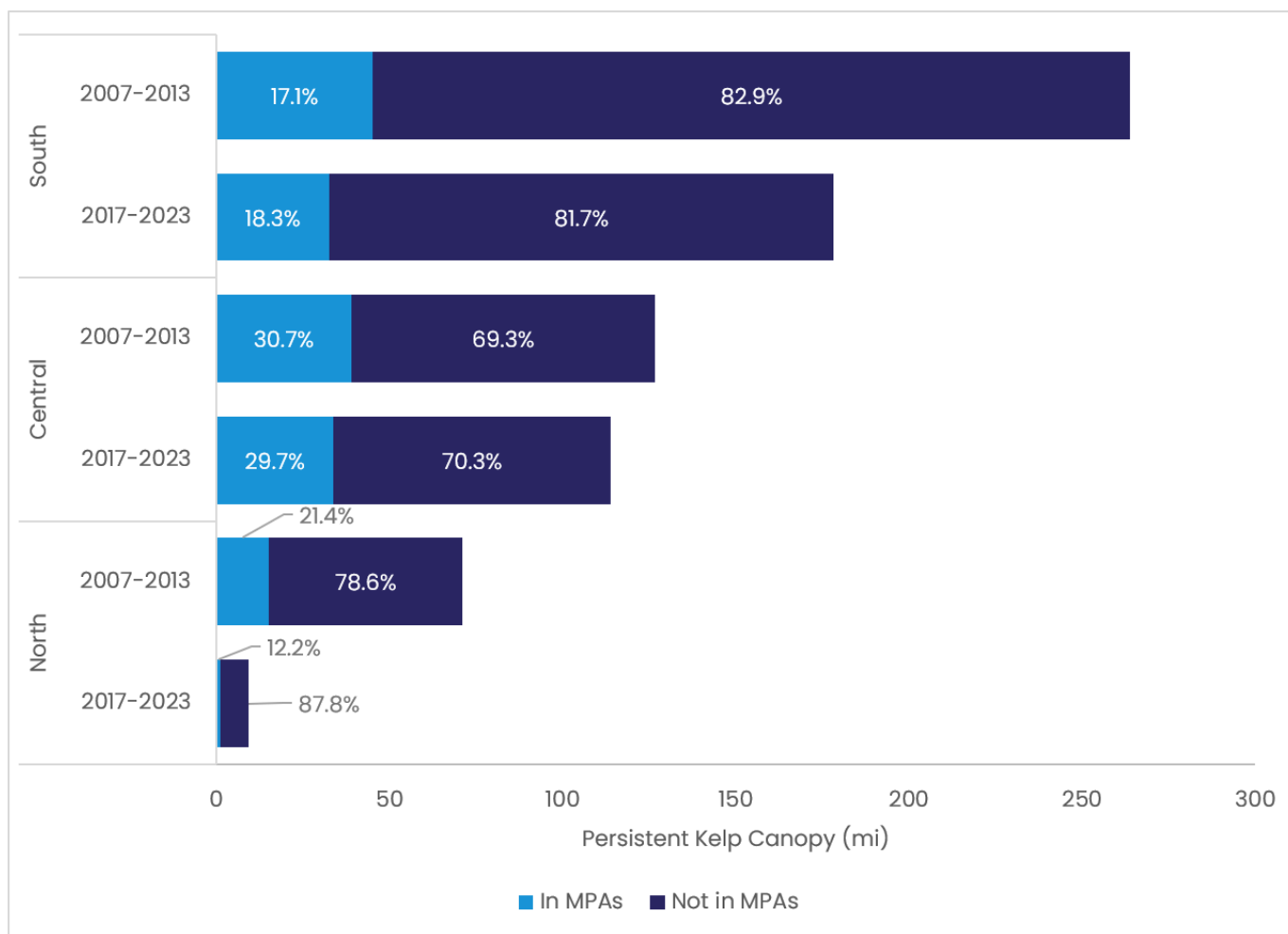


Figure 13. Absolute and relative (%) extent of persistent kelp canopy contained within MPAs (light blue) and outside of MPAs (dark blue) in California's three bioregions for the two 7-yr time periods before (2007–2013) and after (2017–2023) the 2014–2016 marine heat wave.

In contrast, the North bioregion exhibited substantial changes in both the extent of kelp and its representation within MPAs. Maximum kelp within MPAs declined from 18.4 miles during 2007–2013 to 7.8 miles during 2017–2023 (57% decline), and the proportion of maximum kelp within MPAs decreased from 21.4% to 17.7% (Figure 12). Declines were even greater for persistent kelp. Total persistent kelp within the North bioregion's MPAs decreased from 15.2 miles to 1.1 miles (92% decline), while the relative proportion within the region's MPAs declined from 21.4% to 12.2% (Figure 13).

During 2007–2013, approximately 83% of the maximum kelp extent detected in the North bioregion was persistent, compared to only 15% during 2017–2023, indicating that many locations that historically supported persistent kelp were greatly impacted following the 2014–2016 MHW. Prior to the disturbance, the MPA Network within the North bioregion contained an equal proportion (21.4%) of both maximum and persistent kelp, suggesting that persistent kelp was not disproportionately concentrated within MPAs relative to overall kelp presence. However, examination of the data within individual MPAs indicates that persistent kelp was not distributed evenly among MPAs in the North bioregion. More than 85% of the persistent kelp occurring within MPAs in the North bioregion during 2007–2013 was contained in just five MPAs (Point Arena SMR, Saunders Reef SMCA, Stewarts Point SMCA, Stewarts Point SMR, and Salt Point SMCA), all of which are located along the Sonoma–Mendocino coast. This region experienced some of the most severe and persistent kelp declines following the 2014–2016 MHW, suggesting that the observed disproportionate decrease in persistent kelp within MPAs was strongly influenced by the geographic distribution of historically persistent kelp and regional ecological conditions rather than MPA status itself.

Ultimately, impacts to kelp following major environmental disturbance were not distributed equally statewide. The proportion of kelp within MPAs remained largely stable in the Central and South Coast regions, but was severely impacted in the North Coast region. Research is ongoing to better understand the relative influence of environmental and ecological drivers on patterns of kelp persistence and recovery.



Scuba diver in a kelp forest.  
(CDFW)

Addressing kelp declines throughout the state is a priority. In response, CDFW, in partnership with the Ocean Protection Council, is developing a statewide, ecosystem based, adaptive Kelp Restoration Management Plan (KRMP), which will be the basis for assessing and managing kelp statewide into the future. The KRMP will include a cohesive kelp management strategy that consists of three core components:

1. An innovative framework for ecosystem-based management of kelp forests,
2. A harvest management framework and other Fishery Management Plan elements required by the Marine Life Management Act, and
3. A Restoration Toolkit.

The KRMP will include a robust, adaptive, climate-ready approach to managing the state's kelp forest ecosystems in the face of changing ocean conditions. The KRMP will help identify ecological priorities, site selection criteria, and management frameworks to guide future kelp management and restoration activities. Furthermore, as resources become available, CDFW plans to develop a decision-making framework for considering restoration activities more broadly within the state's MPAs (DMR Recommendation 18), recognizing that one of the mandates of the MLPA is that MPAs act as living laboratories where research and monitoring can occur without the influence of human activities.

## THE FUTURE OF MPA SCIENCE

California's MPA Network was designed using the best available science to create an ecologically connected system of protected areas along more than 1,000 miles of coastline. Results of the 2022 DMR indicate that the MPA Network's foundational design is functioning as intended, with many MPAs showing measurable ecological benefits.

As the MPA Network matures, the focus of MPA science has shifted toward evaluations of performance and function. The DMR's 28 strategic recommendations provide the roadmap for next steps. Some of the science priorities include maintaining continuity in long-term habitat monitoring, understanding the mechanisms underlying MPA performance, improving knowledge of MPA effects on fisheries and stock status, and exploring the role of MPAs as climate adaptation tools.

The priorities ahead reflect the relatively young age of the MPA Network and existing knowledge gaps in the face of a changing ocean. The 2014–2016 MHW drove dramatic declines in kelp across California, illustrating that habitats inside and outside MPAs are vulnerable to large-scale disturbance, while also highlighting the importance of understanding the localized drivers that may support resilience and recovery. Work has begun to understand how climate change and MPAs interact within the context of California's MPA Network, based on the recommendations in the Climate Resiliency and MPAs Working Group Report. One example is the [ShoreCast tool](#), a decision support system that provides access to California rocky intertidal data to explore biodiversity and larval connectivity across MPAs and non-MPA areas, as well as the effects of sea level rise on species distributions.

Adaptive management of California's MPA Network requires recognizing appropriate time scales for detecting change and continuing to address key information gaps in partnership with tribes, local communities, fellow agencies, and other interested parties. Sustained investment in long-term monitoring, emerging technologies, and collaborative science will deepen our understanding of how California's MPAs function, connect, and respond to changing ocean conditions. Strengthening outreach and enforcement efforts and advancing opportunities for tribal co-stewardship will expand our knowledge of the ways in which people use, access, and value MPAs. Together, progress across the social and ecological dimensions of MPA management will help ensure that California's MPA Network continues to fulfill both the goals of the MLPA and the needs of current and future generations.





