# Recommendations for Social Science Research and Monitoring of the California Marine Protected Area Network

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## Coordinating Authors

**Kevin Travis**
California Ocean Science Trust

**Meghan Zulian**
California Ocean Science Trust

**Jill Harris**
California Ocean Science Trust

## Working Group Authors

**Adam Canter**
Wiyot Tribe

**Anastasia Quintana**
Smithsonian Tropical Research Institute

**Arielle Levine**
San Diego State University

**Calla Allison**
Marine Protected Area Collaborative Network

**Coach Jackson**
Nanticoke and Coastal Defenders

**Diana Pietri**
Eastern Research Group, Inc.

**Gabrielle Crowe**
Gabrielino-Shoshone Nation of Southern California

**Jennifer Selgrath**
California Marine Sanctuary Foundation

**Kouslaa Kessler-Mata**
University of San Francisco and yak titʸu titʸu yak tiłhini Northern Chumash Tribe

**Kelsey Shaffer**
yak titʸu titʸu yak tiłhini Northern Chumash Tribe

**Natalie Ban**
University of Victoria

**Patrick Christie**
University of Washington-Seattle

**Phil King**
San Francisco State University

**Ryan Meyer**
University of California, Davis

**Sarah Klain**
University of Oregon

**Thomas Swearingen**
Oregon Department of Fish and Wildlife


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## ABOUT THIS REPORT

This report was collaboratively developed by the California Ocean Science Trust (OST) and a 16-member science working group, convened by OST, in coordination with the California Ocean Protection Council and the California Department of Fish and Wildlife. The report authors received targeted input from additional contributors and state agencies. This document presents scientific concepts, considerations, and recommendations for incorporating the social sciences into the research and monitoring of the California Marine Protected Area (MPA) Network. The recommendations, findings, and conclusions of this report are those of the authors and do not represent endorsement or reflect the views of the State of California (State). This report will be delivered to the State to inform the State's effort to update the MPA Monitoring Action Plan.

CALIFORNIA OCEAN SCIENCE TRUST

## ABOUT OST

OST strengthens the bridge between scientific research and sound ocean management. Created by state legislation, we support and bring world-class science and innovation together with state and federal policymakers to accelerate progress toward a healthy and resilient coast and ocean.

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**Ana Spalding**, Smithsonian Tropical Research Institute
**Carrie Pomeroy**, University of California, Santa Cruz
**Emma Chiaroni**, Penn State University
**Laurie Richmond**, Cal Poly Humboldt and California Sea Grant
**Lisa Campbell**, Duke University
**Rachel Carlson**, University of California, Berkeley
**Rebecca Gruby**, University of Miami

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# OVERVIEW

This report is organized into four sections:

**1) The Introduction** provides background and context on the human dimensions of Marine Protected Areas (MPAs) and oceans, as well as California's MPA Network and existing MPA management programs. This section addresses limitations of MPA implementation and management, such as the initial lack of meaningful Tribal engagement and limited use of social science for monitoring and management.

**2) The Guiding Principles** provide a philosophical foundation for the development and implementation of this report. These principles ensure that all recommendations prioritize Tribal sovereignty and remain rooted in equitable, inclusive, and actionable science.

**3) The Research and Monitoring** section introduces six foundational cornerstones to serve as a framework for advancing social science research and monitoring of the MPA Network. This section presents scientific objectives for each cornerstone, providing a strategic approach to understanding the human dimensions of the MPA Network.

**4) The Implementation and Operationalization** section proposes a practical roadmap for executing these recommendations. It outlines strategies for capacity-building, including, but not limited to, within state agencies and Tribes; defines five distinct funding tracks; and establishes a phased 10-year timeline for advancing adaptive management.

# EXECUTIVE SUMMARY

California's oceans are home to a diverse array of marine life that is integral to its cultural heritage and economy. California's Marine Protected Area (MPA) Network was established to protect this marine biodiversity and promote the ocean's benefits to people, but to date, the research and monitoring of the MPA Network has been focused on biophysical parameters with limited integration of social sciences or Tribal stewardship.

The gap in understanding how people interact with and derive benefits from the MPA Network was identified by Tribes, multiple MPA partners, and specifically called out in the 2022 Decadal Management Review (DMR). Incorporating human dimensions research and perspectives into MPA management will ensure the MPA Network delivers benefits for people and nature.

This report presents recommendations to address this gap by integrating social science research and monitoring into the adaptive management of the MPA Network, establishing a framework of six foundational "cornerstones" to guide monitoring, research, investments, and management actions. Central to this framework is the commitment to uplifting Tribal sovereignty and guardianship and elevating social sciences to an equal level to biophysical sciences in MPA monitoring and management. Implementing this framework will expand the community of people working together to ensure that the MPA Network protects the biodiversity and cultural heritage of California's coast, while minimizing adverse impacts and maximizing outcomes for people.

## The Case for Integrating Social Science in MPA Research and Monitoring

- Social science is essential for effective MPA management and compliance because MPAs are tools designed to influence human behavior, with a goal to sustain ecosystems for the benefit of both nature and people.
- Social sciences and Indigenous Knowledges have been minimally included in California's MPA research and monitoring due to significant imbalances in staffing, funding, and capacity.
- Indigenous Knowledges are distinct, place-based knowledge systems developed by Indigenous communities through close interaction with and management of their environments over millennia. Tribal nations hold a distinct connection to oceans, centered on a sacred duty to live in knowledgable, regernative relationships with the land, waters, and non-human beings. Interweaving and mobilizing these knowledge systems with non-Indigenous science strengthens research and monitoring across all science disciplines.
- Relevant and useful social science research and monitoring require sustained investment in the following: longitudinal monitoring to track ocean and MPA uses and values in light of social and demographic change; targeted research for management-relevant inquiries; and periodic evaluation of research and monitoring investments to inform effective adaptive management.
- Some social science approaches should be integrated with existing ecological monitoring and/or priorities, and some approaches should be addressed through strictly social science perspectives.

# Key Recommendations

- **Prioritize social science research and monitoring in the MPA Network on the six foundational cornerstones** to address key information gaps and meet multiple priorities of MPA partners (Figure 1).


***Figure 1.*** *The six cornerstones of the social science research and monitoring recommendations.*

- **Initiate and fund convenings** of social and ecological experts to develop and finalize the approach for integrating these recommendations in the MPA Monitoring Action Plan [1], followed by regular expert convenings to assess the effectiveness of research and monitoring efforts in meeting the goals of the MPA Management Program, and the Marine Life Protection Act. These convenings should be more frequent than the 10-year management review cycle, especially at the onset of implementing the updated MPA Monitoring Action Plan.

- **Organize social science around use and action**, and plausibly connected to concrete management actions, policies, or laws. This will ensure that these recommendations are effectively implemented and results are applicable to adaptive management. For example, the State should incentivize co-designed research where MPA partners and researchers, communities, and/or Tribes engage in continuous feedback from a project's inception.

- **Build state agency capacity for social sciences**. This includes hiring dedicated social scientists within relevant state agencies and departments, and partnering with social scientists external to state agencies. Additionally, the State should provide training for existing agency staff to expand their understanding of the value of social sciences for managing MPAs.

- **Invest in Indigenous Knowledges and Tribal Stewardship and Guardianship**. Acknowledging that Indigenous Knowledges are not siloed into academic disciplines or policy development and implementation, supporting Tribally-led research will involve advancing research, monitoring, and stewardship that moves beyond the social sciences. The State should invest in capacity building and funding for Tribes to steward, research, and monitor their ancestral coastal and marine territories, and simultaneously build capacity for non-Indigenous agency staff to grow their respect for Indigenous Knowledges, Tribal rights, and means for trust-based collaboration.
- **Support a series of externally facilitated convenings (charettes)** that bring together diverse social groups, place-based communities, and rightsholders to foster increased trust, generate new knowledge, and improve MPA management. In particular, the State should leverage existing governance structures (e.g., MPA Collaboratives) and support additional convenings to foster candid and constructive diaglogues.
- **Identify opportunities to integrate social and ecological research and monitoring**. Recognizing that humans are an inherent and highly influential part of the ecosystem, and MPAs are tools designed to influence human behavior, it is critical to balance social science research and monitoring with integrated social-ecological approaches to promote effective management.

By integrating these recommendations, California can move beyond management that emphasizes biophysical research and outcomes to acknowledge the inextricable link between coastal communities and the marine environment. Uplifting Tribal sovereignty and institutionalizing Tribal guardianship represents a fundamental step toward healing historical exclusions and fostering a future of equitable ocean stewardship. Ultimately, this framework provides the roadmap to ensure the MPA Network thrives as a resilient, shared resource that protects both the natural biodiversity and the rich cultural heritage of California's coast for generations to come.

# I. Introduction

## Background on the California Marine Protected Area Network

California's oceans support a rich biodiversity that is central to the State's identity, heritage, and economy, and humans are an inherent and highly influential part of the ocean ecosystem. Tribes hold a different paradigm of oceans in which humans are neither separate, central, nor superior to nature, but hold responsibilities of care, gratitude, and reciprocity to nature. Backed by the Marine Life Protection Act (MLPA) of 1999, California's Marine Protected Area (MPA) Network was established to protect this biodiversity and promote the ocean's benefits to people [2]. The MLPA specifically directed the State of California to redesign its MPAs to function as a network, guided by six goals:

1. Protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.
2. Help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.
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.
4. Protect marine natural heritage, including the protection of representative and unique marine life habitats in CA waters for their intrinsic values.
5. Ensure California's MPAs have clearly defined objectives, effective management measures, and adequate enforcement, and are based on sound scientific guidelines.
6. Ensure the State's MPAs are designed and managed, to the extent possible, as a network.

The MLPA was established to increase coherence and effectiveness in protecting the State's marine life and habitats, marine ecosystems, and marine natural heritage, as well as to improve recreational, educational, and study opportunities provided by marine ecosystems subject to minimal human disturbance. Notably absent from the MLPA language and goals are any mentions of communities, Tribes, cultural connections, or social-ecological systems. In alignment with the MLPA, MPA Network designers leveraged the best available science, largely biophysical, to protect specific areas, minimizing the extent of fishing closures while maximizing ecological and environmental connections between sites. The current MPA Network and design of MPAs were completed and implemented in 2012.

The MLPA also required consistent, monitoring-informed management of the Network into the future. The first Master Plan for Marine Protected Areas was completed in 2016, which set four management pillars of the MPA Network [3]:

1. Policy and Permitting
2. Enforcement and Compliance
3. Research and Monitoring
4. Outreach and Education

The first round of long-term ecological monitoring projects guided by the Master Plan was funded in 2019 and executed through 2022, with ongoing long-term ecological monitoring today. Using these data, a decadal management review was undertaken in 2022 by academic partners and state agencies to assess the ecological performance of the Network, synthesizing data from these projects and initial monitoring conducted over the first 10 years of research and management. The process for performing this assessment was guided by the Decadal Evaluation Working Group, which was tasked with producing scientific guidance for the evaluation and identifying gaps in existing monitoring and management [4]. The 2022 Decadal Management Review (DMR) showed that the MPA Network is delivering ecological benefits, while highlighting persistent gaps in understanding how people interact with MPAs and the broader social-ecological relationships across California's coast and ocean [5]. The DMR identified 28 recommendations to address these gaps.

