



# North Central Coast State of the Region Assessment (2010-2015) Portfolio Product

Document Title: A Report Card for Ecosystem Health in California

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**About:** This product is part of a portfolio of documents developed to inform the *State of the California North Central Coast: A Summary of the Marine Protected Area Monitoring Program 2010-2015*. It was internally reviewed by California Ocean science Trust. For more information about the State of the Region Assessment, visit [oceanspaces.org/nccsotr](http://oceanspaces.org/nccsotr).





# A Report Card for Ecosystem Health in California

A central question lies at the heart of marine protected area (MPA) monitoring: What is the health of California’s ocean, both inside and outside of these protected areas? Using MPA monitoring data as a foundation, California ecologists, working alongside managers, are developing a process for assessing the health of California’s ecosystems, and testing a pilot report card for sharing those assessments with decision makers. Using rigorous scientific assessments that report on the condition of marine ecosystems across sites and regions, decision makers can better allocate resources across sites, and prioritize specific management actions more effectively.

## About this Document

This report provides an overview of a project led by the California Ocean Science Trust from 2012-2014, with support from the Packard Foundation. The example report cards included within this report were developed in collaboration with a wide range of experts, resource managers, and policy makers. We thank all those who have contributed their expertise and offered their input throughout this process.

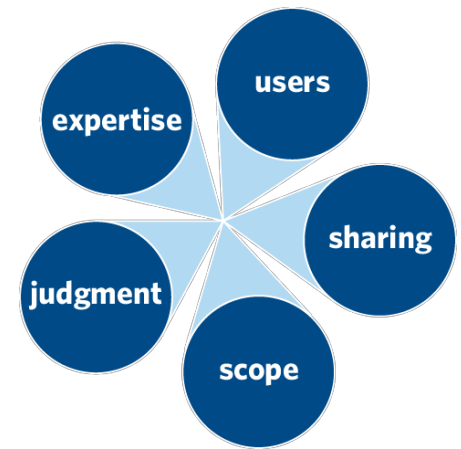
## A tool for broad management goals

California’s network of MPAs was established with the broad goals of protecting biodiversity and improving ocean health. To evaluate progress towards these goals and make adaptive management decisions, managers and policy-makers need information on the status, trends and overall health of marine ecosystems. Additionally, faced with the challenge of managing across multiple ecosystems and regions, regional managers and policymakers have shown an interest in tools that report on the health or condition of marine ecosystems in a highly synthesized format. To address this demand, California ecologists have been working alongside managers to develop a multi-step process to assess the health, or condition, of ecosystems and to generate a pilot report card to translate MPA and other monitoring data in a way that is useful for informing management decisions.

# Using expert judgement to assess the health of ecosystems

*With limited information and data on priority ecosystems, assessing ecosystem condition often requires expert judgment, in which a group of experts is asked to consider a broad range of scientific data and results, and to use this information to evaluate a resource, habitat, or ecosystem.*

In the case of MPA monitoring, many questions arise that require scientific judgment: what indicators to select, what monitoring projects to implement, and what grade to assign on an ecosystem report card. Through interviews and a workshop with managers and practitioners of expert judgment processes worldwide, Ocean Science Trust developed a guidance document that presents standards, guidelines, and a rigorous theoretical framework for planning and executing expert judgment processes. The resulting framework provides guidance on selecting experts, defining the scope, soliciting judgments, sharing results, and engaging stakeholders. Legitimacy, transparency, accountability, credibility, and saliency were identified as core values that guide the process of applying the framework. In addition to establishing good practice, this framework provided the foundation for designing and implementing a process for assessing the condition or health of marine ecosystems, and the basis for the design of California's first ecosystem health report card.