## APPENDIX A: LEVELS OF PROTECTION BY ACTIVITY AND MLPA REGION

# NORTH COAST

Table A1. Level of protection, MPA type, and associated activities (species and gear) established during the MLPA North Coast Study Region planning process (excerpted from the California MLPA Master Plan Science Advisory Team's "Methods Used to Evaluate Marine Protected Area Proposals in the MLPA North Coast Study Region"). Some activities may not conform to existing commercial and recreational allowances. Updates to scientific names since the planning process are not reflected here.

| Color Code | Level of Protection | MPA Types   | Activities Associated with this Protection Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------|---------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | Very High           | SMR         | No take                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|            | High                | SMCA<br>SMP | Salmon and other pelagic finfish <sup>a</sup> (H&L or troll in waters >50 m depth); pelagic finfish <sup>a</sup> except salmon (spearfishing); coastal pelagic finfish <sup>b</sup> (H&L, round-haul net, dip net, cat net, hand); Pacific lamprey (H&L, hand harvest, spear, bow and arrow, dip net); eulachon (dip net); non-living shells (hand)                                                                                                                                                                                                                                                             |
|            | Moderate-high       | SMCA<br>SMP | Dungeness crab (trap, hoop-net, diving, hand); salmon and other pelagic finfish <sup>a</sup> (troll in waters <50 m depth); surf and night smelts (dip net, a-frame net, cat net); sharks, skates, and rays (spear, harpoon, bow and arrow in non-estuarine waters); trout except steelhead rainbow trout (H&L); California halibut, flounders, soles, turbot, and sanddabs (spearfishing); market squid (H&L, round-haul net, dip net, cast net, hand)                                                                                                                                                         |
|            | Moderate            | SMCA<br>SMP | Redtail surfperch (H&L from shore); surfperch (H&L from shore); California halibut, flounders, soles, turbot, and sanddabs (H&L); coonstripe shrimp and spot prawn (trap); clams (intertidal hand); nori/laver and sea lettuce (intertidal hand); salmon and other pelagic finfish <sup>a</sup> (H&L in waters <50 m depth); white sturgeon (H&L); sharks, skates, and rays (H&L)                                                                                                                                                                                                                               |
|            | Moderate-low        | SMCA<br>SMP | Pacific halibut (H&L); rockfishes, cabezon and other sculpins, lingcod and other greenlings, California moray eel, wolf eel, and monkeyface and rock pricklyback (H&L, spearfishing, trap, hand, bow and arrow); red abalone (free-diving); urchin (diving); surfperch (H&L); shiner surfperch (H&L, dip net, cast net); unspecified finfish (H&L, spearfishing); sharks, skates, and rays (H&L, spear, harpoon, bow and arrow in estuarine waters); limpets and turban snails (hand); octopus (H&L, hand); crabs (trap, hoop net, hand); Turkish towel and Mendocino grapestone <sup>d</sup> (intertidal hand) |
|            | Low                 | SMCA<br>SMP | Rock scallop (diving); mussels (hand); bull kelp (hand); ghost shrimp (hand); sea palm (intertidal hand); canopy-forming algae <sup>e</sup> (intertidal hand); native oysters (hand); unspecified shrimps (hand); unspecified marine invertebrates (hand); unspecified marine algae (hand)                                                                                                                                                                                                                                                                                                                      |

SMR = state marine reserve, SMCA = state marine conservation area, SMP = state marine park,  
H&L = hook and line, m = meters

The SAT is currently reviewing the level of protection for numerous activities; this table will be updated as activities are reviewed and approved by the SAT. It should be noted that staff is working with the SAT to coordinate terminology for particular gear types that is consistent with both the activities being proposed by the NCRSG and as defined in regulations under California Fish and Game Code. Thus the descriptions here may change in a future version of this document.

<sup>a</sup> The grouping “pelagic finfish” includes: northern anchovy (*Engraulis mordax*), barracudas (*Sphyraena* spp.), billfishes\* (family *Istiophoridae*), dolphinfish (*Coryphaena hippurus*), Pacific herring (*Clupea pallasii*), jack mackerel (*Trachurus symmetricus*), Pacific mackerel (*Scomber japonicus*), salmon (*Oncorhynchus* spp.), Pacific sardine (*Sardinops sagax*), blue shark (*Prionace glauca*), salmon shark (*Lamna ditropis*), shortfin mako shark (*Isurus oxyrinchus*), thresher sharks (*Alopias* spp.), swordfish (*Xiphias gladius*), tunas (family *Scombridae*), and yellowtail (*Seriola lalandi*). \*Marlin is not allowed for commercial take.

<sup>b</sup> The grouping “coastal pelagic finfish” includes: Northern anchovy (*Engraulis mordax*), Pacific herring (*Clupea pallasii*), jack mackerel (*Trachurus symmetricus*), Pacific mackerel (*Scomber japonicus*), and Pacific sardine (*Sardinops sagax*).

<sup>c</sup> *Porphyra* spp. (Nori, Laver), *Ulva* spp. (Sea Lettuce).

<sup>d</sup> *Chondracanthus/Gigartina exasperata* (Turkish Towel), and *Mastocarpus* spp. (Mendocino Grapestone).

<sup>e</sup> The grouping “canopy-forming algae” includes the following harvested groups: *Alaria* spp. (Wakame), *Lessoniopsis littoralis* (Ocean Ribbons), *Laminaria* spp. (Kombu), *Saccharina/Hedophyllum sessile* (‘Sweet’ Kombu), *Egregia menziesii* (Feather Boa), and *Fucus* spp. (Bladder Wrack or Rockweed).



# NORTH CENTRAL COAST

Table A2. Level of protection, MPA type, and associated activities (species and gear) established during the MLPA North Central Coast Study Region planning process (excerpted from the California Marine Life Protection Act Initiative's "Methods Used to Evaluate MPA Proposals in the North Central Coast Study Region"). Some activities may not conform to existing commercial and recreational allowances. Updates to scientific names since the planning process are not reflected here.

| Color Code | Level of Protection | MPA Types   | Activities Associated with this Protection Level                                                                                                                                                     |
|------------|---------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | Very High           | SMR         | No take                                                                                                                                                                                              |
|            | High                | SMCA<br>SMP | In water depth > 50m: pelagic finfish <sup>a</sup> by hook and line (salmon by troll only); coastal pelagic finfish <sup>b</sup> by seine                                                            |
|            | Moderate-high       | SMCA<br>SMP | In water depth < 50m: pelagic finfish by hook and line (salmon by troll only); coastal pelagic finfish by seine; Dungeness crab (traps/pots), squid (pelagic seine)                                  |
|            | Moderate            | SMCA<br>SMP | Salmon (non-troll H&L); abalone (diving); halibut, white seabass, shore-based finfish, croaker, and flatfishes (H&L); smelt (H&L and hand/dip nets); clams (hand harvest); giant kelp (hand harvest) |
|            | Moderate-low        | SMCA<br>SMP | Urchin (diving); lingcod, cabezon, greenling, rockfish, and other reef fish (H&L); surfperches (H&L)                                                                                                 |
|            | Low                 | SMCA<br>SMP | Bull kelp and mussels (any method); all trawling; giant kelp (mechanical harvest); mariculture (existing methods)                                                                                    |

<sup>a</sup> Pelagic finfish: northern anchovy (*Engraulis mordax*), barracudas (*Sphyraena* spp.), billfishes\* (family *Istiophoridae*), dolphinfish (*Coryphaena hippurus*), Pacific herring (*Clupea pallasii*), jack mackerel (*Trachurus symmetricus*), Pacific mackerel (*Scomber japonicus*), salmon (*Oncorhynchus* spp.), Pacific sardine (*Sardinops sagax*), blue shark (*Prionace glauca*), salmon shark (*Lamna ditropis*), shortfin mako shark (*Isurus oxyrinchus*), thresher sharks (*Alopias* spp.), swordfish (*Xiphias gladius*), tunas (family *Scombridae*), and yellowtail (*Seriola lalandi*). \*Marlin is not allowed for commercial take.

<sup>b</sup> Coastal pelagic finfish: northern anchovy (*Engraulis mordax*), Pacific herring (*Clupea pallasii*), jack mackerel (*Trachurus symmetricus*), Pacific mackerel (*Scomber japonicus*), and Pacific sardine (*Sardinops sagax*).

# CENTRAL COAST

Table A3. Level of protection, MPA type, and associated activities (species and gear) established during the MLPA Central Coast Study Region. Some activities may not conform to existing commercial and recreational allowances. Updates to scientific names since the planning process are not reflected here.

| Color Code | Level of Protection | MPA Types | Activities Associated with this Protection Level [gear assumed, not specified during planning for this region]                                                                                                 |
|------------|---------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | Very High           | SMR       | No take.                                                                                                                                                                                                       |
|            | High                | SMCA      | In water depths > 50 m: Take of salmon, albacore, and pelagic finfish <sup>a</sup> .                                                                                                                           |
|            | Moderate-high       |           | NA                                                                                                                                                                                                             |
|            | Moderate            | SMCA      | In water depths < 50 m [inferred based on High LOP above, not explicitly stated in doc]: Take of salmon, albacore, pelagic finfish, squid; [Dungeness] crab, spot prawn, and giant kelp (hand harvested only). |
|            | Moderate-low        |           | NA                                                                                                                                                                                                             |
|            | Low                 | SMCA      | [All other remaining] forms of commercial and recreational take; mechanical harvest of kelp.                                                                                                                   |

<sup>a</sup> Pelagic Finfish are defined as: northern anchovy (*Engraulis mordax*), barracudas (*Sphyraena* spp.), billfishes\* (family Istiophoridae), dolphinfish (*Coryphaena hippurus*), Pacific herring (*Clupea pallasii*), jack mackerel (*Trachurus symmetricus*), Pacific mackerel (*Scomber japonicus*), salmon (*Oncorhynchus* spp.), Pacific sardine (*Sardinops sagax*), blue shark (*Prionace glauca*), salmon shark (*Lamna ditropis*), shortfin mako shark (*Isurus oxyrinchus*), thresher sharks (*Alopias* spp.), swordfish (*Xiphias gladius*), tunas (family Scombridae), and yellowtail (*Seriola lalandi*). \*Marlin is not allowed for commercial take.