One of these DMR recommendations (recommendation #12) is to "Convene a human dimensions advisory team of trained natural resource social scientists across multiple disciplines to update the MPA Monitoring Action Plan to include a more comprehensive approach to human dimensions research and monitoring, considering the recommendations made in this report." The DMR also recommended a specific focus on three social science research areas:

- Understanding changes in human behavior related to MPAs
- Understanding of how human well-being is affected by MPAs, including economic, social, and cultural well-being
- Understanding of changes in attitudes, perceptions, and knowledge related to MPAs and how these factors influence one another

This working group was convened to address this specific DMR recommendation and to chart a path forward for social science integration into California's MPA monitoring and management.

## Limitations of the MLPA

### SOCIAL SCIENCE

The MLPA planning and design process was designed to be science-based, and it balanced the use of best available science with political and social feasibility. While there has been social science research in California MPAs [e.g., 6-9], it is not systematic, coordinated, nor generally funded by the State. To date, the State has prioritized the biophysical sciences as the primary lens through which impacts of MPAs are measured.

Since the creation of the MLPA, marine resource management has evolved to more comprehensively include people and human societies in definitions of "ecosystem" [6,10-11]. This shift was influenced by and intertwined with Elinor Ostrom's work, and others, who challenged the "Tragedy of the Commons" dogma by proving that local users are often the most effective stewards of the ocean, and that common-pool resources, such as fish and water, should be managed using a social-ecological systems framework [e.g., 12-14]. Limited initial social science research on California's MPAs focused on perceptions by fishermen; however, multiple groups influence and are influenced by Marine Protected Areas [e.g., 15-18].

Developing a thorough understanding of how all users value, shape, and depend on MPAs requires research across multiple social science disciplines, including economics, sociology, anthropology, and psychology [19]. MPA management that considers and supports human well-being is more likely to achieve its conservation goals and be effective because it is more acceptable, desirable, and supported by local communities [18,20-21].

## TRIBAL ENGAGEMENT

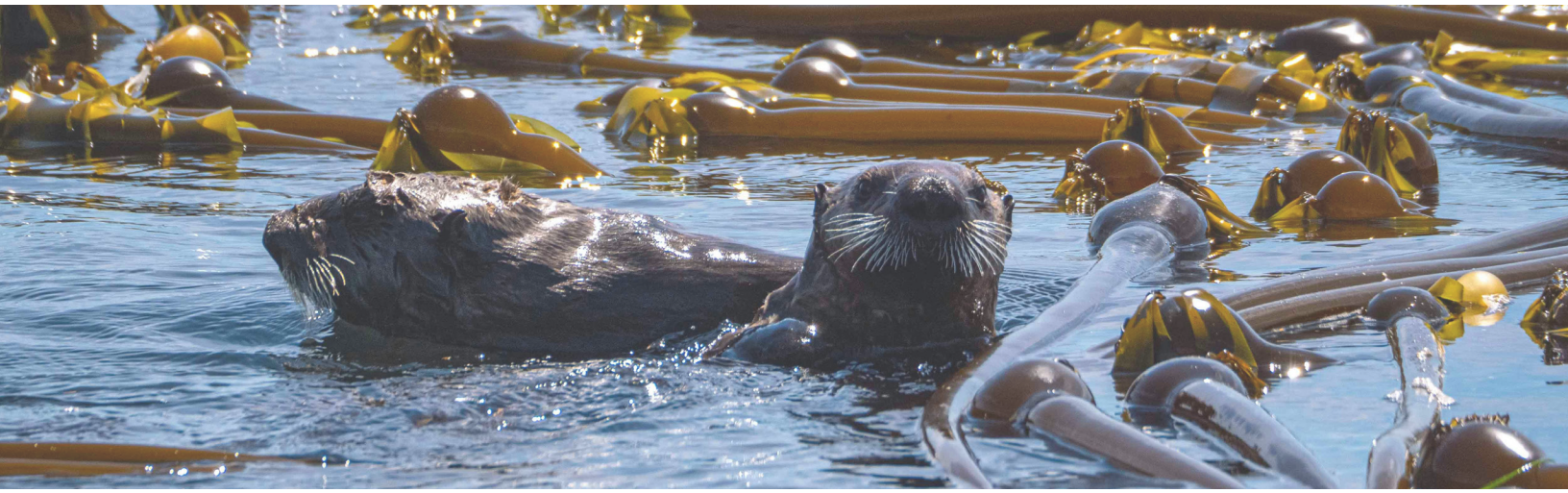
California Native American Tribes have long recognized humans as part of, and inseparable from the environment, and have stewarded marine resources and coastal ecosystems within their ancestral territories since time immemorial [22]. Despite this, the MLPA was signed into law in 1999 with minimal Tribal involvement or consultation, and the goals of the MLPA fail to recognize or include the traditional, cultural, or ceremonial relationships between Tribes and the ocean environment. During the MPA planning process (2004-2012), there was no clear path for Tribes to protect their traditional practices or participate in the planning process. The State did include a first-ever Tribally-led marine monitoring program in the North Coast, which was seen as an important but insufficient step [23]. After strong efforts for their rights and obligations to steward their ocean and coastal ancestral territories, Tribes had some opportunities to participate as stakeholders alongside other marine resource users in the planning process. Many Tribes considered this approach disrespectful. In response to further advocacy by Tribes, the State created Tribal take exemptions in various MPAs. These exemptions provide take allowances for specific federally recognized Tribes in specific MPAs. To spur such policy and regulatory changes required significant energy and advocacy from Tribes and partner organizations, and the initial decision to leave Tribes out of the MLPA and initial MPA planning process continues to impact Tribal-state relationships.

Since the MLPA and MPA planning process, the State has made strides to learn from its past mistakes and take steps towards healing historical and ongoing wrongs. In 2011, Governor Edmund G. Brown directed state agencies to invite government-to-government consultation on matters that may affect Tribes [24]. In 2019, Governor Gavin Newsom acknowledged and apologized for the historical atrocities perpetuated by the State against California Native American Tribes and peoples, and committed the State to strengthening and sustaining effective relationships between the State and Tribes through Executive Order N-15-19 [25]. Further, Governor Newsom's Statement of Administration Policy on Native American Ancestral Lands directed state agencies to advance Tribal access and land return of Tribal ancestral lands, including through co-management agreements between the State and Tribes [26]. The California Natural Resources Agency (CNRA), which houses the departments that lead the MPA Management Program (the California Fish and Game Commission, the California Department of Fish and Wildlife,

and the California Ocean Protection Council), has developed an updated agency-wide Tribal Consultation Policy and Tribal Stewardship Policy and Toolkit, which further guide early, often, and meaningful government-to-government consultation and the implementation of co-management agreements and ancestral land return [27-28].

The State is committed to developing a mutually beneficial and equitable partnership with coastal California Native American Tribes within the MPA Management Program and beyond. Core to this commitment is the inclusion of Tribal representatives in decision-making bodies, and the support of both Tribally-led research/monitoring and education/outreach projects.

Recognizing the fundamental responsibility towards nature and the ocean held by Tribes, the Tribal cornerstone, discussed below, is distinctly categorized from the other cornerstones.



## Why Social Science for California's MPA Network?

By collecting social science data and integrating it into management, the State can foster improved compliance with MPA regulations, thereby preserving the environment, through increased transparency and the promotion of a shared stewardship approach among ocean users. A social-ecological approach can support inclusive, equitable, and effective management decisions by integrating Indigenous Knowledges, local knowledge, and community perspectives into the adaptive management process. Ultimately, leveraging the social sciences allows managers to understand and pursue a wider range of both social and ecological benefits, such as sustainable fisheries, recreation, and community resilience, while minimizing socioeconomic and cultural impacts, ensuring the MPA Network fulfills the goals of the MLPA to protect both the natural diversity and the cultural heritage of California's coast.

## Scope and Approach

The primary purpose of this report and its recommendations is to provide a science-based framework to monitor, study, and evaluate the "human dimensions" of California's MPA Network for state agencies with jurisdiction over the MPA Network, namely the California Department of Fish and Wildlife (CDFW), the California Ocean Protection Council (OPC), and the California Fish and Game Commission (CFGC). Human dimensions are defined here as "the social, economic, cultural, and institutional aspects of MPAs, which encompass the state or change of human behavior, economic outcomes, and stakeholder attitudes, perceptions, or knowledge" [29]. By formalizing a research and monitoring approach for social science, the State can better manage the complex, interconnected social and ecological systems of our coast, ensuring that decisions are adaptive, equitable, and effective.

These recommendations are intended to serve as a shared resource for a diverse network of partners, signaling priority needs and standardized approaches that can align efforts across the State. In addition to CDFW, OPC, and CFGC, this report is designed to inform the work of:

- **MPA Statewide Leadership Team (MSLT) Members & State Agencies:** Providing a consistent framework for integrating social science data into communication and collaboration among state and federal agencies, Tribal governments, and partners to facilitate improved management.
- **Other State and Federal Partners:** Providing a guiding document for the role of social science and social-ecological frameworks in management partnerships between California and Federal partners, including the NOAA Office of National Marine Sanctuaries.
- **Academic Researchers & Students:** Identifying critical science needs and data gaps to guide future research.
- **Philanthropic Funders:** Highlighting high-priority investment areas where social science can yield the greatest impact for human well-being, stewardship, coastal resilience, and other outcomes.
- **NGOs and Community Science Groups:** Offering guidance on how NGO partnerships and public participation can be scaled and bridge gaps to inform state management.
- **Tribal Nations and Local Communities:** Supporting the co-production of knowledge and ensuring that Indigenous Knowledges guide research, monitoring, and management of the MPA Network.

While this report is rooted in the context and needs of the MPA Network, the working group emphasizes that it could also inform other conservation priorities, including California's 30x30 Initiative [30]. Additionally, coastal social-ecological systems do not end at MPA boundaries. The social science research and monitoring recommended here should be viewed within a broader ecological and social context, such as:

- **All Ocean Spaces:** Recognizing that human interactions within MPAs are inextricably linked to activities in all coastal waters.
- **Connected Upstream Places:** Accounting for inland communities and watershed management that can directly impact coastal health and equitable access.
- **Social Connectivity:** Acknowledging that the social, cultural, economic, and recreational values of individuals, social groups, and Tribes transcend beyond MPA designations, requiring a broader approach to ocean stewardship.

This report was developed by a science working group whose members were appointed by OST and OPC, in coordination with CDFW staff, following an open call for nominations (see Appendix C). The working group met regularly from June 2025 to February 2026. Members assessed existing data, identified information needs, developed a list of recommendations, and proposed the six cornerstones of social science research and monitoring.

*Demonstrating co-stewardship, indigenous youth engage in traditional paddling in the South La Jolla State Marine Reserve through collaborative research between Coastal Defenders and the Scripps Institution of Oceanography.*

# II. Guiding Principles

This section provides a philosophical foundation to ensure that the social science research and monitoring recommendations are rooted in core values, equitable approaches, and integrated methodologies. While developed for social science, these tenets are designed to be applied broadly across all research and monitoring efforts within the MPA Network to ensure a consistent, values-driven approach. Additionally, the working group acknowledges that social-ecological systems extend beyond MPA boundaries, requiring a holistic lens that encompasses all ocean spaces, both coastal and inland communities, connected watersheds, and the diverse social systems that link them.

