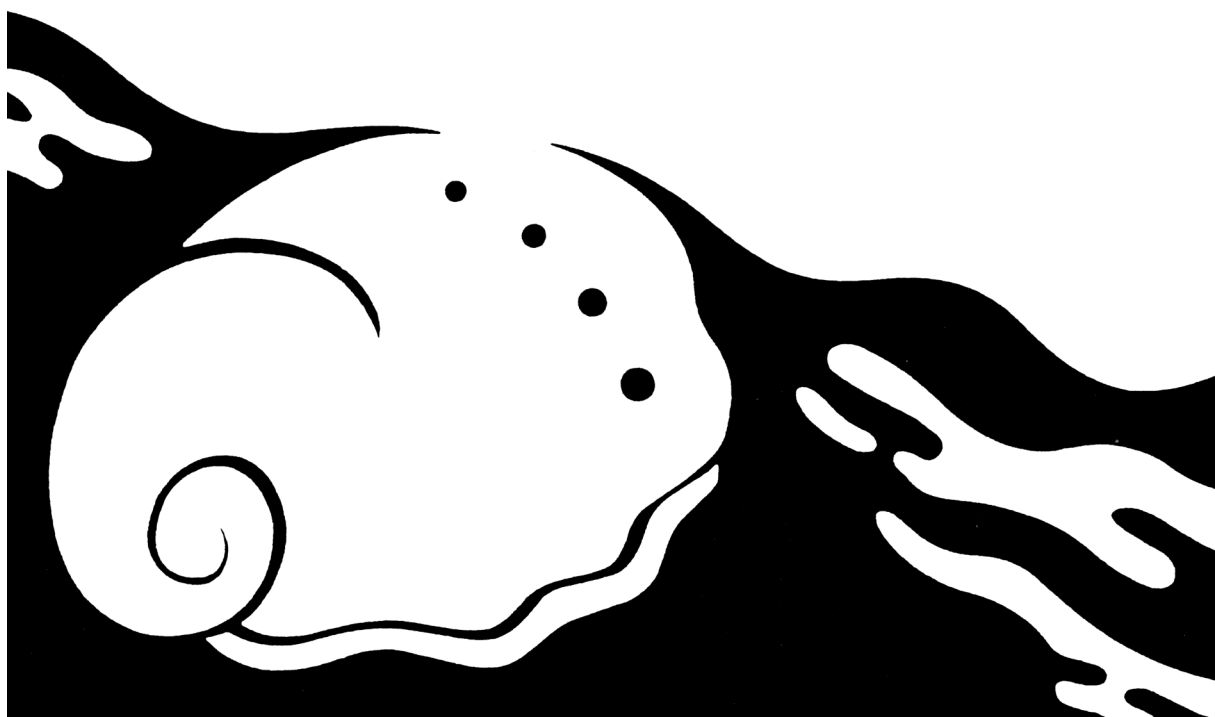


Pacific Outer Continental Shelf Region

Synopsis of the Interagency Rocky Intertidal Monitoring Network Workshop

Final Report



U.S. Department of the Interior
Minerals Management Service
Pacific OCS Region

Pacific Outer Continental Shelf Region

Synopsis of the Interagency Rocky Intertidal Monitoring Network Workshop

**Held February 26-27, 1997, at Cliff House
University of California
Santa Barbara, CA**

Final Report

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Agreement No. 14-35-0001-30761
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**U.S. Department of the Interior
Minerals Management Service
Pacific OCS Region**

**Camarillo
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EXECUTIVE SUMMARY

A distinguished group of scientists and representatives of local, state and federal agencies met on February 26-27, 1997, at the University of California at Santa Barbara to discuss the need for and structure of a multi-agency rocky intertidal monitoring network for central and southern California. Their deliberations resulted in the following principal findings and recommendations.