# SOUTH COAST

Table A4. Level of protection, MPA type, and associated activities (species and gear) established during the MLPA South Coast Study Region (excerpted from the California Marine Life Protection Act Initiative's "Methods Used to Evaluate Marine Protected Area Proposals in the MLPA South Coast Study Region"). Some activities may not conform to existing commercial and recreational allowances. Updates to scientific names since the planning process are not reflected here.

| Color Code | Level of Protection | MPA Types   | Activities Associated with this Protection Level                                                                                                                                                                                                                                                                                                                                                           |
|------------|---------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | Very High           | SMR         | No take                                                                                                                                                                                                                                                                                                                                                                                                    |
|            | High                | SMCA<br>SMP | Coastal pelagic finfish, bonito, and market squid (pelagic seine [round haul net], dip-net, crowder); jumbo squid (squid jigs); swordfish (harpoon); In water depth > 50m: pelagic finfish, bonito and white seabass (H&L; spear at any depth)                                                                                                                                                             |
|            | Moderate-high       | SMCA<br>SMP | Catch and release in <10m water or using surface gear (H&L single barbless hooks and artificial lures only); pier-based fishing (H&L, hoop-net); halibut (spear); In water depth 30<50m on mainland: pelagic finfish, bonito and white seabass (H&L)                                                                                                                                                       |
|            | Moderate            | SMCA<br>SMP | Spot prawn (trap/pots); sea cucumber (scuba/hookah); grunion (hand harvest); giant kelp (hand harvest); clams (hand harvest)                                                                                                                                                                                                                                                                               |
|            | Moderate-low        | SMCA<br>SMP | Catch and release in >10m (H&L); shore-based finfish (H&L); kelp bass, barred sand bass, lingcod, cabezon, and rockfish (H&L, spear); sheephead (H&L, spear, trap); spotted sand bass and halibut (H&L); lobster (trap, hoop net, scuba); urchin (scuba/hookah); rock crab and Kellet's whelk (trap); In water depth <50m at islands and <30m on mainland: pelagic finfish, bonito and white seabass (H&L) |
|            | Low                 | SMCA<br>SMP | Rock scallop (scuba); mussels (hand harvest); giant kelp (mechanical harvest); marine algae other than giant and bull kelp (hand harvest)                                                                                                                                                                                                                                                                  |

H&L = hook and line.

The SAT is currently reviewing the level of protection for numerous activities, this table will be updated as activities are reviewed and approved by the SAT. It should be noted that staff is working with the SAT to coordinate terminology for particular gear types that is consistent with both the activities being proposed by the RSG and as defined in regulations under California Fish and Game Code. Thus the descriptions here may change in a future version of this document.

## APPENDIX B: MPA ATTRIBUTES



Table B1. Attributes of California MPAs (special closures not included), including planning process study region, bioregion, level of protection (LOP), size, depth range, and total amounts of key habitats. Backbone MPAs are shown in bold.

| MPA Name                            | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|-------------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                                     |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| North Bioregion                     |              |           |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| Pyramid Point SMCA                  | NC           | Mod-High  | 13.99        | 0             | 40.76         | 2.98       |                  | 1.27                |                  |                   |                | 1.47             |                   |                | 1.90           | 1.00             |                   |                |
| Point St. George Reef Offshore SMCA | NC           | Mod-High  | 9.52         | 49.38         | 121.89        |            |                  |                     |                  |                   |                |                  | 0.40              |                |                | 7.39             | 1.73              |                |
| Reading Rock SMCA                   | NC           | Mod-High  | 11.96        | 0             | 54.13         | 2.90       | 0.22             | 0.51                |                  | <0.01             |                | <0.01            |                   |                | 3.01           | 3.65             |                   |                |
| Reading Rock SMR                    | NC           | Very High | 9.60         | 41.36         | 81.9          |            |                  |                     |                  |                   |                |                  | 0.24              |                |                | 9.35             |                   |                |
| Samoa SMCA                          | NC           | Mod-High  | 13.06        | 0             | 50.52         | 3.69       |                  |                     |                  |                   |                |                  |                   |                | 3.65           | 5.97             |                   |                |
| South Humboldt Bay SMRMA            | NC           | Very High | 0.81         | 0             | 4.24          |            |                  |                     |                  | 0.81              |                |                  |                   |                |                |                  |                   |                |
| South Cape Mendocino SMR            | NC           | Very High | 9.08         | 0             | 87.07         | 1.59       | 0.65             | 3.66                |                  |                   |                | 0.15             | 3.28              |                | 1.33           | 3.47             |                   |                |
| Mattole Canyon SMR                  | NC           | Very High | 9.79         | 27.09         | 558.65        |            |                  |                     |                  |                   |                |                  | 0.56              | 0.15           | 0.02           | 5.64             | 1.75              |                |
| Sea Lion Gulch SMR                  | NC           | Very High | 10.42        | 0             | 118.46        | 2.42       | 2.32             | 2.78                | 0.11             |                   |                | 0.54             | 3.13              | 0.12           | 2.07           | 3.59             | 1.00              |                |
| Big Flat SMCA                       | NC           | Mod-High  | 11.59        | 0             | 423.47        | 3.21       | 1.35             | 0.10                | 0.05             |                   |                | 0.44             | 0.02              | 0.01           | 0.01           | 2.47             | 5.06              |                |
| Double Cone Rock SMCA               | NC           | Mod-High  | 18.49        | 0             | 117.15        | 4.66       | 3.25             | 2.34                |                  |                   |                | 1.81             | 0.09              |                | 3.13           | 11.20            | 1.97              |                |
| Ten Mile Beach SMCA                 | NC           | Mod-High  | 3.54         | 0             | 89.52         | 1.00       | 0.05             | <0.01               |                  | 0.01              |                |                  |                   |                | 0.93           | 2.42             |                   |                |

| MPA Name                     | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                              |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| <b>Ten Mile Estuary SMCA</b> | NC           | Very High | 0.18         | 0             | 0             | 0.45       | 0.48             |                     |                  | 0.18              |                |                  |                   |                |                |                  |                   |                |
| <b>Ten Mile SMR</b>          | NC           | High      | 11.95        | 0             | 105.03        | 2.63       | 6.58             | 2.64                | 1.05             | <0.01             | 1.48           | 0.52             |                   |                | 1.65           | 8.08             | 0.40              |                |
| Mackerricher SMCA            | NC           | Low       | 2.49         | 0             | 38.35         | 4.23       | 3.71             | 5.02                | 1.30             | <0.01             | 1.59           | 0.04             |                   |                | 1.53           | 0.05             |                   |                |
| Point Cabrillo SMR           | NC           | Very High | 0.44         | 0             | 61.90         | 0.20       | 2.82             | 1.92                | 0.28             |                   | 1.09           |                  |                   |                |                |                  |                   |                |
| Russian Gulch SMCA           | NC           | Low       | 0.22         | 0             | 33.95         | 0.11       | 2.60             | 1.11                | 0.74             |                   | 0.59           |                  |                   |                | 0.01           |                  |                   |                |
| Big River Estuary SMCA       | NC           | Mod       | 0.13         | 0             | 0.94          | 0.24       | 0.77             |                     |                  | 0.12              |                |                  |                   |                |                |                  |                   |                |
| Van Damme SMCA               | NC           | Low       | 0.06         | 0             | 8.85          | 0.54       | 0.25             | 0.25                | 0.06             | <0.01             |                |                  |                   |                |                |                  |                   |                |
| Navarro River Estuary SMCA   | NC           | Mod       | 0.09         | 0             | 0.96          | 0.05       | 0.72             |                     |                  | 0.09              |                |                  |                   |                |                |                  |                   |                |
| <b>Point Arena SMCA</b>      | NCC          | High      | 6.74         | 48.99         | 100.57        |            |                  |                     |                  |                   |                | 0.14             |                   |                |                | 6.59             |                   |                |
| <b>Point Arena SMR</b>       | NCC          | High      | 4.38         | 0             | 56.73         | 0.17       | 1.63             | 2.61                | 1.41             |                   | 2.36           | 0.74             |                   |                | <0.01          | 2.13             |                   |                |
| Sea Lion Cove SMCA           | NCC          | Mod-Low   | 0.22         | 0             | 16.18         | 0.36       | 2.26             | 0.79                | 0.26             |                   | 0.18           |                  |                   |                | 0.05           |                  |                   |                |
| Saunders Reef SMCA           | NCC          | Mod-Low   | 9.36         | 0             | 85.91         | 1.83       | 4.29             | 1.93                | 2.68             |                   | 2.09           | 0.96             |                   |                | 0.65           | 5.85             |                   |                |
| Del Mar Landing SMR          | NCC          | Very High | 0.22         | 0             | 27.02         | 0.16       | 1.05             | 1.26                | 0.36             |                   | 0.34           |                  |                   |                | 0.30           |                  |                   |                |
| Stewarts Point SMCA          | NCC          | Low       | 1.21         | 0             | 48.61         | 1.22       | 5.70             | 1.38                | 3.62             |                   | 3.02           | 0.09             |                   |                | 0.37           | 0.09             |                   |                |
| <b>Stewarts Point SMR</b>    | NCC          | Very High | 24.0         | 0             | 91.82         | 0.98       | 5.72             | 3.16                | 3.48             |                   | 3.43           | 0.40             |                   |                | 0.60           | 21.80            |                   |                |

| MPA Name                           | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|------------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                                    |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| Salt Point SMCA                    | NCC          | Mod-Low   | 1.84         | 0             | 71.06         | 0.62       | 4.28             | 2.34                | 3.35             | <0.01             | 3.14           | 0.34             |                   |                | 0.16           | 0.41             |                   |                |
| Gerstle Cove SMR                   | NCC          | Very High | 0.01         | 0             | 8.08          | 0.04       | 0.27             |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| Russian River SMCA                 | NCC          | Mod       | 0.84         | 0             | 18.97         | 1.51       | 0.53             | 1.03                | 0.02             | <0.01             | 0.12           |                  |                   |                | 0.67           |                  |                   |                |
| <b>Russian River SMRMA</b>         | NCC          | Very High | 0.36         | 0             | 1.74          | 1.96       |                  |                     |                  | 0.35              |                |                  |                   |                |                |                  |                   |                |
| <b>Bodega Head SMCA</b>            | NCC          | Mod-High  | 12.31        | 0             | 83.62         |            | 0.29             | 0.51                |                  |                   | 0.84           | 3.29             |                   |                |                | 7.95             |                   |                |
| <b>Bodega Head SMR</b>             | NCC          | Very High | 9.34         | 0             | 82.95         | 1.32       | 2.74             | 1.95                |                  |                   | 2.28           | 1.23             |                   |                | 0.44           | 5.92             |                   |                |
| <b>Estero Americano SMRMA</b>      | NCC          | Very High | 0.13         | 0             | 1.85          | 0.41       | 0.44             |                     |                  | 0.13              |                |                  |                   |                |                |                  |                   |                |
| <b>Estero de San Antonio SMRMA</b> | NCC          | Very High | 0.07         | 0             | 1.61          | 0.60       | 0.48             |                     |                  | 0.07              |                |                  |                   |                |                |                  |                   |                |
| <b>Point Reyes SMCA</b>            | NCC          | Mod-High  | 12.27        | 14.23         | 66.39         |            |                  |                     |                  |                   | 0.12           | 0.01             |                   |                | 0.08           | 11.66            |                   |                |
| <b>Point Reyes SMR</b>             | NCC          | Very High | 9.55         | 0             | 42.19         | 8.38       | 5.36             | 4.33                | 0.13             | 0.01              | 1.94           | <0.01            |                   |                | 5.88           | 0.61             |                   |                |
| <b>Estero de Limantour SMR</b>     | NCC          | Very High | 1.45         | 0             | 2.13          | 3.35       | 2.17             |                     |                  | 1.41              |                |                  |                   |                |                |                  |                   |                |
| Drakes Estero SMCA                 | NCC          | Mod       | 2.50         | 0             | 1.70          | 2.28       | 5.00             |                     |                  | 2.50              |                |                  |                   |                |                |                  |                   |                |
| Duxbury Reef SMCA                  | NCC          | Mod       | 0.69         | 0             | 5.67          | 3.02       | 3.03             |                     | 0.02             |                   |                |                  |                   |                |                |                  |                   |                |
| <b>North Farallon Islands SMR</b>  | NCC          | Very High | 18.07        | 0             | 86.04         |            | 0.66             | 0.21                |                  |                   | 1.51           | 0.55             |                   |                | 0.34           | 17.29            |                   |                |

