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# **Beyond the Golden Gate— Oceanography, Geology, Biology, and Environmental Issues in the Gulf of the Farallones**

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**California Department of Health Services**

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**National Oceanic and Atmospheric Administration**

*Gulf Of The Farallones National Marine Sanctuary*

*Cordell Bank National Marine Sanctuary*

*National Marine Fisheries Service*

**National Park Service**

**Point Reyes Bird Observatory**

**U.S. Army Corps of Engineers**

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# Foreword

*Both scientists and decisionmakers have become increasingly aware of the need to understand the complexity of natural systems when considering actions that affect individual aspects of resources and the environment. The interconnectedness of the physical and biological elements of a natural system is often appreciated in the abstract, but sometimes not as much as it should be in scientific studies. Too frequently, how the interaction of all elements of a system influence the organism, habitat, or process being focused on is given only lip service or general observations. Although not intended to be an integrated study, this report on oceanographic, geological, biological, and environmental aspects of the Gulf of the Farallones is an excellent example of a study describing the many facets of a complex marine system.*

*In marine systems, the geologic foundation and sediment dynamics of the sea floor define the basic environment for communities of bottom-dwelling organisms, which are influenced by circulation patterns that also affect organisms living in the water column. Decreased light penetration caused by turbidity affects the plankton, the base of the marine food web, and thus affects fish and other marine populations. We sometimes consider the most dynamic and influential elements of marine systems to be the currents, waves, and mobile species that are monitored regularly because they change frequently on a human time scale. However, this report demonstrates how geologic processes, including crustal processes manifested as earthquakes, can also be influential on the same time scale. The inclusion of a chapter on tectonics brings this point home.*

*This report also demonstrates the impact that a past tendency towards an “out of sight, out of mind” approach to the use of the ocean floor for waste disposal has had on future use of marine resources and how new technology can improve the situation. Concerns over possible leakage from drums of radioactive waste dumped until about 1970 on the ocean floor in the Gulf of the Farallones affected the marketability of fish caught in the area. Technology has only recently enabled scientists to locate the drums and begin assessing the actual risk. Similarly, new technology has allowed proposed sites for disposal of dredged material to be evaluated with a more thorough understanding of bottom conditions and processes.*

*Studies that help provide an integrated knowledge of complex natural systems, like these on the Gulf of the Farallones, give decisionmakers and the public an enhanced ability to avoid the mistakes of the past and promote sustainable use of important environments and resources.*

Charles G. Groat  
Director, U.S. Geological Survey