

**California Marine Life Protection Act Initiative:  
Monitoring and Evaluation Section of the Draft Master Plan Framework**

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**X.X MONITORING AND EVALUATION**

In the last several decades, monitoring and evaluation have become important features of management approaches to living marine resources and the environment (NRC 1990). More recently, they have become central elements in management programs intended to adapt as understanding of the managed ecosystems – both the biophysical and social systems – improves and circumstances change. In California, the Legislature incorporated this adaptive approach into the Marine Life Management Act (MLMA) in 1998. Besides defining adaptive management, the MLMA requires the development of research and monitoring activities within fishery management plans (FGC Sections 90.1, 7073[b]3, and 7081).

A year later, the Legislature incorporated the principle of adaptive management as well as monitoring and evaluation of MPAs and MPA networks into the Marine Life Protection Act (MLPA):

- At FGC Section 2853(c)3, the MLPA requires that the Marine Life Protection Program include “[P]rovisions for monitoring, research, and evaluation at selected sites to facilitate adaptive management of MPAs and ensure that the system meets the goals stated in this chapter.”
- FGC Section 2852(a) uses the definition of adaptive management first used in the MLMA: “‘Adaptive management,’ with regard to marine protected areas, means a management policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing program actions as tools for learning. 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.”
- At FGC Section 2856(a)2(H), the MLPA requires that the Master Plan include “[R]ecommendations for monitoring, research, and evaluation in selected areas of the preferred alternative, including existing and long-established MPAs, to assist in adaptive management of the MPA network, taking into account existing and planned research and evaluation efforts.”
- Finally, FGC Section 2855(c)3 requires that in developing the Master Plan, the Department and team solicit comments and information from interested parties regarding a number of issues, including the design of monitoring and evaluation activities.

In these and other ways, the MLPA emphasizes the role of monitoring and evaluation in adapting individual MPAs and MPA networks in response to new knowledge and circumstances. In doing so, the

MLPA reflects state of the art practice and expert opinion (NRC 2001). It is worth noting that the MLPA does not call for monitoring and evaluation of all MPAs, but rather of selected areas.

Since MPA networks will be phased in individual regions through 2011 rather than adopted all at once statewide, the initial focus must be on developing effective monitoring programs in individual regions, including monitoring in areas both inside and outside MPAs. As these programs yield results, experience should lead to the revision of this document for use in later regions. The final phase in developing monitoring and evaluation programs will be the evaluating and adjusting these programs in individual regions to reflect a coherent program statewide.

Meeting the MLPA's standards regarding adaptive management should begin with developing management plans, as described elsewhere, that identify explicit ecological and socioeconomic goals for each MPA and MPA network that align with the intent of the MLPA. Specific measurable objectives should be identified that can be used to evaluate progress towards these MPA goals.

Clear and measurable objectives should, in turn, form the basis for the design of systems to monitor and evaluate the impacts of management actions. Monitoring and evaluation systems should explicitly address five principles (Pomeroy et al. 2004). Such programs should be:

- Useful to managers and stakeholders for improving MPA management;
- Practical in use and cost;
- Balanced to seek and include scientific input and stakeholder participation;
- Flexible for use at different sites and in varying conditions; and
- Holistic through a focus on both natural and human perspectives.

Adaptive management also requires a feedback loop through which monitoring results inform management decisions. Through this process the MPA network objectives, management plans, and monitoring programs are adjusted in response to new information and circumstances (Pomeroy et al. 2004; NRC 1990). To this end, management plans for MPA networks should specify methods and timing for reporting and incorporating the results of monitoring and evaluation programs into management decisions *before* monitoring programs are developed and implemented.

Effective monitoring and evaluation programs can assess whether actions taken have produced the desired results and other benefits (Pomeroy et al. 2004). For instance, such programs can assess whether resources expended in management have been effective and consistent with policy and management goals, and have yielded progress toward goals and objectives. Appropriately defined benchmarks provide useful quantified measures of progress toward a goal at specified stages. The results from such activities can increase understanding and confidence among stakeholders in existing management measures or the need for changes in management. Monitoring and evaluation can generate the kind of information that decision makers seek when considering requests for additional resources. Well-designed monitoring and evaluation programs also can build understanding about the structure and function of the managed ecosystem, and thereby improve the knowledge base for future management decisions.