| MPA Name                       | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|--------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                                |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| Southeast Farallon Island SMCA |              |           |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
|                                | NCC          | High      | 12.95        | 39.23         | 118.85        |            |                  |                     |                  |                   |                | 1.60             |                   |                | 8.41           | 2.94             |                   |                |
| Southeast Farallon Island SMR  |              |           |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
|                                | NCC          | Very High | 5.36         | 0             | 75.44         | 0.08       | 6.01             |                     |                  |                   | 2.89           | 1.13             |                   | 0.53           | 2.19           |                  |                   |                |
| Central Bioregion              |              |           |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| Montara SMR                    | NCC          | Very High | 11.81        | 0             | 51.21         | 2.14       | 3.45             | 1.89                | 0.59             |                   | 3.44           | 0.24             |                   | 0.23           | 7.59           |                  |                   |                |
| Pillar Point SMCA              | NCC          | Mod-High  | 6.70         | 0             | 53.54         | 0.07       | 0.32             |                     | 0.03             |                   | 0.79           | 0.24             |                   |                | 5.46           |                  |                   |                |
| Año Nuevo SMR                  | CC           | Very High | 11.15        | 0             | 53.04         | 10.45      | 6.86             | 2.56                | 2.55             | <0.01             | 3.43           | 0.75             |                   | 2.52           | 1.55           |                  |                   |                |
| Greyhound Rock SMCA            | CC           | Mod       | 12.00        | 0             | 66.69         | 2.79       | 3.39             | 0.81                | 1.09             |                   | 3.09           | 0.01             |                   |                | 8.54           |                  |                   |                |
| Natural Bridges SMR            | CC           | Very High | 0.25         | 0             | 3.17          | 3.10       | 3.79             | 1.13                |                  | <0.01             |                |                  |                   |                |                |                  |                   |                |
| Elkhorn Slough SMCA            | CC           | Low       | 0.22         | 0             | 7.53          | 0.11       |                  |                     |                  | 0.21              |                |                  |                   |                |                |                  |                   |                |
| Elkhorn Slough SMR             | CC           | Very High | 2.72         | 0             | 6.53          |            |                  |                     |                  | 2.68              |                |                  |                   |                |                |                  |                   |                |
| Moro Cojo Slough SMR           | CC           | Very High | 0.20         | 0             | 0             |            |                  |                     |                  | 0.20              |                |                  |                   |                |                |                  |                   |                |
| Soquel Canyon SMCA             |              |           |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
|                                | CC           | High      | 22.97        | 73.39         | 652.03        |            |                  |                     |                  |                   |                | 0.13             | 0.80              | 1.24           |                | 12.72            | 3.84              | 4.23           |
| Portuguese Ledge SMCA          |              |           |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
|                                | CC           | High      | 10.64        | 79.31         | 1512.80       |            |                  |                     |                  |                   |                | 0.13             | 0.07              |                |                | 1.40             | 5.73              | 3.30           |
| Edward F. Ricketts SMCA        | CC           | Low       | 0.23         | 0             | 22.74         | 0.34       | 0.87             | 0.05                | 0.73             |                   | 0.18           |                  |                   | 0.70           |                |                  |                   |                |



| MPA Name                          | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|-----------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                                   |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| Lovers Point – Julia Platt SMR    | CC           | Very High | 0.30         | 0             | 27.25         | 0.45       | 1.39             | 0.30                | 1.05             |                   | 0.07           |                  |                   |                | 0.68           | <0.01            |                   |                |
| Pacific Grove Marine Gardens SMCA | CC           | Low       | 0.98         | 0             | 56.44         | 1.56       | 2.30             | 0.35                | 1.88             |                   | 1.17           | 0.11             |                   |                | 0.69           | 0.09             |                   |                |
| Asilomar SMR                      | CC           | Very High | 1.51         | 0             | 55.82         | 2.06       | 2.61             | 1.42                | 2.01             |                   | 1.30           | 0.06             |                   |                | 0.67           | 0.02             |                   |                |
| Carmel Pinnacles SMR              | CC           | Very High | 0.53         | 10.19         | 96.54         |            |                  |                     |                  |                   |                | 0.31             |                   |                |                | 0.09             | <0.01             |                |
| Carmel Bay SMCA                   | CC           | Low       | 2.20         | 0             | 239.95        | 3.08       | 2.66             | 2.03                | 3.02             | <0.01             | 1.55           | 0.14             | 0.02              |                | 1.37           | 0.34             | 0.08              |                |
| Point Lobos SMCA                  | CC           | Mod       | 8.47         | 73.51         | 587.17        |            |                  |                     |                  |                   |                | 0.05             | 0.45              |                |                | 0.05             | 3.68              | 4.23           |
|                                   |              | Very High |              |               |               |            | 13.7             |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| Point Lobos SMR                   | CC           | High      | 5.50         | 0             | 177.85        | 2.10       | 0                | 5.93                | 4.49             |                   | 5.00           | 1.35             | 0.07              |                | 0.59           | 2.12             | 0.25              | <0.0           |
| <b>Point Sur SMCA</b>             | CC           | High      | 10.62        | 41.63         | 236.40        |            |                  |                     |                  |                   |                | 0.81             | 0.01              |                |                | 9.48             | 0.32              | 1              |
|                                   |              | Very High |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| <b>Point Sur SMR</b>              | CC           | High      | 9.79         | 0             | 57.54         | 5.45       | 4.11             | 6.50                | 5.14             | <0.01             | 3.89           | 0.85             |                   |                | 1.51           | 2.68             |                   |                |
| Big Creek SMCA                    | CC           | Mod       | 7.85         | 43.94         | 614.00        |            |                  |                     |                  |                   |                | <0.01            | 0.02              | <0.01          |                | 1.01             | 0.74              | 6.07           |
|                                   |              | Very High |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| <b>Big Creek SMR</b>              | CC           | High      | 14.51        | 0             | 753.24        | 2.79       | 4.71             | 3.58                | 5.29             |                   | 2.31           | 0.04             | 0.01              | <0.01          | 3.95           | 3.03             | 1.04              | 7.46           |
| <b>Piedras Blancas SMCA</b>       | CC           | High      | 8.84         | 10.94         | 106.32        |            |                  |                     |                  |                   |                | 2.38             |                   |                |                | 6.44             | 0.01              |                |
|                                   |              | Very High |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| <b>Piedras Blancas SMR</b>        | CC           | High      | 10.44        | 0             | 50.49         | 5.48       | 6.09             | 7.26                | 5.09             | <0.01             | 4.10           | 0.55             |                   |                | 2.46           | 2.04             |                   |                |
| Cambria SMCA                      | CC           | Low       | 6.26         | 0             | 33.71         | 5.30       | 4.11             | 5.80                | 5.63             | <0.01             | 4.62           | <0.01            |                   |                | 1.19           | 0.09             |                   |                |
| White Rock SMCA                   | CC           | Low       | 2.91         | 0             | 43.51         | 1.55       | 4.02             | 1.31                | 3.64             |                   | 2.96           | 0.09             |                   |                | 0.72           | 0.37             |                   |                |