1. **Continue monitoring, create a network, and secure stable funding.**

Rocky intertidal monitoring programs in central and southern California provide valuable information needed for proper resource protection and management. Therefore, the highest priority should be placed on ensuring continued monitoring at the existing sites so that data gaps do not occur. Current programs should be integrated into a Multi-Agency Rocky Intertidal Network that would increase the efficiency of monitoring efforts, enhance the usefulness of resulting information, and provide regional-scale characterization of shore life dynamics. Shared long-term funding or in-kind services are critical to ensure the stability of the network and to maximize its effectiveness.

2. **Form a steering committee, a data panel, and a scientific panel.**

A Multi-Agency Steering Committee comprised of representatives of organizations committing funding or other resources should be formed to assure support of the network and to direct these resources. A Data Management Panel should guide the development of network data management and communication protocols. A Scientific Review Panel should review existing methodology for improvements and help integrate research and monitoring programs. Both technical panels would report findings and recommendations for the network to the Steering Committee.

3. **Develop a management system for network data.**

There is an immediate need to develop a system capable of managing the data from all programs in the regional network. The Data Management Panel should oversee the design and operation of a data management and communication system that is easily accessible and user-friendly. Initially, this system should provide an efficient means to access standardized data from each monitoring program. Eventually, all monitoring data should be placed in a central repository maintained by a data specialist.

4. **Review existing data from network programs.**

High priority should be placed on reviewing pooled data from all network programs in the region. This review would provide an overview of the intertidal data resources in the region and serve as the basis for decisions about potential modifications to the monitoring programs. The Scientific Review Panel should oversee this analysis and evaluate ways to integrate relevant research with the resource surveys. It is important that regular monitoring be maintained during this review period.

INTRODUCTION

The Minerals Management Service (MMS) supports a variety of research and monitoring studies along rocky shores adjacent to ongoing offshore oil operations in central and southern California, as mandated by the Outer Continental Shelf Lands Act and the National Environmental Policy Act. Other agencies (federal, state and local) and organizations also monitor rocky intertidal resources because of concerns about environmental impacts such as oil spills, pollution from outfalls and runoff, and commercial and recreational activities. There is a growing appreciation that these monitoring programs provide important data for detecting and predicting changes in marine life so that measures can be taken to anticipate and reduce harmful effects. Fifty-nine sites currently are being monitored in the region from San Luis Obispo County to San Diego County, including the eight Channel Islands (Appendix C). Although 49 of these sites are surveyed using similar techniques (scoring abundance changes of key species in fixed plots on stable rock benches sampled semi-annually), no coordinated program has been established over the region.

Believing that the time was right to explore an integrated, multi-agency approach to rocky intertidal monitoring, MMS contracted with the University of California at Santa Barbara to organize an Interagency Workshop held on February 26-27, 1997, at UCSB's West Campus Cliff House. Specific workshop goals were as follows:

- Determine the need for and structure of a multi-agency network.
- Identify network participants and their needs/responsibilities.
- Recommend a network protocol, including sites, species, and sampling methods/frequency.
- Decide how the network data could best be managed for the users.
- Examine how research can best be integrated with the monitoring network.

Results from this workshop will be used by MMS and other agencies to set priorities in their short- and long-term planning processes.

FORMAT OF THE WORKSHOP

Forty-seven individuals from twenty-seven government, academic, and private organizations were invited to participate in the workshop (Appendix B). The invitees were chosen on the basis of their expertise in intertidal ecology, monitoring, or data management, or their affiliation with a relevant agency. All participants were sent a packet of material in advance of the workshop to provide background information about the nature and extent of the rocky intertidal monitoring currently being conducted in central and southern California (Appendix C, in part). In addition, the morning of the first day of the workshop was devoted to presentations and discussion of workshop goals, a review of existing monitoring, ongoing development of a Handbook of Rocky Intertidal Methods, insight from a recently-established subtidal monitoring network (Southern California Bight Pilot Project) and a summary of the rationale and vision for a rocky intertidal monitoring network (see Appendix A for Workshop agenda).

