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Research and Monitoring

The California Department of Fish and Wildlife (CDFW) is preparing the first comprehensive review of the [MPA Management Program](#) and progress of the MPA Network towards meeting the ecosystem-focused goals of the [Marine Life Protection Act](#) (MLPA). The [Decadal Management Review](#) will be rooted in the four pillars of the Management Program: Outreach and Education, Research and Monitoring, Enforcement and Compliance, and Policy and Permitting. Scientific evaluation of MPA Network performance will rely on results from baseline and long-term monitoring projects guided by the framework outlined in the [MPA Monitoring Action Plan](#) (Action Plan) and work conducted by several science advisory teams, all summarized below.

Baseline Monitoring

Phase 1 of the MPA Monitoring Program, identified ecological and socioeconomic conditions at or near the time of MPA implementation across the four planning regions and acts as an important benchmark to compare future changes to. To find out more about baseline monitoring projects and results, [visit CDFW's monitoring webpage](#).

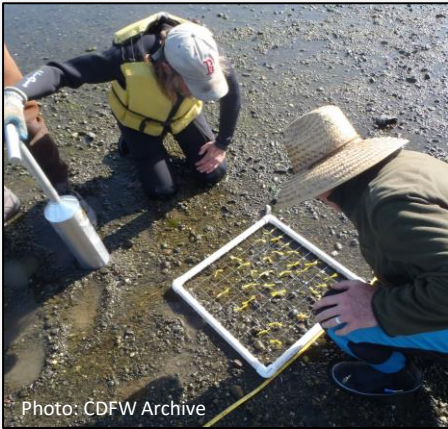
Long-term Monitoring

Phase 2 of the Monitoring Program is informed by baseline studies and targets the key habitats, metrics, species, human uses, and evaluation questions outlined in the Action Plan across the statewide Network. Each project selected monitoring sites using the tiered system set forth in the Action Plan as well as habitat specific considerations. Because funding fluctuates over time, the Action Plan tiered MPA sites to ensure a cost-effective approach to monitoring. In addition, the Action Plan also split the state into three bioregions (North, Central, South) based on geographic differences in ecological communities along the California Coast. Each habitat-based project is conducting a suite of analyses that examine the effects of protection on an individual MPA, bioregion, and statewide level to help evaluate the performance of the Network at meeting the goals of the MLPA. To find out more about long-term monitoring projects, please visit [California SeaGrant's webpage](#).

Current Long-Term Projects

Habitat Based Monitoring

Estuarine



This [project](#) established an estuarine technical advisory committee (TAC) to identify key estuary monitoring questions of management relevance and develop measurable indicators for these questions. Lead researchers are engaging the TAC and developing standardized data collection protocols and monitoring tools to assess indicators of estuary health. These protocols and tools are being tested through data collection at a subset of California’s estuary MPAs and sites outside of MPAs in 2020-2021. Analyses will evaluate ecological and socioeconomic conditions of estuary MPAs using currently available baseline data as well as data collected in the 2020-2021 field seasons. Lead researchers will use results from the analyses to develop a “blueprint” for ongoing, coordinated statewide MPA estuary monitoring into the future.

Sandy Beach and Surf Zone

This project is conducting surveys at [beaches](#) inside and outside MPAs to collect key biological and environmental data. Analyses will compare abundance and biomass of indicator species, species diversity, trophic structure, and occurrence of special status species between sites. Additional analyses will examine changes in biological and environmental variables inside and outside MPAs over time, as well as across the statewide Network, using a variety of advanced statistical and modeling approaches. Changes in human uses following MPA implementation will also be assessed.

- [Final sandy beach long-term monitoring report](#) (available January 2022)



Rocky Intertidal

This project is examining biological and environmental data from rocky [intertidal habitats](#) (20-30 years at some sites) from a variety of sources. The project is also concurrently collecting biological and environmental data inside and outside MPAs according to standardized protocols established by the [Multi-Agency Rocky Intertidal Network](#). Analyses will be conducted using both historical and new data to assess individual MPA effects as well as regional and network-wide effects in intertidal communities.