| MPA Name                            | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|-------------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                                     |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| <b>Morro Bay SMR</b>                | CC           | Very High | 0.88         | 0             | 1.59          |            |                  |                     |                  | 0.88              |                |                  |                   |                |                |                  |                   |                |
| Morro Bay SMRMA                     | CC           | Low       | 3.07         | 0             | 9.37          | 1.45       | 0.18             |                     |                  | 3.01              |                |                  |                   |                |                |                  |                   |                |
| <b>Point Buchon SMCA</b>            | CC           | High      | 12.19        | 58.42         | 120.11        |            |                  |                     |                  |                   |                | 0.29             | 0.05              |                |                | 8.13             | 3.25              |                |
| <b>Point Buchon SMR</b>             | CC           | Very High | 6.68         | 0             | 67.72         | 1.46       | 2.71             | 1.27                | 3.00             |                   | 3.23           | 0.47             |                   |                | <0.01          | 4.46             |                   |                |
| <b>Vandenberg SMR</b>               | CC           | Very High | 32.91        | 0             | 42.03         | 13.18      | 9.99             | 3.80                | 1.28             | <0.01             | 2.43           | 0.04             |                   |                | 11.79          | 8.85             |                   |                |
| <b>South Bioregion</b>              |              |           |              |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| <b>Point Conception SMR</b>         | SC           | Very High | 22.52        | 0             | 153.46        | 1.98       | 3.43             |                     | 2.27             |                   | 1.79           | 0.57             | <0.01             |                | 2.03           | 15.34            | 3.60              |                |
| Kashtayit SMCA                      | SC           | Mod-Low   | 2.02         | 0             | 52.27         | 1.33       | 1.33             |                     | 0.20             | <0.01             |                |                  |                   |                | 1.93           | 0.19             |                   |                |
| Naples SMCA                         | SC           | Low       | 2.60         | 0             | 53.00         | 1.55       | 1.38             |                     | 2.07             |                   | 1.52           |                  |                   |                | 0.54           | 0.41             |                   |                |
| <b>Campus Point SMCA (No-Take)</b>  | SC           | Very High | 10.56        | 0             | 230.85        | 3.10       | 1.25             |                     | 2.66             |                   | 1.12           | 0.19             |                   |                | 2.04           | 6.61             | 1.49              | 0.05           |
| <b>Goleta Slough SMCA (No-Take)</b> | SC           | Very High | 0.16         | 0             | 1.18          | 0.51       |                  |                     |                  | 0.15              |                |                  |                   |                |                |                  |                   |                |
| <b>Richardson Rock SMR</b>          | SC           | Very High | 40.75        | 24.79         | 134.49        |            |                  |                     |                  |                   |                | 0.20             | 0.04              |                |                | 0.52             | 0.09              |                |
| <b>Harris Point SMR</b>             | SC           | Very High | 25.40        | 0             | 114.08        | 2.28       | 7.44             |                     | 3.99             |                   | 4.39           | 2.38             | 0.28              |                | 3.81           | 16.12            | 2.71              |                |
| Judith Rock SMR                     | SC           | Very High | 4.56         | 0             | 135.89        | 0.50       | 1.70             |                     | 1.34             |                   | 1.12           | 0.08             |                   |                | 0.13           | 1.58             |                   |                |
| <b>Carrington Point SMR</b>         | SC           | Very High | 12.78        | 0             | 66.68         | 1.26       | 5.07             |                     | 3.59             |                   | 2.02           | 0.31             |                   |                | 3.68           | 4.17             |                   |                |

| MPA Name                            | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|-------------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                                     |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| Skunk Point SMR                     | SC           | Very High | 1.47         | 0             | 27.67         | 1.77       | 0.74             |                     | 0.91             |                   |                |                  |                   |                | 2.05           |                  |                   |                |
| <b>South Point SMR</b>              | SC           | Very High | 13.08        | 0             | 392.91        | 1.45       | 3.47             |                     | 3.78             |                   | 2.11           | 0.26             | <0.01             |                | 1.67           | 3.57             | 5.70              | 1.63           |
| Painted Cave SMCA                   | SC           | Mod-Low   | 1.79         | 0             | 91.10         |            | 3.04             |                     | 0.47             |                   | 0.24           | <0.01            |                   |                | 1.91           | 0.09             |                   |                |
| <b>Gull Island SMR</b>              | SC           | Very High | 19.93        | 0             | 698.09        | 2.29       | 1.89             |                     | 3.11             |                   | 2.59           | 0.14             | 0.17              | 2.09           | 2.51           | 3.89             | 3.36              | 7.40           |
| <b>Scorpion SMR</b>                 | SC           | Very High | 9.64         | 0             | 237.03        | 0.60       | 3.83             |                     | 2.41             |                   | 0.76           | 0.28             | <0.01             |                | 2.28           | 4.44             | 1.37              | 0.87           |
| Anacapa Island SMCA                 | SC           | Mod-Low   | 7.30         | 0             | 125.47        | 0.19       | 3.50             |                     | 1.63             |                   | 0.51           | 0.01             |                   |                | 1.71           | 5.91             | 0.89              |                |
| <b>Anacapa Island SMR</b>           | SC           | Very High | 11.55        | 0             | 241.18        | 1.00       | 6.42             |                     | 2.42             |                   | 0.98           | 0.13             |                   |                | 2.26           | 7.17             | 2.37              | 0.82           |
| Footprint SMR                       | SC           | Very High | 7.05         | 49.29         | 534.46        |            |                  |                     |                  |                   |                | 0.10             | 0.16              | 0.23           |                | 1.05             | 1.53              | 3.59           |
| <b>Begg Rock SMR</b>                | SC           | Very High | 37.9         | 62.54         | 119.65        |            |                  |                     |                  |                   |                | 9.14             | 4.06              |                |                | 16.47            | 8.28              |                |
| <b>Santa Barbara Island SMR</b>     | SC           | Very High | 12.77        | 0             | 588.62        | 0.15       | 1.03             | 0.03                | 1.04             |                   | 0.07           | 0.11             | 0.02              |                | 1.21           | 1.63             | 0.46              | 0.04           |
| <b>Point Dume SMCA</b>              | SC           | Very High | 15.92        | 0             | 683.37        | 4.03       | 0.46             |                     | 1.60             | <0.01             | 0.40           | <0.01            | <0.01             |                | 3.80           | 5.69             | 1.57              | 5.66           |
| <b>Point Dume SMR</b>               | SC           | Very High | 7.53         | 0             | 649.43        | 2.56       | 1.34             |                     | 1.29             |                   | 0.54           | <0.01            | <0.01             |                | 1.71           | 1.04             | 0.72              | 4.42           |
| <b>Point Vicente SMCA (No-Take)</b> | SC           | Very High | 15.04        | 0             | 826.82        | 1.35       | 0.21             | 0.42                | 1.77             |                   | 1.62           | <0.01            | <0.01             | <0.01          | 0.07           | 1.17             | 0.99              | 12.22          |
| <b>Abalone Cove SMCA</b>            | SC           | High      | 4.79         | 0             | 627.79        | 1.43       | 0.86             | 0.09                | 1.08             |                   | 0.28           | 0.05             |                   |                | 1.04           | 1.16             | 0.57              | 2.37           |
| Bolsa Bay SMCA                      | SC           | Mod-Low   | 0.07         | 0             | 0.31          | 0.12       |                  |                     |                  | 0.07              |                |                  |                   |                |                |                  |                   |                |

| MPA Name                                  | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|-------------------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                                           |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| <b>Bolsa Chica Basin SMCA (No-Take)</b>   | SC           | Very High | 0.70         | 0             | 1.73          | 1.15       |                  |                     |                  | 0.70              |                |                  |                   |                |                |                  |                   |                |
| Arrow Point to Lion Head Point SMCA       | SC           | Low       | 0.65         | 0             | 84.07         | 1.17       | 2.42             |                     | 2.52             |                   | 2.11           | <0.01            |                   |                | 0.86           | 0.24             |                   |                |
| <b>Blue Cavern Offshore SMCA</b>          | SC           | High      | 7.70         | 80.02         | 888.28        |            |                  |                     |                  |                   |                |                  |                   | <0.01          |                | 0.05             | 0.26              | 7.38           |
| <b>Blue Cavern Onshore SMCA (No-Take)</b> | SC           | Very High | 2.61         | 0             | 273.54        | 0.75       | 1.90             |                     | 2.33             |                   | 1.38           | 0.02             |                   | <0.01          | 1.32           | 0.85             | 0.81              | 0.70           |
| Long Point SMR                            | SC           | High      | 1.67         | 0             | 226.10        | 1.07       | 1.22             | 0.04                | 0.17             |                   | 0.73           | <0.01            | <0.01             |                | 1.63           | 0.83             | 0.56              | 0.10           |
| Casino Point SMCA (No-Take)               | SC           | Very High | 0.00         |               |               |            |                  |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| Lover's Cove SMCA                         | SC           | High      | 7            | 10.98         | 18.72         |            |                  |                     | 0.12             |                   | 0.11           |                  |                   |                | 0.04           | <0.01            |                   |                |
|                                           | SC           | Mod-High  | 0.06         | 0             | 60.11         | 0.38       | 0.12             | 0.06                | 0.08             |                   | 0.26           | <0.01            |                   |                | 0.22           | 0.02             |                   |                |
| <b>Farnsworth Offshore SMCA</b>           | SC           | High      | 6.67         | 32.96         | 672.76        |            |                  |                     |                  |                   |                |                  | 0.52              | <0.01          | 0.02           |                  | 3.31              | 1.83           |
| <b>Farnsworth Onshore SMCA</b>            | SC           | Mod-High  | 2.59         | 0             | 89.96         | 1.84       | 1.57             |                     | 1.45             |                   | 0.21           | 0.02             |                   |                | 2.02           | 1.77             |                   |                |
| Cat Harbor SMCA                           | SC           | Mod-Low   | 0.26         | 0             | 53.65         | 1.80       | 0.84             | 0.03                | 0.37             |                   | 0.18           | <0.01            |                   |                | 0.65           | 0.03             |                   |                |
| Upper Newport Bay SMCA                    | SC           | Mod-Low   | 1.24         | 0             | 4.00          | 1.19       | 0.25             |                     |                  | 1.22              |                |                  |                   |                |                |                  |                   |                |
| Crystal Cove SMCA                         | SC           | Mod-Low   | 3.53         | 0             | 70.59         | 3.94       | 2.03             | 0.58                | 1.73             | <0.01             | 1.89           | <0.01            |                   |                | 2.41           | 1.46             |                   |                |
| <b>Laguna Beach SMR</b>                   | SC           | Very High | 6.72         | 0             | 457.85        | 3.48       | 2.48             | 0.27                | 1.96             | <0.01             | 1.47           | <0.01            |                   |                | 3.05           | 2.88             | 1.13              | 0.57           |