The following overarching principles, adopted by the working group, serve as the framing for all social science research and monitoring, acknowledging the inextricable link between humans and the environment:

- **Tribal Sovereignty and Indigenous Knowledges**. Prioritize Tribally-led research and stewardship; include Indigenous Knowledge systems in monitoring, governance, and adaptive management; and prioritize Tribal data sovereignty and governance that follows the principles of the four R's: Respect, Relevance, Reciprocity, and Responsibility. This guiding principle should be applied to all types of research and monitoring of MPAs, not just to social science. Uplifting Tribal sovereignty and Indigenous Knowledges should also not be seen as a substitute for formal Tribal consultation processes.
- **Equitable, Inclusive, and Representative Engagement and Action for Change**. Include experiential and local knowledge in MPA management

when engaging and partnering with communities throughout the implementation and adaptive management of a social science research and monitoring plan. Through the lens of environmental justice, be intentional and transparent about who is asking questions, what kinds of questions are being asked, and how data will be used.

- **Robust, Applied and Actionable Social Science**. Ensure social science research is plausibly connected to concrete actions that state agencies, the MPA Statewide Leadership Team, funders, or others can take, linking research with mandates, policies, and laws. Continually engage with agencies to co-produce research questions to bolster agency staff capacity. Also acknowledge that robust social science will inherently yield results that highlight dissenting views of MPAs. Integrating these perspectives strengthens social science and improves long-term MPA management.

# III. Research and Monitoring

The following section contains research and monitoring recommendations from the working group. Section III-A outlines the six foundational "cornerstones" that serve as the recommended framework to guide monitoring, research, investments, and management actions, including integration into the State's update of the MPA Management Action Plan. Section III-B presents objectives associated with each cornerstone, divided into monitoring, research, and, where relevant, evaluation objectives. These objectives describe the desired understanding that would result from new monitoring and research. Section III-C provides example research questions, methods, and indicators for addressing the monitoring objective(s) of each cornerstone.

Together, these three sections provide a strategic approach to studying and evaluating how the MPA Network influences and is influenced by the diverse communities, social, and ecological systems of California. Collectively, all six cornerstones support the four pillars of the MPA Management Program, and cornerstones 3, 4, and 5 directly address the recommended human dimensions research areas from the DMR (see Introduction).

# A. Six Cornerstones for MPA Social Science Research and Monitoring

The six cornerstones are grouped into three overarching thematic categories that define the scope of social science research and monitoring: 1. Institutional Structures, Processes, and Power; 2. Internal and External Drivers of Social Outcomes; 3. Social Outcomes, Tradeoffs, and Social-Ecological Systems. Each cornerstone is supported by a rationale, grounded in current limitations of the MLPA and MPA management and monitoring programs. Icons corresponding to each cornerstone are used throughout this document as shorthand for indicating where content applies to one or more cornerstones.

## INSTITUTIONAL STRUCTURES, PROCESSES, AND POWER

**Cornerstone 1. Governance:** The norms, institutions, and processes that define how power is exercised and decisions are made. It integrates structure, power dynamics, and institutional culture and value systems with the capacity for adaptive management. Influenced by value systems and cognitive/affective factors, this cornerstone is about how diverse actors (e.g., individuals, communities, foundations, Tribes, government bodies) participate and are impacted by MPAs and their management systems, serving as an important driver for all subsequent domains (adapted from Ostrom) [14].

*Rationale: The norms, structures, and processes of California's governance bodies directly determine the quality and legitimacy of MPA management. Beyond influencing external perceptions, the study of governance allows for the critical evaluation of institutional values, decision-making efficiency and equitability, and the exercise of power. By analyzing the dynamics of government institutions, Tribes, communities, and social groups, the State can identify pathways to improve the adaptive management of the MPA Network.*

**Cornerstone 2. Tribal Stewardship, Guardianship, and Sovereignty:** Tribally-led stewardship, training, research, and monitoring of MPAs, and the State's accountability in support of these actions. The scope of further research and monitoring to be defined by Tribes through a dedicated funding pathway provided by the State and through diverse funding mechanisms.

*Rationale: Tribes have stewarded their ancestral marine and coastal territories since time immemorial, yet most were excluded from participating in the creation and management of MPAs. Recognizing this injustice and that Indigenous Knowledges are essential to MPA success and ocean sustainability, Tribes should be given the support to conduct their own training, stewardship, research, and monitoring of Marine Protected Areas.*

## INTERNAL AND EXTERNAL DRIVERS OF SOCIAL OUTCOMES

**Cornerstone 3. Behavior and Usage:** Behavior in, and use of MPAs and connected coastal systems by individuals, social groups, and Tribes; and factors that contribute to or constrain access.

*Rationale: An understanding of human uses in MPAs and connected coastal systems is important to devising effective management strategies. Understanding the ways that different social groups use or are excluded from MPAs and connected coastal systems allows for more nuanced policy relevant to diverse user groups.*

**Cornerstone 4. Cognitive and Affective Factors:** Past and present knowledge of attitudes, perceptions, and values towards MPAs, including the educational efforts and social factors that influence them.

*Rationale: MPAs can positively and negatively impact individuals, social groups, and Tribal communities. The State should seek to understand how these impacts shape attitudes, perceptions, and values towards MPAs and connected coastal systems in order to understand the cognitive and affective factors that shape social group responses to and perceptions of MPAs, and means to broaden awareness and support.*

## SOCIAL OUTCOMES, TRADEOFFS, AND SOCIAL-ECOLOGICAL SYSTEMS

**Cornerstone 5. Social Outcomes and Tradeoffs:** Social outcomes and influencing factors, and the distribution of costs and benefits among individuals, social groups, and Tribes.

*Rationale: As social systems, the social dynamics of MPAs should be understood and monitored to ensure the management of the MPA Network is maximizing social benefits and minimizing negative impacts across all social groups and Tribes.*

**Cornerstone 6. Social-Ecological Linkages:** Relationships among social factors, outcomes, and their influencing factors, and resulting impacts on the ecological dimensions of MPAs, as well as the influence of ecosystem dynamics and changes on human behavior and social outcomes, such as well-being.

*Rationale: MPAs are complex social and ecological systems with independent and linked dynamics. Given that MPAs are tools to inform human behavior, it is critical to evaluate the proximal and distal social-ecological linkages to understand the relationships between management actions, ecosystem protection, and desired outcomes.*

## B. Objectives Across Cornerstones

Data collected as part of a research and monitoring program is necessary to answer the most fundamental questions about the functions and outcomes of the MPA Network. To this end, the six cornerstones include three types of objectives: *Monitoring, Research,* and *Evaluation.*

- **Monitoring objectives** are the foundation for a social science research and monitoring program of MPAs. These objectives are best addressed through repeated, long-term data collection as part of a monitoring program to understand changes over time.
- **Research objectives** can be addressed through more focused projects that might employ innovative methods and take place at various frequencies, including comparing patterns or relationships within and between cornerstones.
- **Evaluation objectives** are designed to evaluate dimensions of MPA management, including the State's accountability to Tribal stewardship and guardianship. These apply to Cornerstones 1 and 2.

Cross-cutting objectives fall primarily within one cornerstone but address others and are indicated by symbols in the cross-cutting column that were introduced in Section III-A. These objectives signal research and monitoring opportunities that have multi-cornerstone impact and outcomes.

| CORNERSTONE 1: Governance | Cross-cutting cornerstones |
|---|---|
| Monitoring Objectives | |
| 1-A. Track who is, and is not, participating in MPA governance, as well as the type of participation. | |
| 1-B. Track the governance structures, power dynamics, and decision-making rights of formal and informal governance bodies and partners. |  |
| Research Objectives | |
| 1-C. Determine how adaptive management of the MPA Network as a whole is perceived and/or operationalized by formal and informal governance bodies, social groups, and Tribes. |  |
| 1-D. Evaluate the relationships among, and influences of, MPA enforcement, compliance, and Tribal Guardianship across all social groups. |  |
| 1-E. Understand the relationship between MPA governance and attitudes, perceptions, and knowledge of MPAs. |  |
| 1-F. Identify areas of conflict, governance processes contributing to that conflict, and pathways for conflict transformation where the underlying conditions that produce conflict in the first place can be changed. |  |
| 1-G. Understand how participating in MPA governance, stewardship, and guardianship influences cognitive and affective factors, social outcomes, and use patterns. |  |
| Evaluation Objectives | |
| 1-H. Evaluate the institutional social science capacity of MPA governance, management entities, and programs. | |
| 1-I. Evaluate the impact and efficacy of MPA outreach and education by MPA governance entities and partners. |  |
| 1-J. Evaluate the transparency, inclusivity, and responsiveness of MPA governance, specifically the use of social science research and monitoring findings to ensure equitable distribution of social outcomes. |  |
| 1-K. Track how factors such as permitting processes and enforcement training are adapted to facilitate Tribally-led stewardship, co-management, training, research, and monitoring. |  |

| **CORNERSTONE 2: Tribal Stewardship, Guardianship & Sovereignty**<br>*Tribes to determine their own objectives that span across the social-ecological system, extending to outcomes beyond MPA social science research questions, methods, and indicators. The objectives listed below are illustrative examples.* | **Cross-cutting cornerstones** |
|---|---|
| Monitoring Objectives | |
| 2-A. Track how Tribally-led stewardship, co-management, training, research, and monitoring are supported, elevated, and prioritized by the State and partner network. | |
| Research Objectives | |
| 2-B. Understand dimensions of Tribal capacity for MPA stewardship, research, and monitoring. | |
| 2-C: Identify culturally-relevant research questions, methods, and indicators. | |
| Evaluation Objectives | |
| 2-D. Evaluate the uptake of Tribally-led research and monitoring into MPA governance and management, with respect for data sovereignty practices. |  |
| 2-E. Evaluate the robustness and effectiveness of state agency Tribal policies, strategies, and co-government agreements, as they pertain to MPAs, state waters, and marine resources. |  |
| 2-F. Evaluate Tribal opportunities to participate in MPA governance. |  |
| 2-G. Evaluate enhancements to, and/or alternatives, state-sponsored enforcement, including Tribal guardianship. |  |

| **CORNERSTONE 3: Behavior and Usage** | **Cross-cutting cornerstones** |
|---|---|
| Monitoring Objectives | |
| 3-A. Describe the cultural and demographic characteristics, social identities, and relationships of MPA users and related groups. | |
| 3-B. Track behavior and usage patterns in MPAs, and access to MPAs, and connected coastal systems, including consumptive and non-consumptive user groups. | |

| Research Objectives | |
|---|---|
| 3-C Understand how behavior and usage patterns of MPAs and connected coastal systems influence cognitive and affective factors and social outcomes. |  |
| 3-D. Understand how MPA and ocean users' cultural and demographic characteristics, social identities, and relationships influence behavior and usage. | |
| 3-E. Understand MPA access, barriers to access, mechanisms to reduce those barriers, and how those vary among social groups and Tibes. |  |
| 3-F. Understand how participation in community science programs and other MPA- and ocean-related activities influences cognitive and affective factors, social outcomes, and use patterns. |  |
| 3-G. Understand how participation in Tribal stewardship of MPAs and connected coastal systems influences cognitive and affective factors, social outcomes, and use patterns. |  |

| **CORNERSTONE 4: Cognitive and Affective Factors** | **Cross-cutting cornerstones** |
|---|---|
| Monitoring Objectives | |
| 4-A. Track individual and community awareness, attitudes, perceptions, values, and knowledge regarding MPAs and connected coastal systems across all social groups and Tribes. | |
| Research Objectives | |
| 4-B. Understand how historical and present socioeconomic, demographic, and cultural factors influence awareness, attitudes, perceptions, values, and knowledge of MPAs and connected coastal systems. |  |
| 4-C. Identify the characteristics (e.g., format, scope of program, methods of engagement and participation, etc.) of formal and informal education that influence awareness, attitudes, perceptions, values, and knowledge of MPAs and connected coastal systems. | |

