National Park Service
U.S. Department of the Interior
Pacific Coast Science and Learning Center
Research Project Summary May 2007

Coastal Biophysical Inventory: A Rapid Assessment of Intertidal Resources

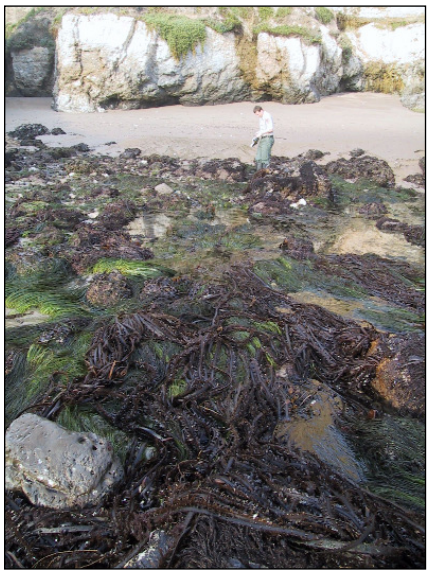
The Question: *What organisms and habitats might be affected by a chemical spill along the coastline near the Golden Gate in the Point Reyes National Seashore and Golden Gate National Recreation Area and how can we prepare for such a spill?*

Ochre seastars (*Pisaster ochraceus)* and eelgrass (*Zostera marina*) are two types of intertidal organisms that a chemical spill could damage.

Coastal resource managers around the world were stunned by the challenges that the Exxon Valdez wreck created along the Alaska Coastline. Previous spills near the Golden Gate and the ongoing risk of chemical spills have created a sobering awareness among coastal resource managers of the National Park Service that geographically adjacent refineries and shipping lanes mean an immediate and constant threat to the Point Reyes National Seashore and the Golden Gate National Recreation Area. Any chemical spill borne upon the surface of the water is like a giant brush painting poison over the intertidal zone as the tides rise and fall throughout a day. The entire habitat is repeatedly exposed to that brush every 12 hours. All organisms of the intertidal zone would be affected, as would the countless organisms that interact with them. The rapid assessment of the Coastal Biophysical Inventory helps resource managers plan and recover from a spill disaster and it sets the stage for more in-depth research about the intertidal zone in the future.

The Project: *Survey organisms and geological substrates of the intertidal zone.*

The Golden Gate National Recreation Area and Point Reyes National Seashore have approximately 186 kilometers of Pacific Ocean coastline that need an assessment of both the organisms that live in the band of habitat along the coast and the geological substrate to which they attach or live. Glacier Bay National Park and Preserve in Alaska has developed a method to rapidly assess the biology and substrate geology of the intertidal zone. The protocols and database of our Coastal Biophysical Inventory were adapted from the Glacier Bay methods.