| MPA Name                         | Study Region | LOP       | Size (sq mi) | Min Depth (m) | Max Depth (m) | Beach (mi) | Rocky Shore (mi) | Offshore Rocks (mi) | Kelp Canopy (mi) | Estuaries (sq mi) | Hard Substrate |                  |                   |                | Soft Substrate |                  |                   |                |
|----------------------------------|--------------|-----------|--------------|---------------|---------------|------------|------------------|---------------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|------------------|-------------------|----------------|
|                                  |              |           |              |               |               |            |                  |                     |                  |                   | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) | 0-30 m (mi)    | 30-100 m (sq mi) | 100-200 m (sq mi) | >200 m (sq mi) |
| Laguna Beach SMCA (No-Take)      | SC           | Very High | 3.09         | 0             | 523.32        | 0.67       | 0.38             |                     |                  | <0.01             | 0.16           | <0.01            |                   |                | 0.89           | 0.94             | 0.57              | 1.04           |
| Dana Point SMCA                  | SC           | Mod-Low   | 3.47         | 0             | 46.81         | 3.55       | 2.18             |                     | 2.26             | <0.01             | 2.06           | <0.01            |                   |                | 1.62           | 0.82             |                   |                |
| Batiquitos Lagoon SMCA (No-Take) | SC           | Very High | 0.51         | 0             | 0             |            |                  |                     |                  | 0.50              |                |                  |                   |                |                |                  |                   |                |
| Swami's SMCA                     | SC           | Mod-Low   | 12.71        | 0             | 326.81        | 2.68       | 0.90             |                     | 2.57             | <0.01             | 0.06           | 0.06             | 0.02              | <0.01          | 3.52           | 3.69             | 3.51              | 1.94           |
| San Elijo Lagoon SMCA (No-Take)  | SC           | Very High | 0.50         | 0             | 0             |            |                  |                     |                  | 0.50              |                |                  |                   |                |                |                  |                   |                |
| San Dieguito Lagoon SMCA         | SC           | Mod-Low   | 0.19         | 0             | 0             |            |                  |                     |                  | 0.11              |                |                  |                   |                |                |                  |                   |                |
| San Diego-Scripps Coastal SMCA   | SC           | Mod-Low   | 1.46         | 0             | 187.06        | 1.19       | 0.19             |                     |                  |                   |                |                  |                   |                | 1.55           | 0.71             | 0.02              |                |
| Matlahuayl SMR                   | SC           | Very High | 1.04         | 0             | 185.26        | 1.23       | 0.92             | 0.04                | 0.32             |                   | 0.05           |                  |                   |                | 1.34           | 0.33             | <0.01             |                |
| South La Jolla SMCA              | SC           | High      | 2.46         | 43.76         | 84.34         |            |                  |                     |                  |                   |                | 0.60             |                   |                |                | 1.85             |                   |                |
| South La Jolla SMR               | SC           | Very High | 5.04         | 0             | 55.68         | 2.33       | 1.45             | 0.38                | 2.32             |                   | 1.89           | 0.38             |                   |                | 0.23           | 1.00             |                   |                |
| Famosa Slough SMCA (No-Take)     | SC           | Very High | 0.03         | 0             | 0             |            |                  |                     |                  | 0.03              |                |                  |                   |                |                |                  |                   |                |
| Cabrillo SMR                     | SC           | Very High | 0.39         | 0             | 13.03         | 0.90       | 0.97             |                     |                  |                   |                |                  |                   |                |                |                  |                   |                |
| Tijuana River Mouth SMCA         | SC           | High      | 3.02         | 0             | 17.28         | 2.37       |                  |                     | 0.12             | <0.01             | 0.17           |                  |                   |                | 1.40           |                  |                   |                |

## **APPENDIX C: HABITAT SPACING MAPS**

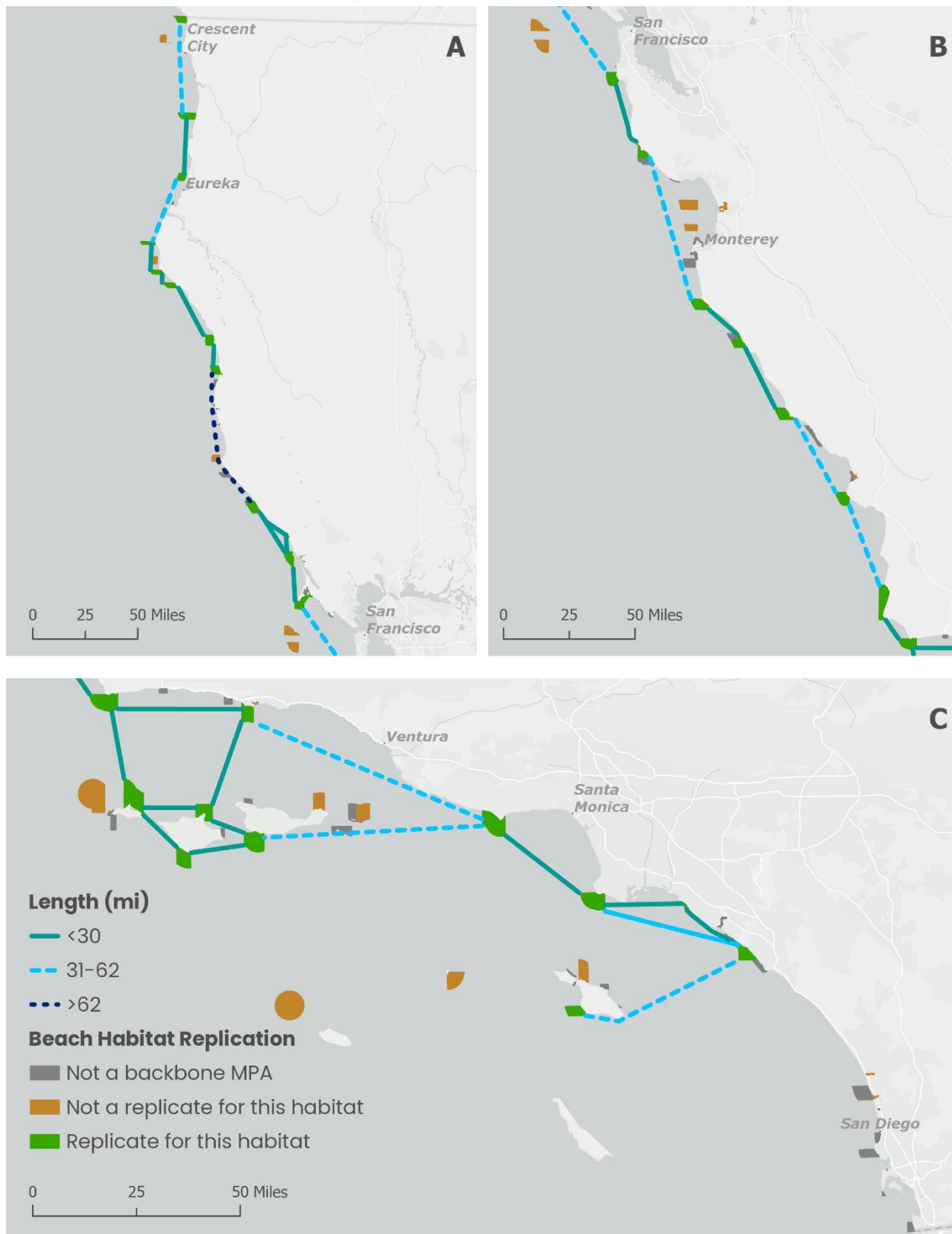


Figure C1. Linear over-water distance (miles) between California MPA replicates for beach habitat in the (a) North, (b) Central, and (c) South bioregions.

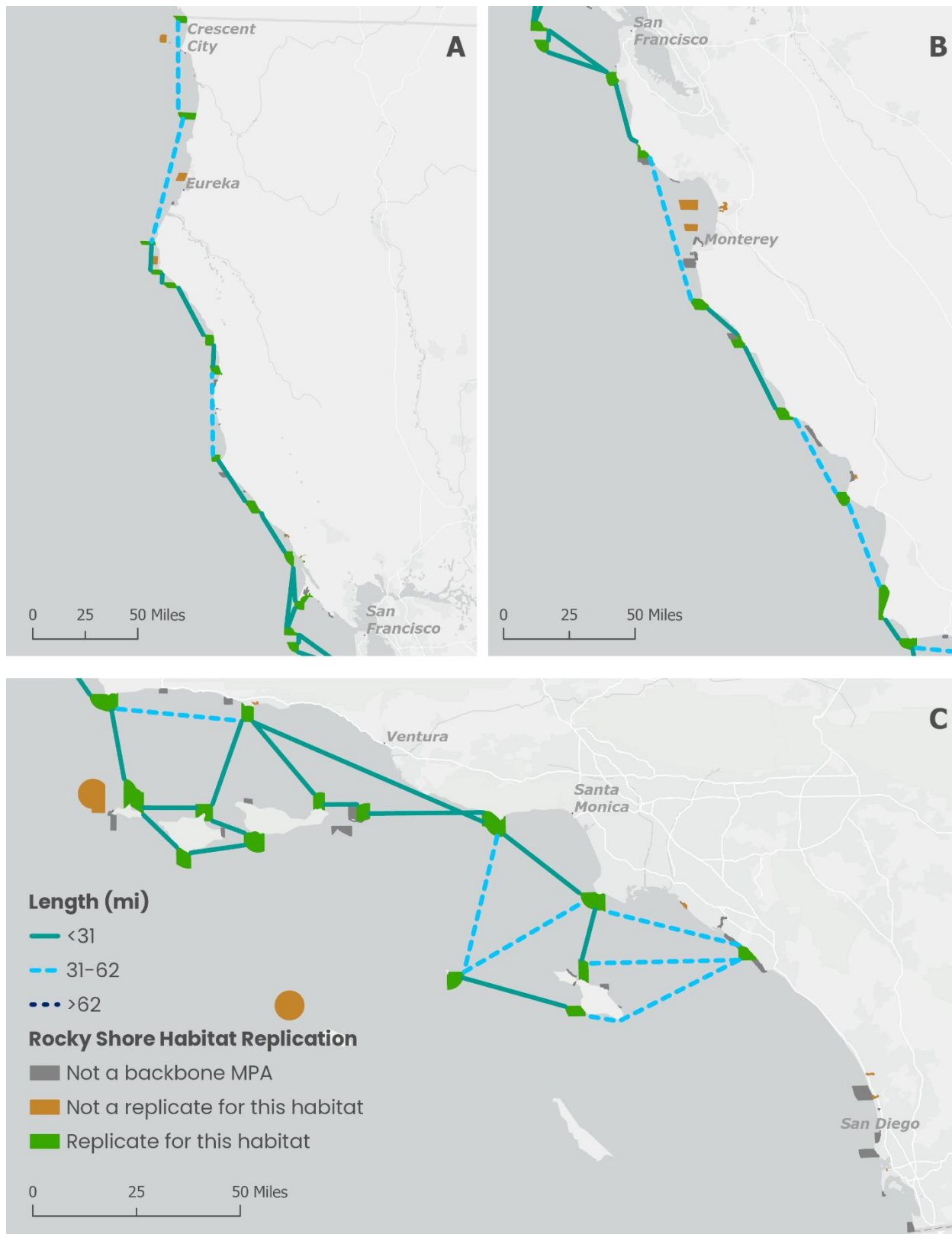


Figure C2. Linear over-water distance (miles) between California MPA replicates for rocky shore (including offshore rock) habitat in the (a) North, (b) Central, and (c) South bioregions.