| | |
|---|---|
| 4-D. Understand the influence of awareness, attitudes, perceptions, values, and knowledge on behavior, including use patterns and compliance. |  |
| 4-E. Identify existing learning networks and understand how involvement in the networks influences awareness, attitudes, perceptions, and knowledge of MPAs and connected coastal systems; and identify opportunities to strengthen and build the capacity of existing and new learning networks. |  |

| **CORNERSTONE 5: Social Outcomes and Tradeoffs** | **Cross-cutting cornerstones** |
|---|---|
| Monitoring Objectives | |
| 5-A. Track the distribution of costs and benefits of MPAs across social, demographic, and geographic communities. Costs and benefits can be measured across any dimension of well-being, such as:<br>• economic and material outcomes<br>• physical and mental health outcomes<br>• cultural outcomes |  |
| Research Objectives | |
| 5-B. Identify conditions, actions, and activities (i.e., participation in educational programs, stewardship) that facilitate a sense of connection with MPAs and connected coastal systems. |  |

| **CORNERSTONE 6: Social-Ecological Linkages** | **Cross-cutting cornerstones** |
|---|---|
| Monitoring Objectives | |
| 6-A. Identify and track social-ecological interactions and feedbacks within and among MPAs, and with connected coastal systems. |  |
| Research Objectives | |
| 6-B. Understand how awareness and perception of ecological status, or the value of ecological resources within MPAs, influence human behavior, such as compliance. |  |
| 6-C. Investigate the reciprocal relationships between the species, habitats and functions valued by individuals, social groups, and Tribes. |  |

# C. Guidance on Monitoring Objectives

Building on the six cornerstones and their monitoring, research, and evaluation objectives, the working group has proposed these example research questions, methods, and indicators for each cornerstone's monitoring objective(s). Each monitoring objective also includes guidance on implementation, approach, and considerations to get started with data collection.

Additional examples of research questions across all cornerstone objectives are in Appendix B.

## CORNERSTONE 1. GOVERNANCE

**Monitoring Objective 1-A.** Track who is, and is not, participating in MPA governance, as well as the type of participation.

**Monitoring Objective 1-B.** Track the governance structures, power dynamics, and decision-making rights of formal and informal governance bodies and partners.

**Guidance on Implementation, Approach, and Considerations:**

- One-time data collection to establish a baseline, revisited periodically: collect oral histories, via interviews or focus groups, of the process to design and implement the MPA Network.
- Key informants should include agency staff, scientists, Tribal leaders (as rightsholders), NGO representatives, and others who were or are involved in MPA Network design and implementation (e.g., fishermen, members of fishing communities).
- Conduct a social network analysis of the MPA Network, focusing on the connections between individuals and organizations, the nature of these connections (e.g., knowledge sharing, program-specific collaboration, enforcement, etc.) and identifying influential actors.

- **Illustrative Questions:**
  - What decisions shape MPA outcomes, and how?
  - Through what processes are decisions made about MPA governance?
  - How is leadership distributed and enacted among governing organizations of the MPA Network?
  - Beyond the decision-making entities, who participates in MPA decisions, and in what ways?

- What are the connections between evolving scientific understanding and adaptive management?
- What types of staff training support equitable Tribal use of oceans?
- How does the geographic distribution of MPA public meetings influence participation in governance?
- What are the social norms of participation in MPA governance, and how do these influence representation and decision making?
- What factors lead to a more equitable management process?

- **Example Methods:**
  - Social network analysis
  - Document analysis (e.g. meeting minutes)
  - Focus groups
  - Process analysis
  - Interviews to analyze policy documents that have been implemented
  - Oral histories of the MPA Network design process
  - Multi-site surveys
  - Participant observation (in MPA meetings/events and in community science programs)

- **Example Indicators:**
  - Use of Indigenous Knowledges in governance
  - Affiliations and demographics of those in leadership positions and members of decision-making bodies
  - Existence and activity level of community and conservation groups
  - Level and quality of collaborative processes and relationships
  - Financial support for "bottom-up" governance organizations
  - Strength of local governance structures and decision-making processes
  - Number of opportunities for the public to participate in decision-making, and the geographic distribution of those opportunities
  - Influence of social media and influencers on the public participation process

## CORNERSTONE 2: TRIBAL STEWARDSHIP, GUARDIANSHIP, AND SOVEREIGNTY

**Monitoring Objective 2-A.** Track how Tribally-led stewardship, co-management, training, research, and monitoring are supported, elevated, and prioritized by the State and partner network.

**Guidance on Implementation, Approach, and Considerations:**

- There are a limited number of existing Tribally-led projects on MPAs, and therefore a need to consider what responsibility the State has to create robust systems for long-term research and monitoring, while elevating and building upon these initial projects/efforts.
- The State should not aim for a certain number of Tribal consultation requests as a measure of success, because formal consultation requires heavy Tribal capacity. Instead, the first step should always be internal coordination among state agencies to leverage existing requests.

- **Illustrative Questions:**
  - What factors influence Tribal engagement with, and participation in, MPA governance?
  - How are Tribal worldviews incorporated into MPA management?

- **Example Methods:**
  - Interviews
  - Oral histories of involvement in MPA processes and projects
  - Group discussions
  - Focus groups

- **Example Indicators:**
  - MOUs with Tribes
  - Number of Tribes involved in MPA governance
  - Depth of engagement (e.g., time, resources)
  - Roles played, commitments made, resources received
  - Communication mechanisms between agencies and Tribes
  - Conflict resolution mechanisms regarding Tribal co-management and co-stewardship

## CORNERSTONE 3: BEHAVIOR AND USAGE

**Monitoring Objective 3-A.** Describe the cultural and demographic characteristics, social identities, and relationships of MPA users and related groups.

**Monitoring Objective 3-B.** Track behavior and usage patterns in MPAs, and access to MPAs, and connected coastal systems, including consumptive and non-consumptive user groups.

**Guidance on Implementation, Approach, and Considerations:**

- This is one area where extensive initial data already exist, such as:
  - Pressure counts inside and outside of MPAs (MPA Watch program)
  - Ocean access survey data (Ocean Access Project)
  - Recreational fishing intercept survey data (California Recreational Fisheries Surveys, CRFS; these surveys would need to be enhanced to collect additional demographic data)
- For studies aimed at detecting an MPA effect, establish MPA and non-MPA study sites. Sites should span the full geographic range, age of MPAs, types of habitat, and levels of protection, to the extent possible.
- Standardized demographic data should be collected alongside existing MPA-related activities, including age, race, gender, education, and income. This data should also be collected as part of related government processes, such as issuing commercial and recreational fishing licenses, commercial passenger vessel for hire (CPFV) reporting, issuing of citations, and CRFS intercept surveys.

- **Illustrative Questions:**
  - What consumptive and non-consumptive uses take place inside and outside of MPAs?
  - How do uses of MPAs compare to uses of other ocean spaces?
  - How have the uses of MPAs and non-MPA sites changed over time, and why?
  - How can usage patterns within MPAs inform deployment of management resources/action (e.g., enforcement, signage, education, etc)?
  - How does use / sustained use relate to factors such as cultural heritage?
  - What factors lead to sustainable use of MPAs?
- **Example Methods:**
  - Pressure counts
  - Obtain historical data (oral histories)
  - Visitor and business intercept surveys
  - Mail/Internet/Community surveys
  - Public participation GIS
  - Anonymized Cell Phone data
  - Analysis of AIS or VMS vessel data
  - Monitoring human use via drone, radar, passive acoustics, and other technology-based methods

- **Example Indicators:**
  - Visitation purposes
  - Travel motives
  - Amount and type of consumptive and non-consumptive coastal activities
  - Swimming abilities and coastal activities
  - Treatment of various social groups in coastal spaces and MPAs
  - How learning and social networks influence use of MPAs and oceans

## CORNERSTONE 4: COGNITIVE AND AFFECTIVE FACTORS

**Monitoring Objective 4-A.** Track individual and community awareness, attitudes, perceptions, values, and knowledge regarding MPAs and connected coastal systems across all social groups and Tribes.

**Guidance on Implementation, Approach, and Considerations:**

- As part of the user surveys conducted in monitoring for Cornerstone 3, add survey questions to collect information on awareness, attitudes, perceptions, values, and knowledge about that specific MPA and the MPA Network in general.
- Methods aimed at detecting the influence of MPAs should include non-MPA sites.
- Studies may be aimed at engaging key informants who are Tribal rights- and knowledge-holders and knowledgeable individuals from other target groups.
- Early studies should identify cost-effective approaches and recommended timeframes for future iterations.

- **Illustrative Questions:**
  - What are the varying levels of knowledge and awareness of MPAs? How do levels of knowledge and awareness differ among user groups, demographics, and geographies?
  - What is the range of attitudes and perceptions about MPAs and the ocean more broadly?
  - What are the types of values and ecosystem services related to MPAs and connected coastal systems (recreation, connection, protection, etc.)?
  - How does participation in community [and citizen] science programs related to MPAs influence perspectives of MPA value and outcomes?
- **Example Methods:**
  - Phone surveys
  - Intercept surveys

- Focus groups, building on instrument developed for long-term MPA monitoring
- Mixed-mode surveys
- Participatory Action Research
- Interviews
- Participant observation (in MPA Collaborative Network meetings/events, in community science programs)

- **Example Indicators:**
  - Awareness of MPAs
  - Knowledge of MPAs
  - Perceived economic impact of MPAs
  - Perceived ecological impact of MPAs
  - Perceptions of MPA governance and effectiveness
  - Support for MPAs
  - Stewardship behavior
  - Science identity and/or self-efficacy with science
  - Sense of safety from social and environmental factors when using/visiting MPAs
  - Influence of social media on perceptions of MPAs

## CORNERSTONE 5. SOCIAL OUTCOMES AND TRADEOFFS

**Monitoring Objective 5-A.** Track the distribution of costs and benefits of MPAs across social, demographic, and geographic communities. Costs and benefits can be measured across any dimension of well-being, such as:

- economic and material outcomes
- physical and mental health outcomes
- cultural outcomes

**Guidance on Implementation, Approach, and Considerations:**

- Conduct an initial cost-benefit analysis covering market and non-market values in the fishing and tourism industries, and local communities. This analysis should be conducted at the same subset of MPAs that are monitored for Cornerstone 3 and repeated every 5 years.
- There are many different ways to measure social outcomes and well-being; subsequent analyses should be conducted on these outcomes.

- **Illustrative Questions:**
  - What are the direct and indirect economic influences of MPAs for individuals and communities, and how do they change over time?
  - What are health and safety outcomes related to engagement with, access to, and use of MPA? How do these differ among demographics and social groups?
  - How do MPAs and MPA programs (such as community science, outreach and education, sanctuary advisory councils, and the MPA Collaborative Network) influence community cohesion?
  - How does participation in MPA governance and management influence social outcomes among different communities?
  - How do MPAs and coastal access contribute to the well-being of California's communities?
- **Example Methods:**
  - Cost-benefit analysis
  - Economic valuation
  - Input-output analysis
  - Historic economic geography
  - Development patterns
  - Surveys
  - Focus groups
  - Interviews
  - Social network analysis (e.g. in the MPA Collaborative Networks, or community science programs)
- **Example Indicators:**
  - Measured and perceived economic spending and benefits
  - Self-reported level of wellbeing, happiness, gratitude, peace, and quality of life of MPA and ocean users
  - Relative importance of benefits from MPAs and the ocean for various MPA and ocean user groups
  - Number, condition, and access to heritage / cultural sites
  - Number, distribution of, and access to MPA sites that allow Tribal cultural harvesting
  - Distribution of economic costs and benefits by social group
  - Self-reported trust and participation in MPA governance
  - MPA access points and CalEnviroScreen indicators

## CORNERSTONE 6. SOCIAL-ECOLOGICAL LINKAGES

**Monitoring Objective 6-A.** Identify and track social-ecological interactions and feedbacks within and among MPAs, and with connected coastal systems.