Components of the framework for expert judgment processes

## Piloting an approach: Assessing the condition of kelp forest and sandy beach ecosystems

*California's MPA monitoring framework and management timeline provided an opportunity to test and refine this process using real-world monitoring data from baseline MPA monitoring programs.*

### Starting with assessments of kelp forest health in the Central Coast.

Through a series of workshops Ocean Science Trust, along with managers and scientists from California and abroad developed a framework for developing and executing expert judgement processes, and a template for an ecosystem report card. An initial workshop brought together expert judgment practitioners, including marine resource managers and scientists, to draw on their experiences and lessons learned and develop a framework for using expert judgement in conducting assessments of ecosystem condition or health. Subsequent workshops brought together kelp forest ecologists, and MPA managers, to test and refine the framework using MPA monitoring data on kelp forests from California's Central Coast region. In addition, participants created an initial template for an ecosystem report card, which included a grading scale and grade definitions for kelp forest ecosystems (definitions of 'very good', 'good', 'poor', and 'very poor' kelp forest ecosystems).



## Refining the process and report card with beach ecosystems in the North Central Coast.

The approaching five-year MPA management review of the North Central Coast regional MPA network in 2015, presented a timely opportunity to further test and refine the process for conducting condition assessments using MPA baseline monitoring data, and design a pilot report card as a new approach for communicating and reporting monitoring results. Building on the outcomes and lessons learned from the kelp forest test-case, Ocean Science Trust designed a similar process to assess the condition of sandy beach ecosystems in the North Central Coast. This test-case aimed to build confidence and trust in the scientific foundation of ecosystem assessments, by testing the process in a different ecosystem and data context. In contrast to Central Coast kelp forest ecosystems, California beach and surf zone ecosystems are, generally speaking, data-poor systems, and the number of California beach ecosystem experts are relatively few. Given these characteristics, Ocean Science Trust refined the ecosystem condition assessment process and approach by identifying the challenges associated with conducting assessments with fewer experts and limited data.

## Designing a pilot report card for ecosystem health

*From assessing the state of the environment for the entire nation of Australia, to honing in on the state of the Chesapeake Bay Watershed, report cards have become resources for policy-makers, resource managers, and ENGOs, by providing information on the status and trends of ecosystem health in a highly synthesized way that is easy to understand.*

Drawing on examples of reporting tools worldwide, and using the Australia State of the Environment Report Card as a model, scientists and marine resource managers in both the kelp forest and beach ecosystem test cases helped to construct an initial version of a pilot report card.



Example of a report card, taken from the Australia State of the Environment Report (2011), and used as a model for developing a California pilot report card for ecosystem health.

## DEMONSTRATING SCIENTIFIC RIGOR AND CREDIBILITY

Reporting tools are designed to distill information into simpler, visual forms, but management and decision-making processes require that these tools also demonstrate credibility and capture scientific rigor.

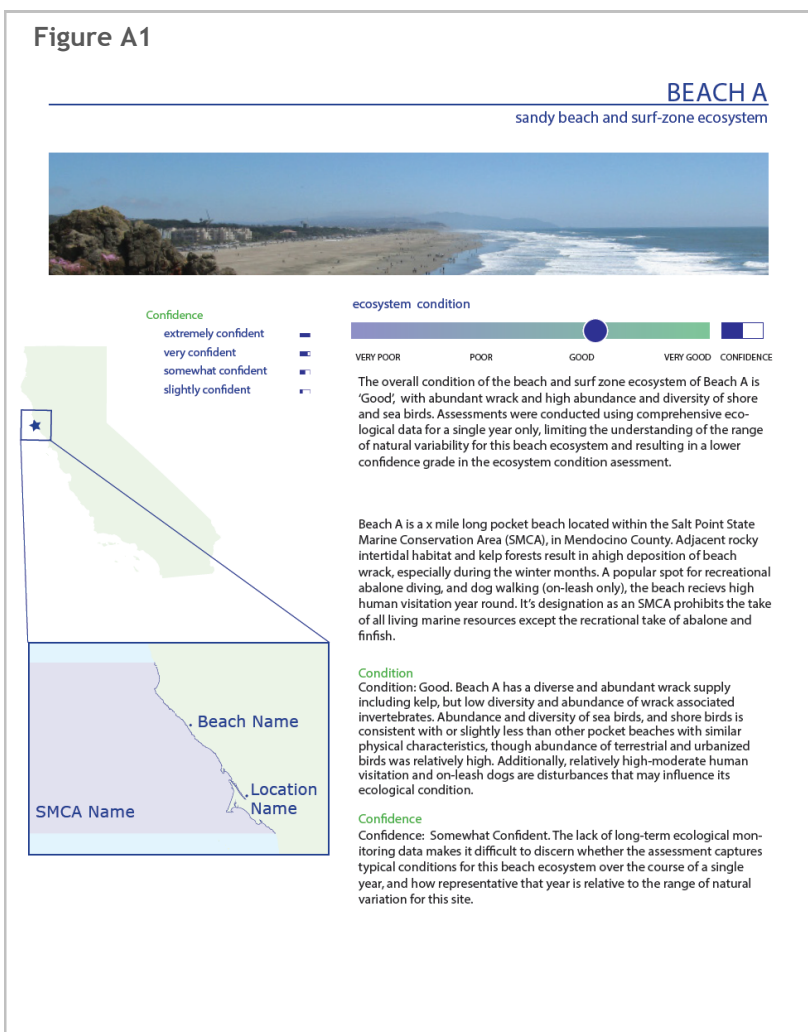
**Credibility:** Demonstrating credibility begins with the process for assessing ecosystem condition; incorporating best practices for conducting expert judgment, and vetting the process with the experts conducting the assessments and decision-makers. Credibility is also perceived through the experts selected to conduct the assessments. In the beach ecosystem test case, experts were kept anonymous, though future processes might consider weighing the pros and cons of anonymity versus transparency in naming experts.