- [Final rocky intertidal long-term monitoring report](#) (available January 2022)

Current Long-Term Projects

Habitat Based Monitoring, continued

Kelp Forest and Shallow Rocky Reef

This project is examining biological and environmental datasets from previous [kelp forest and shallow rocky reef](#) surveys and continues to collect biological data via SCUBA surveys inside and outside MPAs according to standardized protocols established by the [Partnership for Interdisciplinary Studies of Coastal Oceans](#) and [Reef Check California](#). Environmental data will include measuring temperature, pH, and dissolved oxygen. Sea surface temperature, wave height, and chlorophyll-a data are available from online databases. Kelp canopy data are collected via aerial monitoring, and historical analysis of Landsat imagery.

- [Final kelp forest long-term monitoring report](#) (available January 2022)



Photo: A. Van Diggelen, CDFW

Mid-depth Hook-and-Line Surveys

This [California Collaborative Fisheries Research Program \(CCFRP\) project](#) brings together scientists, charter boats, and recreational anglers to catch and release rocky reef fish and is continuing data collection on deep rocky reef habitats inside and outside MPAs statewide. Originally started in 2007 along the central California coast, CCFRP expanded statewide in 2018. Surveys focus on collecting information about fish abundance, size, biomass, diversity, and species composition. In addition to assessing spillover of fish from within MPAs to outside them, connectivity between MPAs, and impacts of environmental stressors such as marine heatwaves on rocky reef fish populations. Additional data collection focuses on examining the level of compliance and attitude towards/perception of MPAs in the recreational fishing community.

- [Final mid-depth long-term monitoring report](#) (available January 2022)



Photo: T. Mattusch

Deep Rocky Reef

This project is analyzing 25+ years of historical imagery-based data from California waters (submersible, remotely operated vehicle (ROV), video lander, etc.). In addition, ROV and baited camera surveys are being conducted to collect biological data inside and outside MPAs. Both historical and new data will be analyzed to provide a comprehensive assessment of [deep rocky reef ecosystems](#) across the MPA Network.

- [Final deep rocky reef report](#) (available January 2022)

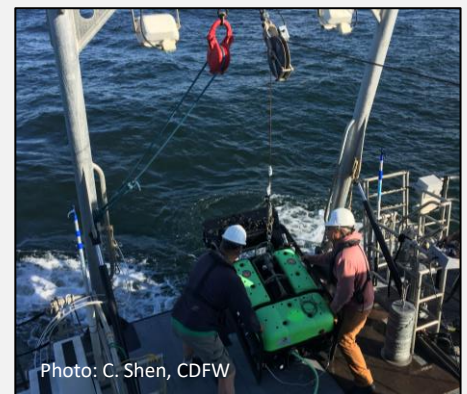


Photo: C. Shen, CDFW

Current Long-Term Projects

Socioeconomic Monitoring

Ecotrust – Commercial and Commercial Passenger Fishing Vessel (CPFV)/party boats

This [project](#) conducted focus groups with commercial fishermen in each of California’s major ports to obtain qualitative information on direct and indirect socioeconomic consequences of MPA establishment. An integrated analyses will be conducted using Ecotrust and CDFW data (commercial landings, CPFV logbooks from 2005-2020) to assess effects of MPA establishment on fishing communities (e.g., changes in landings, revenue, participation rates, etc. changes in spatial distribution of fishing effort; loss of revenue and broader economic changes). The project involves significant communication and collaboration with commercial and CPFV fishermen and results will recommend key metrics and methods for monitoring the socioeconomic health of commercial and CPFV fisheries into the future.