**Guidance on Implementation, Approach, and Considerations:**

- This cornerstone needs to be further jointly developed via a collaborative effort between social science experts and the ecological long-term monitoring experts (See Implementation and Operationalization).
- Use existing results from the surveys conducted in monitoring for Cornerstone 5 and from ecological monitoring to perform a thematic analysis of interview responses, evaluating how changes in fish biomass and biodiversity, and cultural ecosystem services, are related to perceptions.

- **Illustrative Questions:**
  - How do ecological changes in MPAs relate to perceptions of MPAs?
  - What are the reciprocal relationships between social and ecological systems?
  - How do changing environmental conditions influence the accessibility of MPAs?
- **Example Methods:**
  - Workshop of social and biophysical scientists and managers to develop causal models to inform linked social-ecological indicator bundles for monitoring
  - Expert elicitation from across disciplines
  - Survey about perceptions and concerns about environmental change
  - Thematic analysis of survey responses
- **Example Indicators:**
  - Number of days with small craft advisories
  - Catch per unit effort (CPUE)
  - Community nearshore fisheries dependency and vulnerability
  - Cultural ecosystem services
  - Fisheries data (e.g., landings) and demographic data (e.g., age of participants)
  - Links between community-based restoration, civic pride, and ecological conditions

# IV. Implementation and Operationalization

The following sections outline a comprehensive strategy for implementing and operationalizing the social science research and monitoring recommendations presented above, centered on four interconnected components: **Methods and Data, Capacity Building, Funding,** and an **Implementation Timeline**. Together, these recommendations bridge the theoretical goals of social science research and monitoring with the practical realities of implementation.

## A. Methods and Data

As illustrated in Section III-C, data collection across social science research and monitoring will require a diversity of methods. The working group also recognizes the need for a balance between data diversity, utilizing multiple types of data, including quantitative and qualitative methods, archives, and time-series analyses; and the need for standardization, using existing tools or establishing standardized methods that can be repeated across projects, over space, and over time to ensure data and metadata comparability. All data should be collected alongside standardized socioeconomic, demographic, and geographic information to enable comparisons across social groups.

Acknowledging that California is a large state and some social science techniques are place-based and/or incompatible with research at a statewide scale, it is important to find a balance between capturing local context and evaluating MPA Network or statewide conditions. Wherever possible, data should come from both MPA and non-MPA sites and places that are connected ecologically and socially to the ocean.

The working group encourages data collection to be designed for knowledge co-creation. Where possible, the State should support the use of participatory methods that bring users into the research process as co-producers of information, such as Participatory Action Research (PAR), and Community-Based Participatory Research (CBPR) [31-33]. These approaches build trust and ensure ethical practice. Additionally, the State should support Tribally-led recommendations and data suggestions without requirements or expectations.

One particular type of PAR methodology that the State should support are charettes, which are structured, collaborative processes for dialogue and decision-making among people from diverse social groups with potentially competing priorities. Through careful facilitation, charettes provide spaces for airing and resolving fundamental differences [34]. Charettes must be trust-based and participatory processes, pull knowledge from research and from workshop participants, and be explicitly tied to action. This approach is valuable because MPAs are typically implemented in complex social settings that include power imbalances and colonial legacies. Since MPA planning and management typically centers scientific knowledge and methods, non-scientists and other ways of knowing can be marginalized. In response, charettes have been shown to both develop knowledge, and generate buy-in, from those who have been marginalized [35].

The working group underscores the importance of the State's open data and open-source software requirements to ensure transparency and efficiency, while balancing the need to adhere to best practices in social sciences to ensure confidentiality of participants. A major challenge of hosting social science data on public archives centers on issues of data ownership and deidentification. This requirement will need to be thoughtfully addressed. There is tension between the principles of open access data and Tribal data governance principles of Ownership, Control, Access, Possession (OCAP) and Collective Benefit, Authority, Responsibility, and Ethics (CARE) [36-37]. Data ownership among collaborators, interactions with academic Institutional Research Boards (IRBs), and data deidentification and confidentiality should be addressed before initiating data collection and data archiving under this entire plan.

## B. Capacity Building

Capacity is a major factor in effective MPAs, and social science capacity is a major issue in wildlife agencies [38-40]. As such, the working group urges the importance of building internal state capacity for social science research and monitoring. Ideally, this would entail at least one full-time social scientist within each relevant agency (CDFW, OPC, and CFGC), and supporting social science training for staff at each MSLT organization. Additionally,

this could also encompass ensuring that Tribal liaisons within each relevant department or body within the California Natural Resources Agency (CNRA) receive training on social science MPA approaches. The working group recommends hiring additional Tribal liaisons who are social scientists and could focus specifically on social science in MPAs. In addition to dedicated social science staff, the working group recommends hosting social science workshops for CNRA and CDFW biophysical scientists working on MPAs that introduce them to the utility of social science for MPA management and the specific concepts and research priorities in this report. The State should also allocate funds for state agency staff travel to communities and to attend Tribal Council meetings. Existing research demonstrates that public interaction with government agencies improves when agency staff travel to rural communities.

Within one or more of the five funding tracks (discussed below), the State should fund capacity for Tribal staff to support long-term, Tribally-led, and co-led data collection and training opportunities. Tribal capacity building should also include planning and technical assistance grants for Tribal staff to prepare to submit to the funding tracks below. Dedicated capacity should support exploring opportunities for Tribally-led management and the recognition of marine cultural heritage, Tribal ocean and MPA access, as well as careful site selection for future Tribally protected areas and coastal centers. Within one or more of the five funding tracks, the State should fund similar capacity-building for community-engaged research approaches (i.e., PAR, CBPR). This would allow communities to undertake community science, community-based participatory research, and participatory action research projects that contribute to MPA monitoring and management programs.

## C. Funding

Ensuring adequate funding is allocated to the implementation of MPA social science research and monitoring recommendations across all six cornerstones will be critical to management efficacy. As such, the working group recommends that social and ecological science are equally considered and prioritized in funding decisions. Funding for social science should be strategic to sustain long-term monitoring, which addresses some of the most insightful questions about integrating human datasets with ecological monitoring. To accomplish this, the working group recommends identifying opportunities for alignment of state funding with in-kind and existing funding sources, such as philanthropies or local governments.

Allocate research and monitoring funds across the five funding tracks listed below, noting that within these funding tracks, Tribally-led and community-engaged efforts should be given special consideration in funding decisions. Researchers should be required

to engage in continuous feedback with state managers and communities. Funders can incentivize this type of co-designed research through preferential funding or setting aside specific resources to institutionalize and maintain engagements. These funding streams should be advanced concurrently whenever possible. By identifying opportunities for alignment, the State can ensure each priority area maintains momentum while leveraging shared resources for maximum impact.

- Funding Track 1: **Analysis of existing data** (in addition to the collection of new data), such as from initiatives documented in the landscape assessment of existing research and monitoring (see Implementation Timeline below).
- Funding Track 2: **Long-term monitoring** in support of the monitoring objectives for each of the six cornerstones.
- Funding Track 3: Projects in support of **research and evaluation objectives**. Note that some evaluation objectives, such as for Cornerstone 1 (Governance), will be best addressed by researchers not affiliated directly with state agencies.
- Funding Track 4: **Innovative approaches** that take advantage of California's unique MPA Network of 124 sites, each with its own social, institutional, and ecological context.
- Funding Track 5: Planning for and implementation of **charettes**, or multi-stakeholder convenings. Planning for these should begin in Phase 0 and be repeated prior to the next decadal management review.

## D. Implementation Timeline

To effectively operationalize the recommendations in this report, the working group proposes a phased, 10-year implementation timeline designed to align social science research and monitoring with adaptive management. The timeline is structured into four sequential phases, starting with an initial planning and rollout period (Phase 0) and moving through capacity building and active data collection (Phases 1 & 2) to a final synthesis and review phase (Phase 3) in coordination with the next decadal management review. Activities in each phase are categorized as: strategic communications and coordination; fulfillment of monitoring and research objectives; and management actions. The activities are designed to be supported by the five distinct funding tracks identified in the previous section. Figure 2 below places these activities along each phase of the timeline, followed by a description of the specific tasks, responsible entities, and intended outcomes.

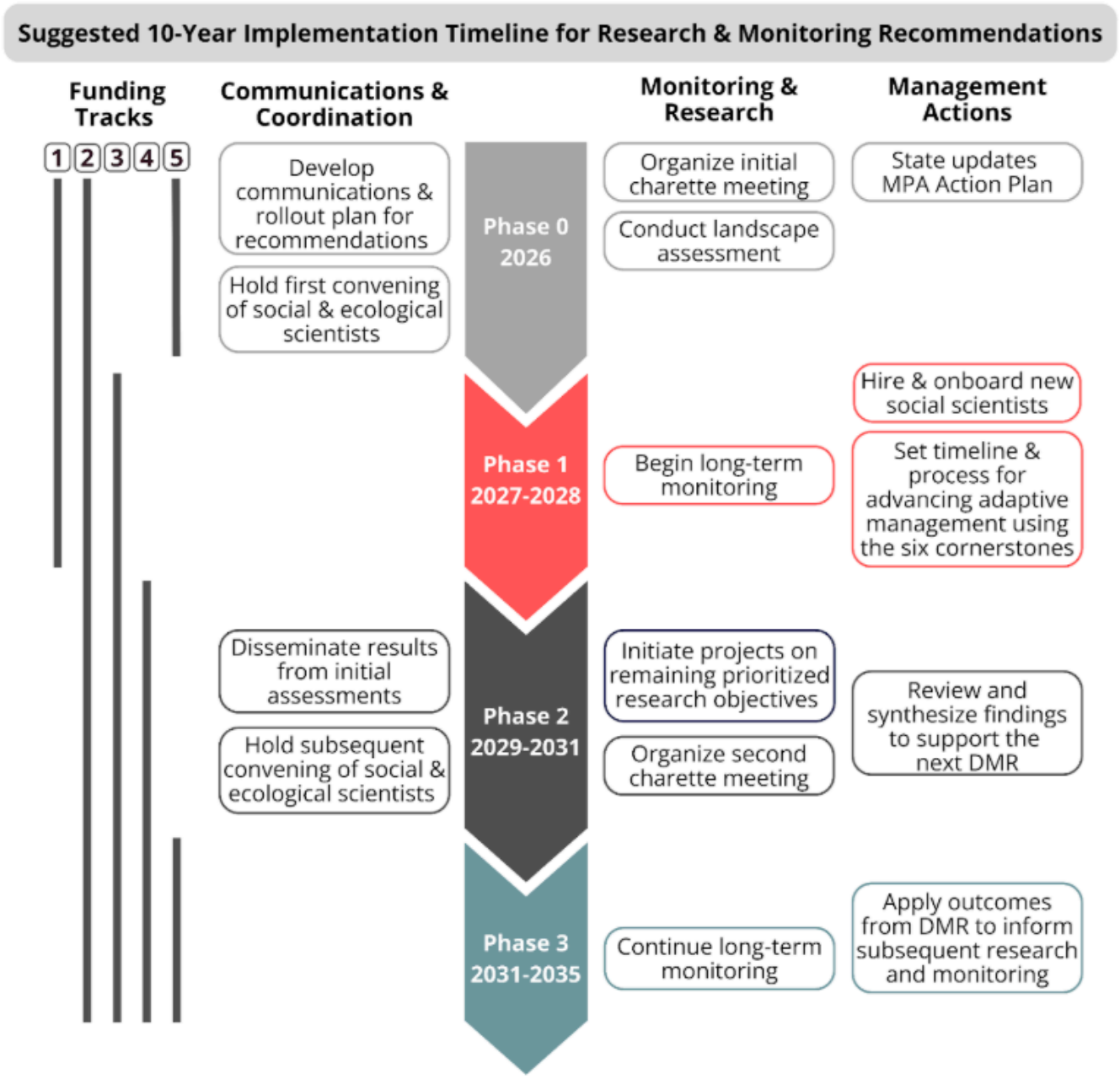



***Figure 2.*** *Suggested 10-year timeline for implementation of research and monitoring recommendations categorized by "Communication and Coordination"; "Monitoring and Research"; and "Management Actions". Location in the timeline indicates the starting point of funding and other activities. Solid bars indicate initiation and, when applicable, completion of each funding track.*