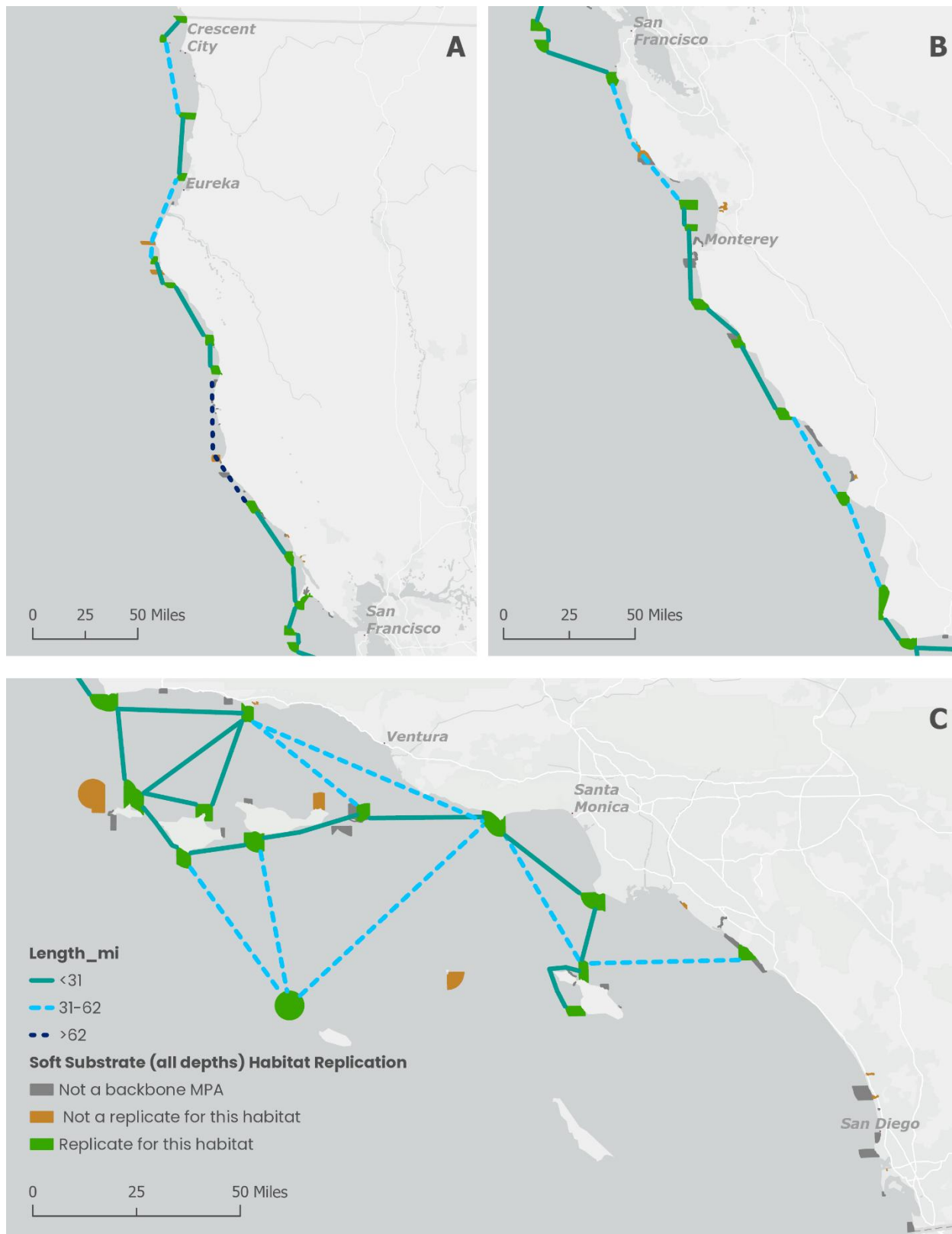


Figure C3. Linear over-water distance (miles) between California MPA replicates for soft substrate (total area, all depths) in the (a) North, (b) Central, and (c) South bioregions.

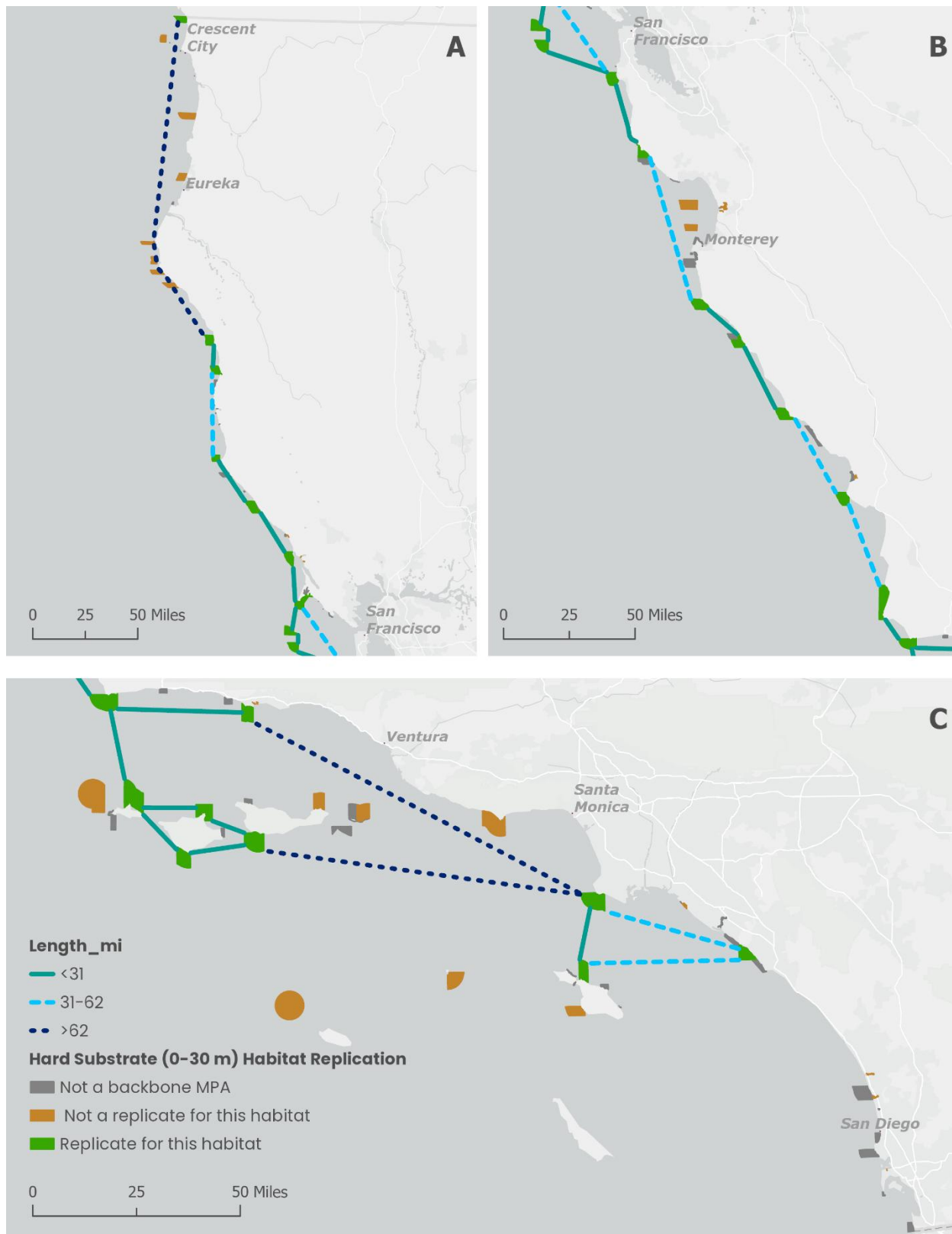


Figure C4. Linear over-water distance (miles) between California MPA replicates for hard substrate (0-30 m) habitat in the (a) North, (b) Central, and (c) South bioregions.



Figure C5. Linear over-water distance (miles) between California MPA replicates for hard substrate (30-100 m) habitat in the (a) North, (b) Central, and (c) South bioregions.