- [Final Ecotrust report](#) (available January 2022)

CDFW – Consumptive Recreational

This project is assessing and mapping relative catch rates in the private recreational fishery and CPFV fishery using CDFW data ([California Recreational Fisheries Survey](#)). Geographical Information System maps will display relative catch rates at a resolution of 1-by-1 nautical mile. These maps will be used to visualize and assess changes in observed and reported relative catch rates pre and post MPA implementation. With the MPA Network added as a map layer, changes in relative catch rates can be compared in relation to MPA locations. Incidentally, this study may also allude to MPA compliance issues.

MPA Watch and UC Davis Partnership

[MPA Watch](#) is a community science program that utilizes volunteers to collect human use and activity data inside and outside MPAs statewide. UC Davis scientists are analyzing MPA Watch data to examine if and how human uses, both consumptive and non-consumptive have changed since MPA implementation.



CDFW – Non-consumptive Survey

This project is surveying public visitations to MPAs, recreational activities the public engages in at the coast, and what they know about the MPA Management Program. Results from an additional survey shared with recreational outfitters such as dive shops, surf shops, and whale watching tours, etc. will determine if interest in participating in recreational activities changed following MPA implementation. These surveys will be added to our knowledge base from existing surveys such as MPA Watch or Ecotrust collected baseline surveys, to provide as encompassing picture as possible of recreational uses and MPA knowledge of the public following MPA implementation.

Current Long-Term Projects

Ocean Observing and Modeling

MPAs and Ocean Conditions

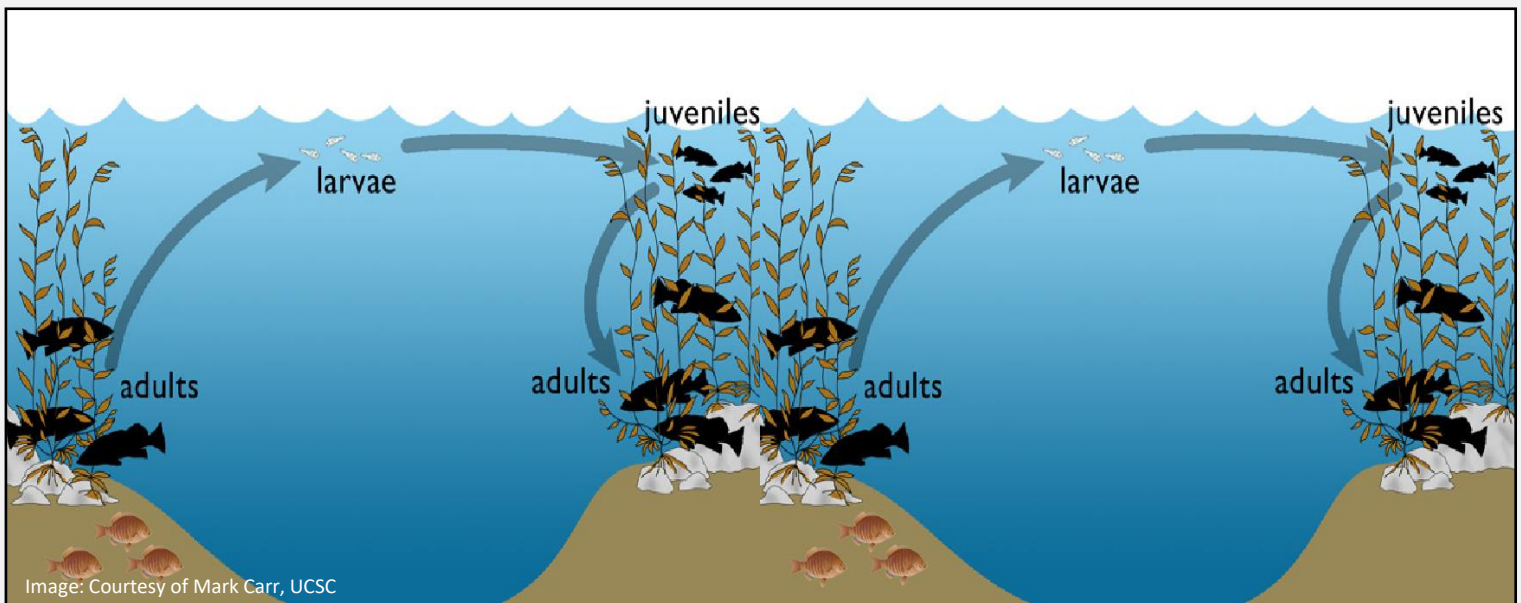
This project uses [satellite data and other ocean observing systems](#) to develop data products for analyzing relationships between large-scale oceanographic phenomena and conditions at MPA sites statewide. Researchers on this project are working with the other researchers conducting long-term MPA monitoring projects to integrate physical data (e.g., temperature, pH) with habitat data into data products referenced above.