## PHASE 0 – YEAR 0 - 1 (2026)

- Develop a **rollout and communications plan** for this report to key interest groups, including MPA governance and management entities, as well as Tribes.
- State updates the MPA Monitoring Action Plan to incorporate recommendations in this report.
- Begin planning for **initial multi-stakeholder convenings (charettes**), intentionally designed to gather participants with differing opinions to discuss specific issues related to MPAs in California (Funding Track 5).
- **Conduct a landscape assessment** of existing research and monitoring (Funding Track 1). These data and subsequent data collected should be archived in open-source, durable repositories.
- **Hold first convening of social and ecological scientists** to begin social-ecological integration, informing the implementation of Cornerstone 6.

## PHASE 1 – YEARS 1 - 2 (2027 - 2028)

- **Hire and onboard new full-time social scientists** at CDFW, CFGC, and OPC.
- Set a timeline and process for **advancing adaptive management using the six cornerstones** and their corresponding evaluation objectives.
- **Begin long-term monitoring and projects to advance research and evaluation objectives**, prioritizing objectives that require initial data for future assessments (Funding Tracks 1, 2, and 3).

## PHASE 2 – YEARS 3 - 5 (2029 - 2031)

- **Disseminate results from initial assessments, long-term monitoring, and projects** to advance cornerstones using a strategic communications plan.
- Initiate projects focused on **remaining research objectives** that were not initiated in years 1-2 (Funding Tracks 3 and 4).
- **Hold subsequent convening of social and ecological scientists** to continue social-ecological integration.
- Across the six cornerstones, review and synthesize findings to date to **inform the next Decadal Management Review (DMR).**

## PHASE 3 – YEARS 5-10 (2031 - 2035)

- Hold a second convening **(charette) prior to the DMR** (Funding Track 5).

- **Apply outcomes from DMR** to inform subsequent social science research and monitoring
- **Continue long-term monitoring** that began in years 1-2; much of this information should be monitored on an approximately 5-year cycle.
- Continue projects that **advance research and evaluation objectives** (Funding Tracks 3 and 4).

By implementing standardized data methodologies, enhancing institutional capacity, and funding key actions, California can establish a durable framework for integrating social science research and monitoring into the management of the MPA Network. This comprehensive operational strategy ensures that state agencies and MPA partners have the resources necessary to translate social science insights into long-term, equitable ocean stewardship.

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# APPENDICES

## A. Terminology

The definitions below are generally those adopted by the State of California. Where no widely accepted definition exists, several definitions from reputable sources have been reviewed and integrated into a recommended definition.

**Adaptive Management (DMR Glossary, 2022):**
With regard to the marine protected areas, adaptive management is a management approach that seeks to improve management of biological resources, particularly in areas of

scientific uncertainty, by changing it based on lessons learned. Actions shall be designed so that, even if they fail, they will provide useful information for future actions, and monitoring and evaluation shall be emphasized so that the interaction of different elements within marine systems may be better understood.

**Affective (Merriam-Webster, 2026)**
Relating to, arising from, or influencing feelings or emotions; or expressing emotions.

**California Native American Tribes (CNRA Tribal Consultation Policy, 2025):**
California Native American Tribe means a federally or non-federally recognized California Native American Tribal government.

**Community engagement (OPC Equity Plan, 2022):**
In the context of the OPC Equity Plan, community engagement entails conducting outreach to, collaborating with, and co-creating with communities to achieve long-term and sustainable outcomes, relationships, and decision-making processes. It also includes the process of working collaboratively with groups of people who are affiliated by geographic proximity, special interests, or similar situations with respect to issues affecting their well-being.

**Community [and citizen] science, [CCS] (OPC Equity Plan, 2022):**
In the context of the OPC Equity Plan, community and citizen science refers to scientific nodes of inquiry (research, monitoring, and analysis) that is inclusive of diverse forms of knowledge, and is driven, led, or implemented by local communities, and characterized by place-based knowledge, social learning, collective action, and empowerment.

**Conflict transformation (Lederach, 2014):**
To envision and respond to the ebb and flow of social conflict as life-giving opportunities for creating a constructive change process that reduces violence, increases justice, in direct action and social structures, and respond to real-life problems in human relationships. Conflict transformation (CT) approaches conceptualize immediate problems as opportunities to understand and positively change the causal relationships, decision-making processes, and systems shaping the conflicts (Lederach et al., 2007). CT starts with a relational approach (Lederach, 2003). By designing and sustaining processes that aim to reconcile negative relationships, CT approaches seek to create conditions where actors can humanize their view of and relationships with "the other" to create the space and opportunity to move from an "us" versus "them" mentality to a more inclusive and genuine "we" (Madden & McQuinn 2014).

**Culture (OPC Equity Plan, 2022):**
Culture refers to a system of shared meanings that is expressed through patterns of customs, practices, and thoughts. A person's culture can come from any combination of age; education; ethnicity; geographic origin; gender; group history; language; life experiences; religious or spiritual beliefs and practices; sexual orientation; and socioeconomic class. Culture is dynamic, changes with time, and is learned and transmitted by members of a particular community.

**Disadvantaged, Marginalized, Underserved (OPC Equity Plan, 2022):**
SB 1000 (Leyva) (Ch. 587, Stats. 2016) added Government Code Section 65302(h)(4)(A), expanding the definition of "disadvantaged communities" for the purpose of general plans to mean "an area identified by the California Environmental Protection Agency pursuant to Section 39711 of the Health and Safety Code or an area that is a low-income area that is disproportionately affected by environmental pollution and other hazards that can lead to negative health effects, exposure, or environmental degradation." This Plan uses the terms "disadvantaged", "marginalized" and "underserved" interchangeably; it intends to encompass not only the definitions contemplated by SB 1000, but also to include other low-income and minority populations that are disproportionately burdened by or less able to prevent, respond, and recover from adverse environmental impacts.

**Ecosystem Services (Millennium Ecosystem Assessment, 2005; Bennett et al., 2009):**
The benefits that people derive from ecosystems, including provisioning (food, water), regulation (flood protection, water filtration), culture (spirituality, culture), and support (nutrient cycling).

**Effectiveness:**
The capability of an action, process, or system to achieve its intended result, outcome, or goal. In a management context, effectiveness is the degree to which an organization, process, or individual attains its objectives. Measures how well pursued goals have been reached.

**Equitable Access (CNRA Outdoors for All Strategy, 2023):**
All people can experience and enjoy California's outdoors regardless of who they are or where they live. It also means that everyone can experience the outdoors in a way that is safe, welcoming, convenient, affordable, and culturally relevant.

**Equity (CNRA Outdoors for All Strategy, 2023):**
Based on the Government Alliance on Race and Equity, equity is defined in the context of social and racial equity, and means achieving fair outcomes for all groups, while fully acknowledging and addressing unequal starting points.

**Environmental justice (OPC Equity Plan, 2022 and Martin, 2017):**
The fair treatment and meaningful involvement of people of all races, cultures, incomes, and national origins, with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. Dimensions of environmental justice include distributional justice, recognitional justice, and procedural justice.

**Governance: (Ostrom, 2009):**
The norms, institutions, and processes that determine how power and responsibilities over resources are exercised, how decisions are made, and how different people participate in these processes.

**Human Behavior (adopted from Karls and Wandrei, 1994):**
The range of actions, reactions, and interactions exhibited by individuals within societal contexts, influenced by cultural norms, values, beliefs, and social and political structures.

**Human Dimensions (of MPAs) (Decadal Evaluation Working Group (DEWG) Report, 2021):**
The social, economic, cultural, and institutional aspects of MPAs, which encompass the state or change of human behavior, economic outcomes, and stakeholder attitudes, perceptions, or knowledge (informed by Charles and Wilson 2009).

**Indigenous Knowledges/Indigenous science (Climate and Traditional Knowledges Workgroup (CTKW), 2014); Jessen et al., 2021; Reid et al., 2020):**
Indigenous Knowledges (IKs) are Indigenous communities' diverse, dynamic, place-based knowledge systems and lifeways. IKs are accumulated over millennia through community members' close relationships with and responsibilities towards their environments, and have guided and continue to guide Indigenous communities' and Tribal Nations' management and stewardship of their ancestral territories and kin. For many Indigenous peoples, IKs are inextricably linked to knowledge holders, and "for many, it is not a definable object, but instead a way of being and living in the world" (Reid et al., 2020). This term is intentionally used in the place of what is often referred to as "Traditional Knowledges" or "Traditional Ecological Knowledge" (see the CNRA Tribal Stewardship Strategy, 2025) to recognize that these ways of knowing are active, dynamic, and not a relic of the past.

**Management levers (adopted from Hajjar et al., 2021):**
A diverse array of policies, programs, technologies, and strategies, including regulatory or institutional interventions, and voluntary strategies based on incentives, that can be implemented at various scales, from local reforms in tenure rights to state policies.

**Social outcomes:**
Measurable effects or changes on individuals' well-being and relationships. They are the concrete, often long-term, results of social functioning, including economic and material outcomes, physical and mental health, cultural outcomes, community engagement, and equity.

**Social Groups (EBSCO):**
Any collection of two or more individuals engaged in some form of interaction, whether it be for personal or professional reasons. These groups are typically bound by shared norms and values, creating a common sense of expectations among members. Social groups can vary in duration, with individuals often belonging to multiple groups simultaneously. Within the study of social groups, two main types are recognized: primary groups, which are characterized by close, intimate relationships, and secondary groups, which are more formal and task-oriented.

**Social science (modified from Social Science Strategy for the Sacramento-San Joaquin Delta, 2020):**
Systematic study of human society and social relationships using a variety of methods, data types, and analyses. The social sciences encompass a range of disciplines such as anthropology, geography, economics, public administration, psychology, and sociology, with sub-disciplines focused on environmental and natural resource management (e.g., natural resource economics, human ecology and environmental psychology).