Many of the recommendations that follow largely come from a 2004 guidebook to natural and social indicators for evaluating MPA management effectiveness (Pomeroy and others 2004). This discussion relies heavily on this guidebook because it is comprehensive, reflects the experience of MPAs around the world, has been field tested, and relies principally upon techniques that are simple rather than complex, and therefore more likely to be implemented and sustained over the long term.

The discussion below presents only the more general features of the approach presented in the guidebook; much more detail is available in the guidebook itself. In addition, monitoring and evaluation programs should reflect local conditions, constraints, and opportunities.

### **Developing a Monitoring and Evaluation Program for MPAs and MPA Networks**

To promote consistency among monitoring and evaluation programs in different regions, developers of regional MPA networks should follow the sequential process outlined below. Parallel processes are likely to eventually be undertaken at a statewide level to enable adaptive management of California's system of MPAs and MPA networks as a whole. Note that the first step – the clear articulation of goals and measurable objectives – is critical for developing a useful monitoring and evaluation program for an individual MPA or a MPA network.

The principal steps of the Master Plan Framework process follow. Any departure from this process should be noted and justified.

- Identify MPA goals and objectives
  - Identify any overlapping goals and objectives.
- Select indicators to evaluate biophysical, socio-economic, and governance patterns and processes
  - Review and prioritize indicators,
  - Develop quantifiable benchmarks of progress on indicators that will measure progress toward goals and objectives, and
  - Identify how selected indicators and benchmarks relate to one another.
- Plan the evaluation
  - Assess existing data;
  - Assess resource needs for measuring selected indicators;
  - Determine the audiences to receive the evaluation results;
  - Review relevant monitoring and evaluation programs at existing MPAs, such as at the Channel Islands;
  - Identify participants in the evaluation; and
  - Develop a timeline and workplan for the evaluation.
- Review and revise planned monitoring and evaluation program
  - Conduct structured peer and public review processes, and
  - Make modifications in response to review.
- Implement the evaluation workplan
  - Select methods and approach and collect data;

- Manage collected data, includes identifying the data manager, providing for the long-term archiving and access to the data, and making the data available for analysis and sharing;
- Analyze collected data; and
- Conduct peer review and independent evaluation to ensure robustness and credibility of results.
- Communicate results and adapt management
  - Share results with target audiences, and
  - Use results to adapt management strategies.

To achieve the purpose of informing adaptive management, the results of monitoring and evaluation must be communicated to decision makers and the public in terms that they can understand and act upon (NRC 1990). Moreover, in addition to aiding in MPA management, measuring, analyzing and communicating indicators can promote learning, sharing of knowledge and better understanding of MPA natural and social systems among scientists, resource managers, stakeholders, members of the public, and other interested parties (Pomeroy et al. 2004). To these ends, monitoring and evaluation programs for MPA networks should include a communications plan that identifies the target audiences and specifies the timing, methods, and resources to regularly synthesize and present monitoring and evaluation results.

The results from monitoring and evaluation should be reviewed annually, although any one year's review may concern a different group of indicators. At a minimum, a comprehensive review of monitoring should be conducted every five years. These reviews should be transparent, include peer review, and make results available to the public. Besides evaluating monitoring methods and results, the review should evaluate whether or not the monitoring results are consistent with the goals and objectives of the MPA network and the MLPA. If the results are not consistent, the review should develop recommendations for adjustments in the management of the MPA network.

Within the above set of required components, the Master Plan Framework does not prescribe specific monitoring methods. For example, monitoring and evaluation programs may be effective within a range of levels in intensity and sampling frequencies. They also may rely on different indicators, depending on the MPA goals and objectives. Useful guidance on the selection of indicators can be found in Pomeroy et al. (2004).

### **General Considerations in Identifying Indicators**

An indicator measures the success of a management action, such as the specific design of an MPA. It is a unit of information measured over time that will make it possible to document changes in specific attributes of the MPA (Pomeroy et al. 2004). General considerations in selecting or designing an indicator, include:

- Measurable - able to be recorded and analyzed in quantitative or qualitative terms.
- Precise - clear meaning, with any differences in meaning well understood OR measured the same way by different people.
- Consistent - not changing over time, but always measuring the same thing.

- Sensitive - changing proportionately in response to actual changes in the variables measured.
- Simple - rather than complex.
- Independence defined - correlation with other indicators examined.