- [Final ocean observing long-term monitoring report](#) (available January 2022)



Improved Connectivity Modeling

This [project](#) is building on an existing population connectivity model specific to California, which was originally created to inform site monitoring priorities in the Action Plan and examine broad larval connectivity across the Network. Based on key priorities outlined in the Action Plan, a demographic component is being added to the connectivity model to include the effects of MPA protection, and population dynamics in general (i.e., size, abundance, fishing mortality), in model outputs. This updated model will more accurately identify the separate and combined contributions of MPAs to ecological connectivity across the statewide Network.



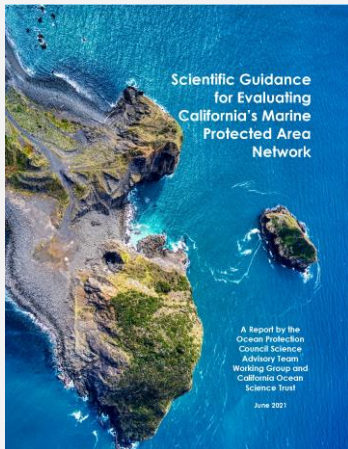
MPA Network Performance Evaluation and Science Guidance

National Center for Ecological Analysis and Synthesis (NCEAS)

Evaluation of ecological functioning, design, and performance of the MPA Network will be a core component of the Decadal Management Review. The [NCEAS](#) working group will perform integrative analyses using existing data streams to address many of the network level evaluation questions outlined in Appendix B of the Action Plan and DEWG report. The analysis will include integrating across habitats targeted for monitoring, better linking human dimension and governance aspects of the MPA Network with ecological performance and examining the effectiveness of the MPA design criteria at a network level.

Ocean Protection Council Science Advisory Working Groups

Scientific Guidance for Decadal Evaluation



Working closely with researchers conducting long-term MPA monitoring and building on the foundation set forth in the Action Plan, a workgroup of the Ocean Protection Council Science Advisory Team provided CDFW, Ocean Protection Council, and Fish and Game Commission with scientific guidance to help inform the 2022 Decadal Management Review and future reviews of the MPA Network. The main charge of the working group was to create a list of scientifically tractable questions, informed by the Action Plan and MLPA goals regarding MPA Network performance to assess in 2022 and beyond, identify gaps in our understanding or MPA performance in California, recommend how to fill those gaps, and provide methods for integrating MPA-related data streams into informative analytical products.

- [Final science guidance report](#) (available June 2021)

Climate Change and MPA Resiliency

The Climate Change Working Group developed a scientific guidance document that contains recommendations to inform how California's MPA Network could be assessed and used as a tool to provide the ecological and societal resilience to climate change. The guidance document includes definitions of what resistance and resilience means in the context of the MPA Network, scientific questions and methods that can be used to assess the performance of the MPA Network with the underlying effects of climate change. In addition, an inventory of current projects and knowledge on using MPAs as a tool for resilience, and gaps in knowledge and monitoring needs is included.

- [Final climate change report](#) (available June 2021)