**Tribal Access (Tribal Stewardship Policy, 2025):**
California Native American Tribes have access to their ancestral lands and tribally approved activities geared at encouraging Tribal members to experience, enjoy, use, and be in relation with their ancestral lands, the outdoors and environment, sacred sites, ceremonies, Tribal cultural resources, and natural resources.

**Tribal Co-Management (CNRA Tribal Stewardship Policy, 2025):**
A specific relationship between a federally recognized tribe and other sovereign governments. As defined by California Government Code 11019.82 (b) (3), co-management "means a collaborative effort established through an agreement in which two or more sovereigns mutually negotiate, define, and allocate amongst themselves the sharing of management functions and responsibilities for a given territory, area, or set of natural resources."

**Tribal guardianship (Reed et al., 2021):**
Adopted from the concept of Indigenous guardianship (Reed et al, 2021) for the context of California. A community-based environmental governance model in which Indigenous

Peoples re-establish and exercise their traditional and ancestral roles as stewards of the land, water, and ice. It is an expression of inherent sovereignty that involves the daily monitoring and enforcement of Indigenous laws, the weaving of Indigenous Knowledges with non-Indigenous science (Two-Eyed Seeing; see Reid et al., 2020), and the active management of ancestral territories to ensure both ecological integrity and cultural revitalization.

**Use patterns (adopted from NOAA NCCOS and IUCN Socioeconomic Manual for Coral Reef Management)**
The spatial and temporal distribution of human activities—both extractive (e.g., fishing) and non-extractive (e.g., recreation, shipping)—and their associated intensity, frequency, and duration.

**User groups (IUCN Socioeconomic Manual for Coral Reef Management)**
Groups of people who share similar sets of interests, activities, or values regarding a specific natural resource. These groups are often categorized by the way they interact with the resource (extractive vs. non-extractive) and their level of dependency on it (primary vs. secondary).

**Well-being:**
A state of being with others and the environment, which arises when human needs are met, when individuals and communities can act meaningfully to pursue their goals, and when individuals and communities enjoy a satisfactory quality of life (Armitage et al. 2012). Gollan and Barclay (2020) present seven aspects of well-being: 1) environment; 2) health and safety; 3) social connections; 4) education and knowledge; 5) culture and heritage; 6) governance; and 7) local economy.

## B. Additional Example Research Questions for Each Cornerstone Objective

The following is a non-exhaustive list of potential research questions that fall under each objective. A product of the collected wisdom of working group members, this list is intended to guide and inspire inquiries by a broad community of researchers, including but not limited to state-supported research. For example, this appendix could be used as a resource for graduate students to find management-relevant topics or for researchers seeking to justify research relevance in funding proposals.

## CORNERSTONE 1: GOVERNANCE

### MONITORING OBJECTIVES

**1-A. Track who is, and is not, participating in MPA governance, as well as the type of participation.**

- What motivates people to participate (or not participate)?
- What are obstacles to participation (for those who would want to participate)?
- Who is, and who is not, engaging with the MPA Management Program and the MSLT? How do they engage, why do they engage, and what are the benefits and drawbacks of their engagement?

**1-B. Track the governance structures, power dynamics, and decision-making rights of formal and informal governance bodies and partners.**

- What agencies and organizations have the power to make a decision, the power to set the agenda, and the power to shape how participants think about possibilities in MPA governance?
- How are decisions made about MPA governance? Who participates in these decisions?
- How is leadership distributed among governing organizations of the MPA Network?
- How do relevant agencies relate to one another during MPA management implementation and evaluation? Are there redundancies or overlaps in the roles of relevant agencies? If so, how are these impacting governance processes?
- What role do relationships play in MPA management? How might institutional relations be improved?
- How does conflict shape MPA governance? How is conflict mediated?
- How does institutional/agency culture impact perception of, and engagement with, MPAs and MPA governance processes?
- How participatory, effective, and equitable is MPA governance?
- What are the roles and effects of community and conservation groups that aim to build a stewardship ethic around the MPAs? How have these roles changed?
- How do existing laws and regulations enable or hinder stewardship activities?
- Which conversations and decision-making processes during the establishment of the MPA Network explain the current distribution of MPAs and existing sources of conflict?

- What capacity building is needed to ensure community stewardship?

**RESEARCH OBJECTIVES**

**1-C. Determine how adaptive management of the MPA Network as a whole is perceived and/or operationalized by formal and informal governance bodies, social groups, and Tribes.**

- What are the relative roles of biophysical, social, and governance measures of effectiveness, and how are they balanced? Are there any barriers to integrating social and governance measures into management decisions?

**1-D. Evaluate the relationships among, and influences of, MPA enforcement, compliance, and Tribal Guardianship across all social groups.**

- What are the distribution and effectiveness of current enforcement strategies (e.g., ordinances and personnel presence)?
- How are existing sanctions graduated and aligned with infraction severity?
- How do users perceive rules, regulations, and enforcement mechanisms? How does this differ among user groups, and how has it changed over time? Does this influence compliance?
- What is the interplay among trust, compliance, and culture in the context of MPA enforcement and compliance?
- What are the degrees of understanding of rules across social groups, including managers?
- How do citizens acting in a patrolling role impact Tribal use of the ocean?
- How do enforcement officers understand and have cultural awareness of Tribal use and Tribal rights?
- What is the capacity of local agencies to enforce existing regulations?
- What are the obstacles to the enforcement of MPA rules and regulations, and enforcement?
- What are resource user-perceptions of MPA rules and regulations, and enforcement?

**1-E. Understand the relationship between MPA governance and attitudes, perceptions, and knowledge of MPAs.**

- How does governance influence attitudes about MPAs?
- How do perceptions (see list of indicators in Section III-C) vary by group, and why?
- How does awareness and knowledge of MPA governance vary by group, and why?
- Are attitudes, perceptions, and awareness of MPA governance changing over time? And why?

- How does institutional/agency culture impact perception of, and engagement with, MPAs and MPA governance processes?
- How do existing policies and permits influence awareness and understanding of those laws for various user groups?
- What are the public perceptions regarding MPA management capacity? In what ways can perceptions of MPA management be improved?

**1-F. Identify areas of conflict, governance processes contributing to that conflict, and pathways for conflict transformation where the underlying conditions that produce conflict in the first place can be changed.**

- Are there examples of conflict transformation in California's MPA system, and what governance (and other) factors contributed to successful conflict transformation?
- What are underlying sources of conflict over MPAs (e.g. values, culture, identity, trust, etc.) and what are possible paths toward addressing these toward conflict transformation?

**1-G. Understand how participating in MPA governance, stewardship, and guardianship influences cognitive and affective factors, social outcomes, and use patterns.**

**EVALUATION OBJECTIVES**

**1-H. Evaluate the institutional social science capacity of MPA governance systems, management entities, and monitoring programs.**

- What factors enable the use of social science in MPA management? What are managers willing to change?
- What capacity building is needed to ensure long-term social science monitoring?

**1-I. Evaluate the impact and efficacy of MPA outreach and education by MPA governance entities and partners.**

- How do the nature and distribution of outreach, education programming, and general communications related to MPAs differ in their format, effectiveness, and the demographics of who they reach?
- What forms of education and outreach are most effective in raising awareness, improving MPA understanding, increasing compliance, and inspiring stewardship, and does this vary across demographic groups?

**1-J. Evaluate the transparency, inclusivity, and responsiveness of MPA governance, specifically the use of social science research and monitoring findings to ensure equitable distribution of social outcomes.**

- How, and what kind of social science data are used in MPA management?

- What management levers can be activated in response to new data? What mechanisms exist for data to influence management decisions?

**1-K. Track how factors such as permitting processes and enforcement training are adapted to facilitate Tribally-led stewardship, co-management, training, research, and monitoring.**

## CORNERSTONE 2: TRIBAL STEWARDSHIP, GUARDIANSHIP & SOVEREIGNTY

*Tribes to determine their own research questions that span across the social-ecological system, extending to outcomes beyond MPA social science research questions, methods, and indicators.*

## CORNERSTONE 3: BEHAVIOR AND USAGE

### MONITORING OBJECTIVES

**3-A. Describe the cultural and demographic characteristics, social identities, and relationships of MPA users and related groups.**

- What are the demographics of MPA users in California? How does their use vary by location, use, and demographics?
- How do the characteristics of MPA users compare to coastal and state-wide demographics?
- How have the demographics of those who use MPAs and reference sites changed over time?
- Are demographic factors correlated with behavior in MPAs? Are certain demographics or cultures more likely to engage in certain types of activities (i.e., compliance, tourism, stewardship)?
- What cultural factors influence behavior in MPAs?

**3-B. Track behavior and usage patterns in MPAs, and access to MPAs, and connected coastal systems, including consumptive and non-consumptive user groups.**

- What consumptive and non-consumptive uses are happening within and adjacent to each MPA? Can these be quantified in a meaningful way?
- How do uses of MPAs compare to uses of other ocean spaces? Does general ocean use influence behavior in, and use of, MPAs?
- How have the uses of MPAs and reference sites changed over time, and why?

- What are the projected future levels of human activities in MPAs? How would changes in use levels influence MPA resources and governance?
- What is the geographic distribution of human activities throughout the MPA Network? Are there hot spots? What factors influence activity distribution and hotspot locations?
- Has the geographic distribution of human activities throughout the MPA Network changed over time?
- How do users steward the ocean and MPAs? How often are reciprocal contributions activities part of ocean activities?
- How have regulations impacted human activities in and around MPAs?
- How do relationships to MPAs, and the oceans more broadly, vary depending on an individual's geographical proximity to MPAs and the coast?

**RESEARCH OBJECTIVES**

**3-C. Understand how behavior and usage patterns of MPAs and connected coastal systems influence cognitive and affective factors and social outcomes.**

- How does ocean use influence awareness, attitudes, perceptions, values, and knowledge of MPAs?

**3-D. Understand how MPA and ocean users' cultural and demographic characteristics, social identities, and relationships influence behavior and usage.**

**3-E. Understand MPA access, barriers to access, mechanisms to reduce those barriers, and how those vary among social groups and Tribes.**

- How are people accessing MPAs?
- How does access influence perceptions and stewardship of MPAs?
- What are the physical, proximal, socioeconomic, and cultural barriers to ocean and MPA access? Are there means to minimize them?
- What are the relationships between access and social groups' interests and cultures?
- How do social and environmental change influence people's access?
- How do California Native Americans exercise their rights and responsibilities within MPAs? What barriers do they face in exercising their rights?
- How have Tribal activities and access been impacted by non-Tribal members who act as gatekeepers? By enforcement officers? Have trainings or outreach to non-Tribal members influenced this?

- Are there inequities in access between different demographic groups, are there other drivers that explain differences?

**3-F. Understand how participation in community science programs and other MPA- and ocean-related activities influences cognitive and affective factors, social outcomes, and use patterns.**

- Why do participants engage in community science and what are the social impacts they experience through their involvement?
- How does participation in community science influence people's
  - awareness and knowledge of MPAs?
  - attitudes and perceptions towards MPAs?
  - values of protecting marine areas?
  - understanding of science and data?
  - participation in MPA governance?
- How does participation in community science influence people's behavior in MPAs, when not actively participating in the program? Does it alter the types of use they typically engage in?

**3-G. Understand how participation in Tribal stewardship of MPAs and connected coastal systems influences cognitive and affective factors, social outcomes, and use patterns.**

- How does Tribal stewardship influence awareness, attitudes, perceptions, values, and knowledge?
- How does Tribal stewardship influence behavior and MPA use?