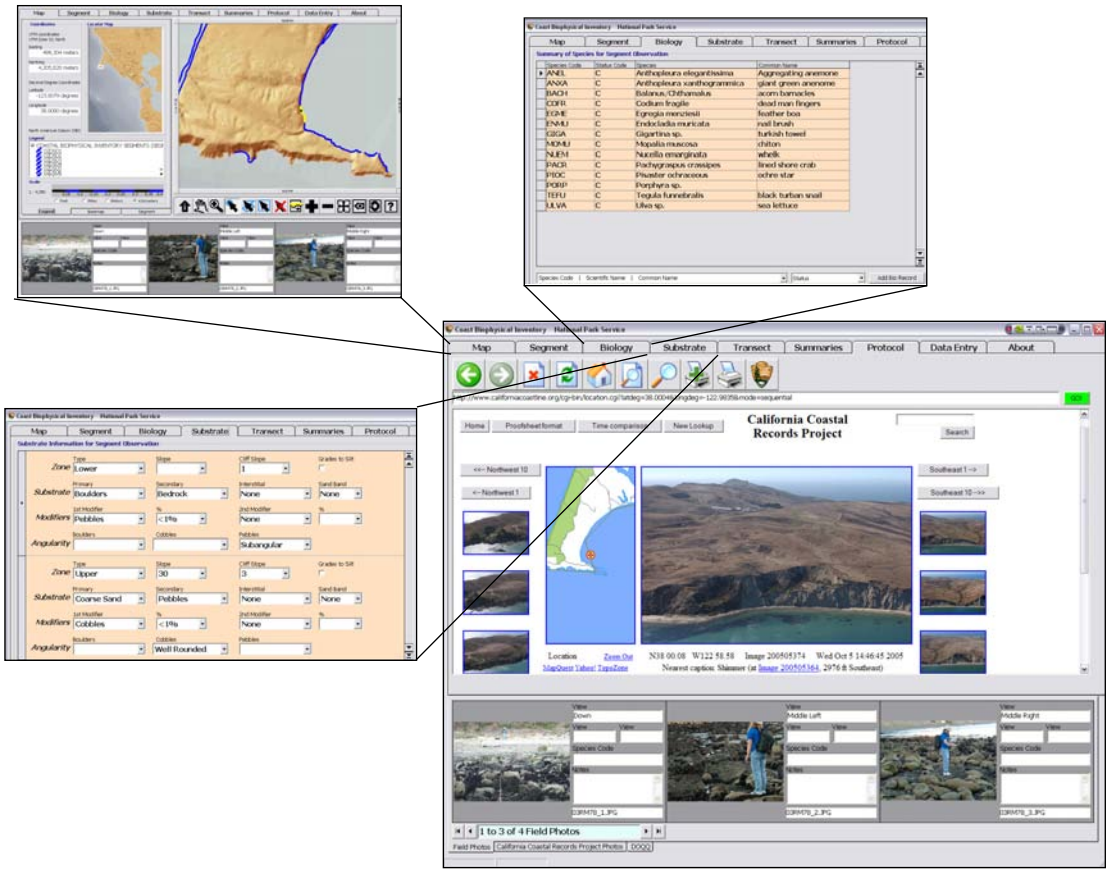
Scientists record baseline information about the biology and geology of the intertidal zone to assist managers recovering from a chemical spill.

First, the coastal geological substrate is inventoried. An observer walks down the coastline at low tide, noting the substrate. The observer notes where the substrate changes (for example from sandy beach to rocky outcrop). Each section of substrate defines a coastal segment. The segment is characterized by shape, slope, the roughness of its parts (for example angular boulders or rounded cobbles) and the relationship of the parts that compose it (for example the beach may be mostly coarse sand interspersed with large rough boulders).

Second, for each coastal segment a biological transect is made perpendicular to the waterline about mid-segment, running from the low tide zone to the high tide line. Along this transect the presence and absence of a set of organisms is recorded in a given time. Zones of organisms, such as mussels or algae, and where they begin and end along the transect are also recorded. Other conditions, such as aggregations of organisms like seal haul-outs, sea bird nests, or off shore kelp forests, are also noted. Photographs up, down and along the transect are taken to complement the recorded information.

Preliminary Results: *Approximately 36% of the coastline has been surveyed so far. A database was created to link information, photographs and maps together for each coastal segment.*

One hundred and thirty-seven coastal segments were characterized for geological substrate and corresponding biological transects. Approximately 67 kilometers of the estimated 186 kilometers of coastline have been surveyed for this ongoing project. Approximately 90 different representative species were inventoried in this process. There are many more species to record, but a comprehensive inventory is being completed through other monitoring programs at specific locations.



A user of the coastal biophysical inventory database can view all completed segments on a map of the coastline. The user can click on any segment and then view aerial and ground-level photographs and detailed information about the organisms and geological substrate of that segment.

Keeping track of this huge volume of information required a dedicated database with connections to electronic map information so that what was seen and where it was seen could be archived and accessed later. The database contains the information, photographs and maps linked together to allow browsing by location, organism, geology, time and photo. Synchronizing the data creates a powerful tool for resource managers. It creates an easier way to view the variety of information about each segment simultaneously so that it creates a better sense of place for new managers unfamiliar with a location. It creates reports for selected segments, allowing quick summarization of information. And finally, it allows for better planning to complete the remaining inventory.

If there is a large spill, deploying of resources may need to be prioritized based upon substrate type because some substrates are easier to clean up than others. Emergency funds cannot be secured until the damage has been estimated, but the coastal biophysical inventory allows for a quick estimation of damage. Sucessfully dealing with a spill catastrophe at or near the Golden Gate requires many partner agencies, and this inventory helps the resource managers be an organized and ready part of any response team.

For More Information:

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The Pacific Coast Science and Learning Center is one of 17 centers across the country working to increase the effectiveness and communication of research and science results in the national parks by facilitating the use of parks for scientific inquiry, supporting science-informed decision making, communicating relevance and providing access to research knowledge, and promoting resource stewardship through partnerships.