**Scientific rigor:** Sharing individual approaches for assessing ecosystem condition, identifying the types of data used, and providing a rationale for the grades and levels of confidence assigned to each site helps capture scientific rigor in the process and results. Providing additional contextual information about the site and ecosystem being assessed, the assessment process and methods, the data and information used, as well as any assumptions inherent in the process can all demonstrate rigor and be helpful in interpreting the assessment/report card results.

A graphic designer worked alongside this process to ensure that results are communicated concisely and clearly, refining the layout and applying design elements that are visually appealing.

The resulting pilot report card includes a four-level grade of ecosystem condition, an indication of trend associated with the condition, the level of confidence associated with the condition and trend, and a brief description of the rationale for the grade, trend, and confidence. The report card also includes a brief description of the site assessed (specific study site, or MPA), including location, physical characteristics, human uses, and key ecological characteristics.

The example report cards presented here report on the condition of three distinct beach ecosystem study sites in the North Central Coast (Figures A1, A2, and A3). These example represent a first iteration of a pilot report card, and provide valuable examples of what full assessments throughout the region could look like using a report card to share monitoring results. The results of the beach ecosystem process are not intended to replace other reports that will inform the first MPA management review, so example report cards do not include specific site names. Instead, we aim to build familiarity with this approach for sharing results, and continue to seek input to refine the approach to expert judgment, ecosystem condition assessment process, and report card design.



#### Grading Statements for Beach & Surf Zone Ecosystem Condition Assessments

**Very good:** The beach and surf zone ecosystems are structurally and functionally intact with processes and structural characteristics well within the natural range of variation.

**Good:** There is some change in the beach and surf zone processes or structural characteristics (e.g., geomorphic, ecological) that threatens the structure and function of the ecosystem.

**Poor:** There is considerable change in the beach and surf zone processes or structural characteristics (e.g., geomorphic, ecological) outside the natural range in variation, that substantially compromises the structure and function of the ecosystem. For example, reduction of a functional group, degradation of ecological zonation, or disruption of sand budget.

**Very Poor:** There are severe changes in the beach and surf zone processes or losses in structural characteristics (e.g., geomorphic, ecological) well outside the natural range in variation, that lead to a loss of structure and function of the ecosystem. For example, extirpation of a functional group, loss of at least one ecological zone, or severe disruption of sand budget.

#### Confidence Statements for Beach & Surf Zone Ecosystem Condition Assessments

■ **Extremely confident:** There are adequate data on the range of natural variability is available, for both geomorphic and ecological characteristics, OR there is other unambiguous qualitative or observational information that provide a basis for an assessment.