The Master Framework requires MPA monitoring and evaluation programs to measure biophysical, socio-economic, and governance indicators, since these dimensions of marine ecosystems are inextricably linked (Pomeroy et al. 2004). Text below provides examples of possible indicators.

**Biophysical.** One common focus of MPAs is the conservation of the living marine resources and habitats of California's coastal waters. Likely biophysical goals of individual MPA networks established under the MLPA include sustaining the abundance and diversity of marine wildlife, protecting vulnerable species and habitats, and restoring depleted populations and degraded habitats. Thus, potential biophysical indicators might include (Pomeroy et al. 2004):

- Abundance and population structure of species of high ecological or human use value;
- Composition and structure of a community of organisms;
- Survival of young;
- Measures of ecosystem condition;
- Type and level of return on fishing effort;
- Water quality; and
- Areas whose habitat or wildlife populations are showing signs of recovery.

**Socio-economic.** Socioeconomic indicators make it possible to understand and incorporate the concerns and interests of stakeholders, to determine the impacts of management measures on stakeholders, and to document the value of an MPA to the public and to decision makers (Pomeroy et al. 2004).

Possible socio-economic indicators include (Pomeroy et al. 2004):

- Use data (and values of those uses) for consumptive and non-consumptive purposes;
- Level of understanding of human impacts on resources;
- Perceptions of non-market and non-use value;
- Community infrastructure and business;
- Number and nature of markets; and
- Shareholder knowledge of natural history.

**Governance.** By definition, MPAs are a governance tool since they limit, forbid, or otherwise control how people use marine areas and wildlife through rights and rules (Pomeroy et al. 2004). Governance may include enforcement, use rights, and regulations. Goals for governance of MPAs include the following (Pomeroy et al. 2004):

- Legal certainty as indicated by legal challenges or reported failure to act because of legal uncertainty;
- Effective management structures and strategies maintained;

- Effective legal structures and strategies for management maintained;
- Effective stakeholder participation and representation ensured;
- Management plan compliance by resource users enhanced; and
- Resource use conflicts managed and reduced.

Possible governance indicators include the following:

- Local understanding of MPA rules and regulations;
- Availability of MPA administrative resources;
- Existence and activity level of community organizations;
- Level of stakeholder involvement; and
- Clearly defined enforcement procedures.

In selecting indicators, a monitoring and evaluation plan for an MPA or MPA network should (Pomeroy, et al. 2004):

- Define and provide a brief description of the indicator;
- Explain the purpose and rationale for measuring the indicator;
- Consider difficulty and utility—that is, how difficult it is to measure and the relative usefulness of information provided by the indicator;
- Evaluate the required resources including people, equipment, and funding;
- Specify the method and approach to collecting, analyzing, and presenting information on the indicator, including sample size, spatial and temporal variation;
- Identify reference points or benchmarks against which results will be measured and timelines within which changes are expected;
- Explain how results from measuring the indicator can be used to better understand and adaptively manage the MPA;
- Provide references on methods and previous uses of the indicator.

Prior knowledge of the variability in the indicators selected should be incorporated into the monitoring and evaluation design where possible. If no prior knowledge exists variation in indicators must be identified within the monitoring and evaluation program. Multiple independent indicators are required for complex systems such as in the marine environment.

Finally, it is important to recognize the role that volunteer monitoring activities can play in evaluation. For example, the Citizen Watershed Monitoring Network in the Monterey Bay National Marine Sanctuary has used a monitoring protocol developed by the U.S. Environmental Protection Agency in collecting information on water quality in the sanctuary. Information from this program has helped in determining where education and outreach efforts should be targeted how successful specific pollution reduction activities have been, and in identifying problem areas for further investigation.

**Works Cited**

National Research Council (NRC). 2001. *Marine Protected Areas: Tools for Sustaining Ocean Ecosystems*. Washington, DC: National Academy Press.

National Research Council (NRC). 1990. *Managing Troubled Waters: The Role of Marine Environmental Monitoring*. Washington, DC: National Academy Press.

Pomeroy R.S., Parks J.E., Watson L.M. 2004. *How is your MPA doing? A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness*. IUCN, Gland, Switzerland and Cambridge, UK. Retrieved 17 Jan. 2004  
<<http://effectivempa.noaa.gov/guidebook/guidebook.html>>.

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