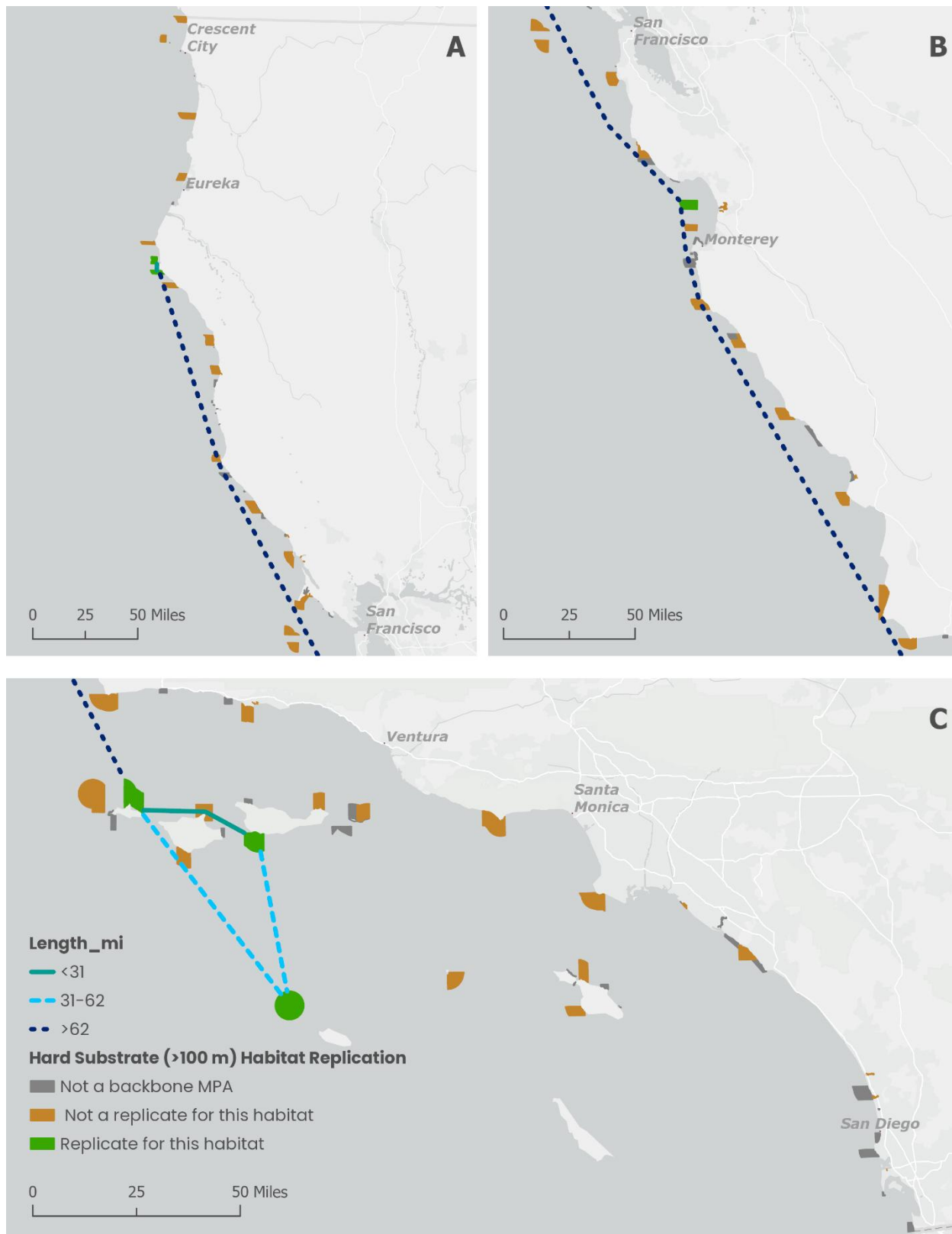


Figure C6. Linear over-water distance (miles) between California MPA replicates for hard substrate (>100 m) habitat in the (a) North, (b) Central, and (c) South bioregions.

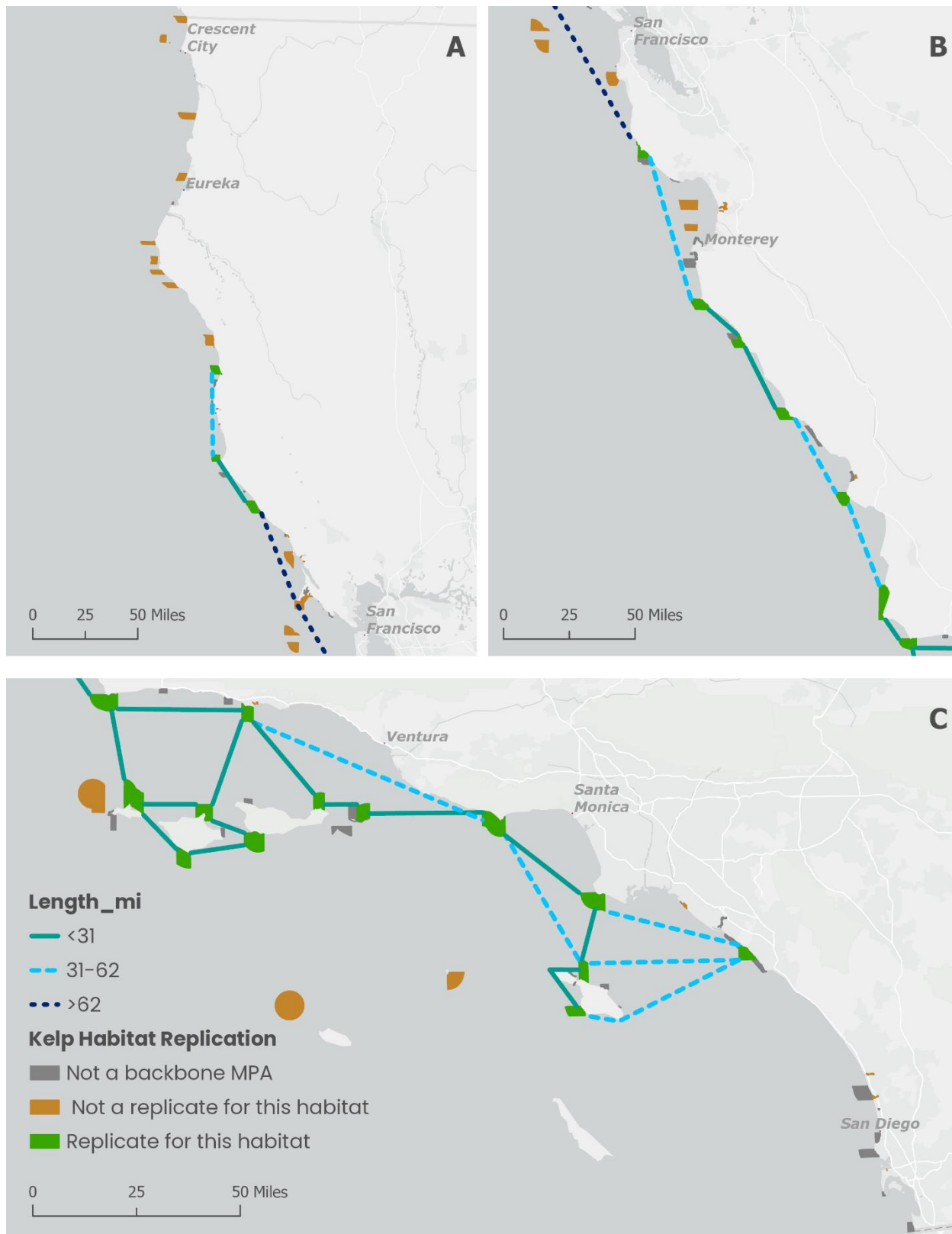


Figure C7. Linear over-water distance (miles) between California MPA replicates for kelp canopy coverage in the (a) North, (b) Central, and (c) South bioregions.



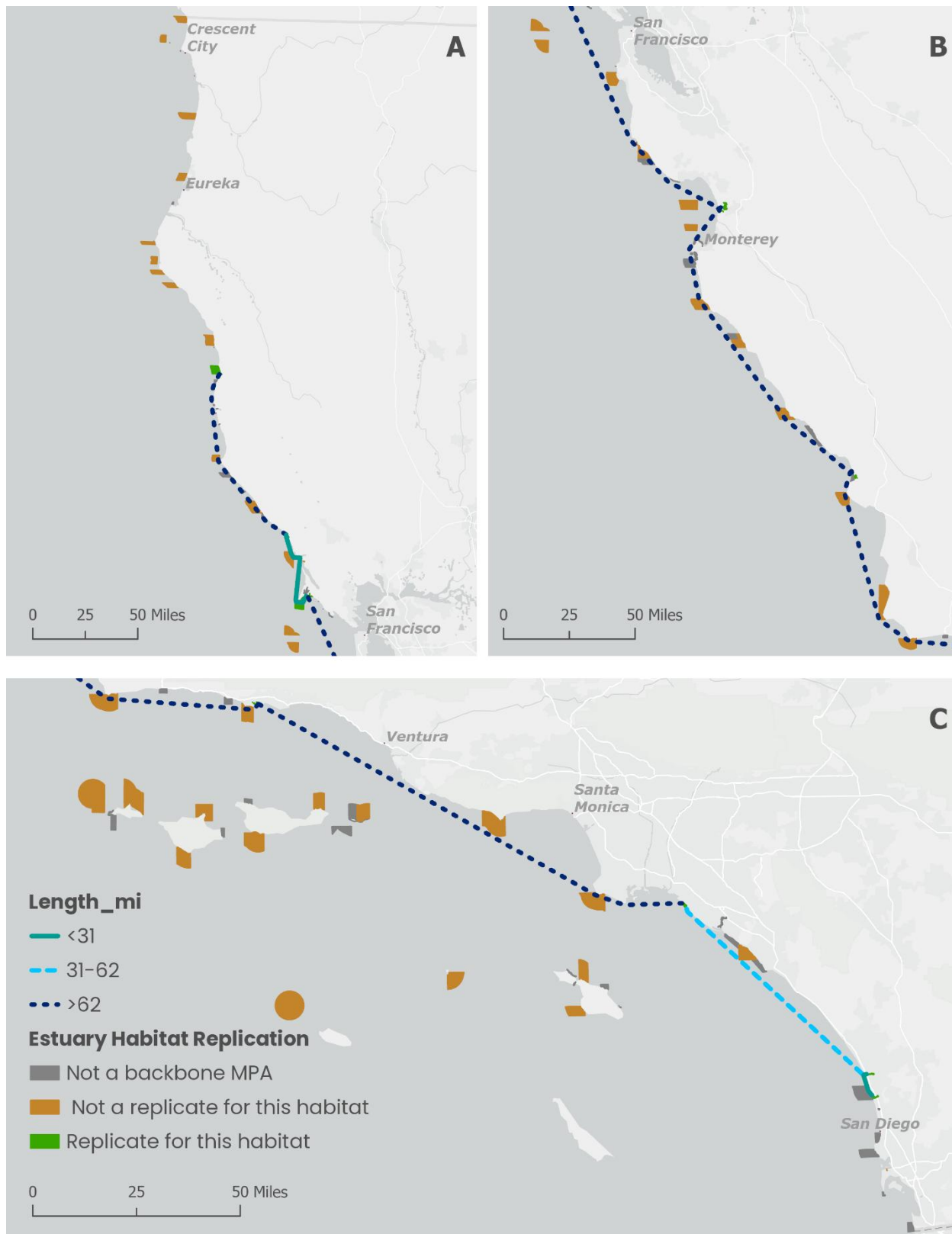


Figure C8. Linear over-water distance (miles) between California MPA replicates for estuarine habitat in the (a) North, (b) Central, and (c) South bioregions.