■ **Very confident:** There are adequate data to determine the range of natural variability for geomorphic OR ecological characteristics, OR there is adequate qualitative or observational information that provide a basis for an assessment.

■ **Somewhat confident:** There are limited data to determine the range of natural variability for geomorphic AND ecological characteristics, OR there is limited qualitative or observational information that provide a basis for an assessment.

■ **Slightly confident:** There are very limited data to determine the range of natural variability for geomorphic AND ecological characteristics, OR there is no other qualitative or observational information that provide a basis for an assessment.

An example of the pilot report card developed through this process, where ecosystem condition is reported for a single ecosystem at a single beach study site. The beach name has been anonymized for the purpose of this report.

Figure A2

BEACH B

sandy beach and surf-zone ecosystem



- Confidence
- extremely confident
  - very confident
  - somewhat confident
  - slightly confident

ecosystem condition



The overall condition of the beach and surf zone ecosystem of Beach B is 'Very Good'; with relatively high abundance and diversity of key macro invertebrate species, shorebirds, and sea birds, and moderate human visitation that is concentrated to one area of the beach. Assessments were conducted using comprehensive ecological data for a single year only, limiting the understanding of the range of natural variability for this beach ecosystem and resulting in a lower confidence grade in the ecosystem condition assessment.

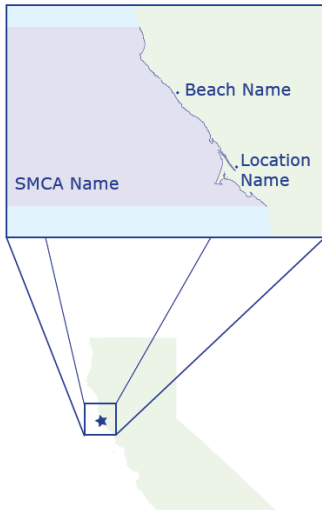
Beach B is a long beach approximately x miles wide and y miles long, with tall bluffs and backed by steep eroding cliffs, located in Marin County. This beach sees high visitation rates year long. A large adjacent parking lot, visitor's center and café located at the south end of the beach keeps visitation concentrated in the north-western portion of the beach, while elephant seals occasionally use the south-eastern end as a haulout site.

Condition

Condition Score: Very Good. Beach B has an abundant and diverse assemblage of seabirds and shorebirds, rich macroinvertebrate fauna with intact zonation, but relatively low abundance of surf zone fishes. Progressive sand loss is also evident. The beach supports a variety of marine mammals including elephant seals that occasionally use the site as a haulout, and are protected by special closures set and enforced by park rangers. While visitation is high, it's concentration to the north-eastern portion of the beach results in a fairly localized human impact including urbanized wildlife, and trash.

Confidence

Confidence: Somewhat Confident. The lack of long-term ecological monitoring data makes it difficult to discern whether the assessment captures typical conditions for this beach ecosystem over the course of a single year, and how representative that year is relative to the range of natural variation for this site.



Figures A1, A2, and A3 represent examples of the pilot report card, and report on the condition of three distinct beach ecosystem study sites in the North Central Coast. The beach names have been anonymized for the purpose of this report.

Figure A3

BEACH C

sandy beach and surf-zone ecosystem



- Confidence
- extremely confident
  - very confident
  - somewhat confident
  - slightly confident

ecosystem condition



The overall condition of the beach and surf zone ecosystem of Beach C lies between 'Good' and 'Poor', with a low abundance of sea birds, and low wrack inputs to the beach. Human visitation to this beach is moderate-high, with coastal armoring including riprap along portions of the beach. Assessments were conducted using comprehensive ecological data for a single year only, limiting the understanding of the range of natural variability for this beach ecosystem and resulting in a lower confidence grade in the ecosystem condition assessment