## CORNERSTONE 4: COGNITIVE AND AFFECTIVE FACTORS

### MONITORING OBJECTIVES

**4-A. Track individual and community awareness, attitudes, perceptions, values, and knowledge regarding MPAs and connected coastal systems across all social groups and Tribes.**

- What are the varying levels of knowledge and awareness of MPAs?
- What is the range of attitudes and perceptions about MPAs and the ocean more broadly?
- What are the types of values related to MPAs and the ocean (extraction, recreation, connection, protection, etc)
- How do people prioritize tradeoffs between different values of MPAs? Consumptive, non-consumptive, existence value, future preservation value?
- Do relationships affect values/attitudes about MPAs and the ocean?

## RESEARCH OBJECTIVES

**4-B. Understand how historical and present socioeconomic, demographic, and cultural factors influence awareness, attitudes, perceptions, values, and knowledge of MPAs and connected coastal systems.**

- How do knowledge and awareness of MPAs differ among cultures, social groups, and with economic status?
- How do attitudes and perceptions about MPAs differ among cultures, social groups, and with economic status?
- How do values related to MPAs and the ocean (extraction, recreation, connection, protection, etc.) differ among cultures, social groups, and with economic status?
- How has the history of geographic communities affected support/opposition and trust?

**4-C. Identify the characteristics (e.g., format, scope of program, methods of engagement and participation, etc.) of formal and informal education that influence awareness, attitudes, perceptions, values, and knowledge of MPAs and connected coastal systems.**

- In what ways have outreach and education efforts accomplished MPA objectives, such as increasing awareness of the MPA Network?
- Do formal, informal, hands-on, in-person engagement, outreach, and classroom instruction yield different results with respect to behavioral change in users of Marine Protected Areas?
- What groups are, and are not, reached by MPA education?
- How is knowledge about the MPAs passed on and taught?
- What are general themes that resonate with a broader public to increase awareness/perceptions? Do specific themes resonate with specific demographics?

**4-D. Understand the influence of awareness, attitudes, perceptions, values, and knowledge on behavior, including use patterns and compliance.**

- What are the enabling conditions for compliance?
- How does awareness and knowledge of MPAs influence consumptive and non-consumptive use?
- How do attitudes and perceptions regarding MPAs influence consumptive and non-consumptive use?

**4-E. Identify existing learning networks and understand how involvement in the networks influences awareness, attitudes, perceptions, and knowledge of MPAs and connected coastal systems; and identify opportunities to strengthen and build the capacity of existing and new learning networks.**

- What are current learning networks for MPAs?
- How are learning networks linked to other perceived and realized management, governance, and ecological outcomes?
- How are social learning networks, including the Tribal Marine Stewards Network and the MPA Collaborative Network, building capacity for MPA management? In what ways are these capacity-building activities helping advance the goals of the MPA Network?

## CORNERSTONE 5: SOCIAL OUTCOMES AND TRADEOFFS

### MONITORING OBJECTIVES

**5-A. Track the distribution of costs and benefits of MPAs across social, demographic, and geographic communities. Costs and benefits can be measured across any dimension of well-being, such as:**

- **economic and material outcomes**
- **physical and mental health outcomes**
- **cultural outcomes**

- What are health and safety outcomes related to engagement with, access to, and use of MPAs? How do these differ among demographics and social groups?
- How do MPAs influence culture and sense of identity?
- What are the direct and indirect cultural impacts of MPAs across social groups?
- How does participation in Tribal stewardship influence human well-being outcomes?
- What are the direct and indirect economic impacts of MPAs across social groups?
- What are the economic outcomes of MPAs for rightsholders, users, and adjacent communities, considering tradeoffs or costs/benefits?
- What are the value and cost of MPAs to consumptive and non-consumptive users? Can we develop new techniques for estimating the value of protection?
- How does participation in MPA governance and management influence human well-being outcomes?

### RESEARCH OBJECTIVES

**5-B. Identify conditions, actions, and activities (i.e., participation in educational programs, stewardship) that facilitate a sense of connection with MPAs and connected coastal systems.**

- Does use of MPA resources inspire a sense of MPA stewardship? In what ways does this vary across different types of MPA uses?
- Who volunteers for MPAs (community science, education, docents, etc.) and what motivates volunteers?
- What are coastal communities' historic relationships to the ocean and MPAs? How have these relationships changed through time?
- The State's demographics have undergone significant changes over time, particularly in recent decades. What impact has this had on communities' relationships to the ocean and MPAs?
- How do different demographics (including ocean users and non-users) relate to the ocean and MPAs?

## CORNERSTONE 6: SOCIAL-ECOLOGICAL LINKAGES

### MONITORING OBJECTIVES

**6-A. Identify and track social-ecological interactions and feedbacks within and among MPAs, and with connected coastal systems.**

- How does participation in governance and stewardship influence ecological dimensions?
- How are biophysical characteristics of MPAs associated with differing levels of participation in MPA governance and stewardship?
- What are the relationships between participation in management and ecological outcomes, including biomass, habitats, water quality, migration, and soundscapes in MPAs?
- How do changes in ecology impact human use?
- How do compliance and non-compliance influence ecological outcomes?
- What are the ecological and social-ecological impacts of existing access, and improved access to MPA sites and adjacent non-MPA sites?
- How do biological responses for important species differ throughout the MPA Network? Do they differ by MPA type?

## RESEARCH OBJECTIVES

**6-B. Understand how awareness and perception of ecological status, or the value of ecological resources within MPAs, influence human behavior, such as compliance.**

- How does awareness of ecological status influence behavior, including tourism, recreational use, and fishing, within and adjacent to MPAs?
- Are individuals and social groups who are aware of ecological status more likely to engage in consumptive or non-consumptive activities?
- What is the range in awareness of the ecological status of resources within MPAs? What are the factors influencing awareness of ecological status, including socioeconomic demographics.

**6-C. Investigate the reciprocal relationships between the species, habitats and functions valued by individuals, social groups, and Tribes.**

- What species, habitats, and/or systems present in MPAs are valued, and by whom?
- What Tribally important species are present in MPAs?
- What are the ecological services provided by the MPA Network, and what are the non-market values?
- How do MPAs affect the species, habitats, and systems that are valued?

# C. Working Group Member Recruitment, Evaluation, and Selection Process

The Marine Protected Areas (MPA) Social Science Working Group recruitment was conducted through an open call for both applicants and nominations. This call, hosted on OPC's website, was released on April 1, 2025 and open for 26 days, and circulated through OPC and OST communication channels, including social media and listservs. The call specified that the working group sought individuals with expertise in any of the following areas: Behavioral science; Collaborative fisheries research; Community and participatory science; Environmental and climate vulnerability; Environmental justice; Natural resource management and governance; Natural resources economics; Social-ecological systems theory; and Indigenous Knowledge, Tribal science, and Tribal cultural heritage. Prior experience with MPAs was not required; applicants with relevant experience in other social science or natural resource contexts were also considered. Selected Working Group members received honorarium, as a nominal recognition of the working group members' participation and knowledge, which may include the following tasks:

- Reviewing background materials on Marine Life Protection Act, California's MPA Network, decadal management review and resulting Decadal Evaluation Working Group guidance and recommendations
- Reviewing and providing input on working group charge and draft structure for the Working Group report
- Providing an overview of datasets and programs they manage
- Participating in scenario visioning for best-case social science research and monitoring recommendations
- Developing recommendations for social science research and monitoring
- Co-developing prioritization approach for research and monitoring recommendations
- Prioritizing research and monitoring recommendations
- Providing input on strategies for implementing recommendations and considerations for integration with ecological monitoring
- Providing a red flag review on final Working Group report

## RECRUITMENT PROCESS

The application asked individuals to identify their affiliation, position title, geographic location, resume/cv, and summarize their 1) experience working on social science in marine protected areas; or 2) social science in other resource management contexts. To encourage a sufficient number of applications, OPC, OST, and CDFW staff also engaged in targeted outreach to approximately 40 people with relevant expertise. This included people who are actively engaged in MPA programs (e.g., MPA Watch), academics from California and other states and countries with a record of social science research connected to MPAs, and Tribal partners across the California coast. These individuals received the open call and were encouraged to indicate their interest, apply directly, or nominate someone to submit their own application. The open call closed on April 27, 2025. The final pool contained a total of 53 applicants.

Alongside the general open call, recruitment, and evaluation process, OPC staff conducted additional targeted outreach through existing professional networks to people with Indigenous Knowledges, Tribal science, and Tribal cultural heritage expertise. Recruitment of those with Tribal expertise continued beyond the timeline of recruitment for other areas of expertise, to ensure representation of Tribal expertise from the North Coast, Central Coast, and South Coast regions of California. OPC, OST and CDFW acknowledge that each coastal Tribe in California has its own distinct lifeways, knowledges, and practices and that perspectives on MPAs differ between and within Tribes. At a minimum, one working group seat per California coastal region was reserved for someone with Tribal expertise from that region.

## EVALUATION AND SELECTION PROCESS

Applicants were evaluated by OPC and OST staff. Initially, staff evaluated applicants based on 1) their experience with social science in MPAs or 2) social science in other resource management contexts; listing their expertise as low, medium, or high in each of these two areas. Evidence of expertise could include peer-reviewed publications exploring social science methods for MPA management, engagement with ongoing MPA social science monitoring efforts in either California or other states, and/or prior experience developing science-based recommendations for MPA adaptive management. Given the number of highly qualified applicants, only those with high expertise in one area, and medium to high expertise in another moved forward to the second stage of evaluation.

In the second stage of evaluation OPC, OST, and CDFW staff used submitted materials to identify applicants' primary areas of subject matter expertise as it pertained to each of the disciplines listed in the working group call. In assembling the working group, staff considered whether individuals contributed unique subject matter expertise, or represented a unique geography or sector. Ultimately, staff selected 16 working group members with primary expertise in Indigenous Knowledges, Tribal science, and Tribal cultural heritage (5 members), community engagement (3), environmental justice (2), economics (1), climate vulnerability (1), sociology (1), social-ecological systems theory (1), social psychology (1), and natural resource management (1). Final selections were thus made in consideration of individual expertise and to establish a working group that collectively encompasses a breadth of expertise and perspective.

## CONTRIBUTOR ROLE

In addition to the working group members, OPC, OST, and CDFW created a "contributor" role for external non-working group members to engage in this effort. This decision was driven by the high number of qualified applicants and the need and opportunity to engage a broad range of expertise and perspectives to inform the development of MPA social science research and monitoring. Individuals were invited to be contributors for several reasons. Some individuals would have been selected for the working group but could not commit the degree of time needed (4 contributors). In other instances, individuals were invited to be contributors because their expertise or experience did not precisely align with the working group's social science focus, but they could still provide valuable perspectives (1). Lastly, some individuals were invited to be contributors because there were multiple working group members with the same primary subject matter expertise, and other applicants had more experience working in marine protected areas.

The contributor role offered flexible commitment and engagement, but generally included input at the beginning and toward the end of the project: 1) meeting with OST, OPC, and/or CDFW staff in June or late July 2025 to provide initial feedback on the overall project scope, and 2) reviewing and providing feedback on draft social science research and monitoring recommendations in Winter 2025-2026. Ten contributors were selected to be a part of this process. They had primary expertise in Indigenous Knowledges, Tribal science, and Tribal cultural heritage (3 contributors), social-ecological systems (1), collaborative fisheries research (2), natural resource management (2), and climate vulnerability (1).