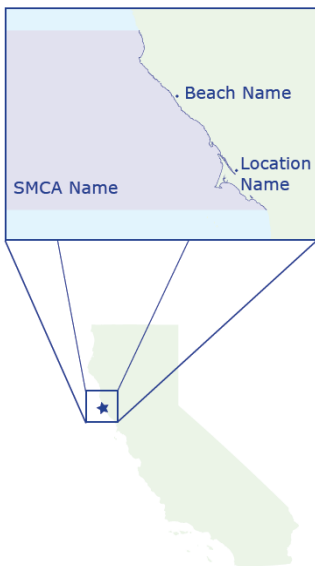
Beach C is a located in San Mateo County, on the San Francisco Peninsula. Approximately x miles wide by y miles long, this long beach is characterized by high cliffs on the north and south end, coarse sand, and coastal armoring including riprap along portions of the beach. There are two beach access points from the cliffs to the beach. It's proximity to both San Francisco and Half Moon Bay make this a popular beach for recreating, including surfing, fishing, and dog-walking (on-leash only).

Condition

Condition Score: Poor - Good. Beach C demonstrated a high biomass of burrowing invertebrates, specifically sand crabs (*Emerita analoga*) a strong predictor of total macroinvertebrate biomass. Shorebird abundance, however, was low given the abundance of macroinvertebrates. Armoring of the bluffs using riprap may influence the ecological condition of the beach. Additionally, high human visitation, recreation, and on-leash dogs are disturbances that may also influence its ecological condition.

Confidence

Confidence: Somewhat Confident. The lack of long-term ecological monitoring data makes it difficult to discern whether the assessment captures typical conditions for this beach ecosystem over the course of a single year, and how representative that year is relative to the range of natural variation for this site.



# A tool for managing California's MPAs and beyond

*Effectively communicating monitoring results to decision-makers and other stakeholders is key to adaptive management of MPAs*

Recognizing that monitoring and management happen at multiple geographic scales, several versions of the pilot report card were scoped and developed : individual sites are sampled to assess ecosystem condition and trends within and outside of MPAs. One version reports only condition of a single ecosystem at the site-level (Figures A1, A2 and A3), a second version reports ecosystem condition for a single site together with a set of sub-scores for specific ecosystem indicators (Figure B), and a third version reports a condition of a MPA together with a set of sub-scores for each ecosystem that occurs within that MPA. (Figure C).

In addition to communicating the status of and trends in ecosystem health, the report card can also alert managers of sites or ecosystems of concern, changes in condition that may require action, and help prioritize specific areas, regions, and management actions. Additionally, a report card offers a common approach, across agencies, to assess ecosystem health and management actions.

Looking forward, this report card has the potential to provide valuable information on the condition of priority ecosystems in a highly synthesized format, so that policy makers and resource managers have a high-level understanding of ecosystem health across the diverse ecosystems and large geographic scope at which they manage. Continuing to explore and adapt both the process for conducting ecosystem condition assessments and the report card will be key to improving their utility and relevance to the management of marine ecosystems in California. For example, exploring how to conduct ecosystem condition assessments using metrics at geographic scales that align with MPA management and decision-making. This could include integrating the ecosystem metrics and indicators identified in regional MPA Monitoring Plans into the condition assessment process.

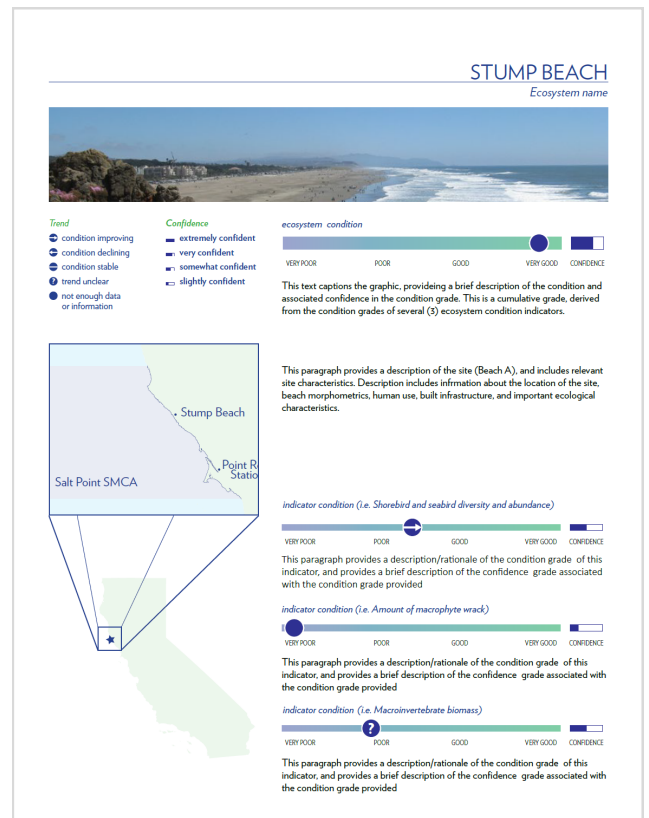


Figure B. This is an example of a potential version of a report card, where the ecosystem condition grade is derived from the condition grades of several indicators. This version was scoped as part of the report card design process, in order to align more closely with California's MPA monitoring framework (identifies ecosystem metrics and

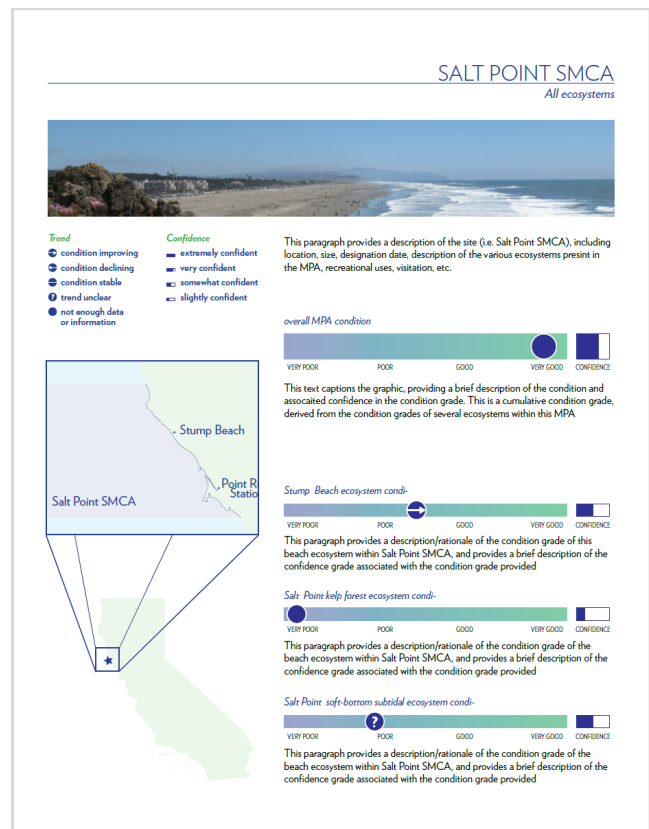


Figure C. This is an example of a potential version of a report card, where the condition grade is for a single MPA, and is derived from the condition grades of several ecosystems within that MPA. This version was scoped as part of the report card design process, to evaluate the overall condition of an MPA, and inform the management of MPAs.



Photo Credit: Claire Fackler

Effectively communicating monitoring results to decision-makers and other stakeholders is key to adaptive management of MPAs. Report cards such as these, in their simplicity and design, allow for groups with differing levels of engagement and expertise in ecosystem and MPA management to understand the status and health of priority ecosystems. Continuing to use a report card to share MPA monitoring results can help improve the usefulness of this tool, while informing the management of the regional network, and ocean health.

### **Contributing Editors**

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### **Acknowledgements**

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### **Citation**

*A Report Card for Ecosystem Health in California*. California Ocean Science Trust, Oakland, California, USA. October 2015.

### **Additional Resources**

[\*Putting the Pieces Together: Designing Expert Judgment Processes for Natural Resource Decision-Making\*](#). California Ocean Science Trust, Oakland, CA, USA. December, 2013





Photo Credit: Sim Mendick, High Mountain Photo

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