Deliberations concerning principal workshop topics were conducted in four working groups: (1) Multi-agency Network Organization, (2) Network Protocol, (3) Data Management and Communication, and (4) Research Integration. Each participant was assigned to one of the four groups. Working groups met during the afternoon of the first day to discuss key issues and identify options for resolving them. At the beginning of the second day, all participants met together to hear the rapporteur from each working group summarize the group's discussion and initial recommendations. Following a discussion involving all participants, the working groups reconvened to incorporate comments and prepare and refine the final recommendations, which were then presented to the entire assembly.

MAJOR RECOMMENDATIONS

In this section, we summarize the principal findings and recommendations developed during the workshop.

Recommendation 1: Maintain existing rocky intertidal monitoring programs in central and southern California and integrate them into a Multi-Agency Rocky Intertidal Network.

Workshop participants expressed broad support for the concept that proper resource management requires knowledge-based decision making, and monitoring is a critical component of the process of understanding the status and dynamics of rocky intertidal life. Key values of intertidal monitoring brought out during the workshop are listed in Table 1. Important advantages of a Multi-Agency Rocky Intertidal Network are summarized in Table 2. The attendees concurred that, until it is well-established, the network should not consider ranging beyond the existing program boundaries (San Luis Obispo County to San Diego County, including the eight Channel Islands); however, similar monitoring efforts outside of this region would be encouraged.

Table 1. Values of Rocky Intertidal Monitoring

- Maintains an historical perspective of important resources.
- Documents the effects of long-term climatic changes.
- Enhances understanding of the extent of temporal variation in natural systems.
- Determines compliance with standards or regulations.
- Provides an early warning of abnormal conditions.
- Helps assess and reduce environmental impacts.
- Identifies trends that may reflect cumulative impacts.
- Guides development and evaluation of impact mitigation measures.
- Provides information to assist in Natural Resource Damage Assessments.
- Assists in designing and critiquing restoration programs for impacted resources.
- Aids in framing research questions regarding cause and effect relationships.
- Increases public awareness of knowledge-based environmental management.
- Provides a cadre of trained biologists capable of rapid response to impacts.

Table 2. Advantages of a Multi-Agency Rocky Intertidal Monitoring Network

- Increases reliability, efficiency and cost-effectiveness of programs.
- Increases cooperation and communication among agencies and organizations.
- Enhances long-term support to ensure continuity of sampling.
- Provides opportunity for identification and rectification of data gaps.
- Allows more timely access to standardized data by all users.
- Integrates information for efficient analysis, synthesis and reporting.
- Permits evaluation of large-scale spatial and temporal patterns.
- Facilitates periodic review of ability of monitoring to achieve goals.
- Expedites linkages to other relevant programs.
- Enhances public outreach and interpretation programs.

Because rocky intertidal monitoring tracks an ever-changing baseline, the core monitoring needs to be maintained on a long-term basis. Resource management agencies have recognized this need by incorporating monitoring as a fundamental part of their operations. The National Park Service (NPS) policy is “to assemble baseline inventory data describing the natural resources under its stewardship, and to monitor those resources forever...” In this regard, the NPS protocol (used at 49 of the sites) was designed as a basic, practical means for obtaining the most useful information in the most cost-effective manner. Clearly not all agencies have the same goals as NPS; however, by pooling resources in an efficient network of core monitoring activities, beneficial results can be achieved with limited funds. This strategy will be most successful if long-term (5-10 yr) funding is secured to maximize efficiency and maintain network stability. Periodic programmatic review could result in further efficiencies. For example, if changes in resource abundances at different sites show coherent trends over an extended period, then it would be possible to reduce the amount of monitoring in future years with minimal loss of information.

Action for Recommendation 1: Continue existing monitoring, formalize the Rocky Intertidal Monitoring Network through agreements among participating agencies, and pursue commitments of long-term support.

Recommendation 2: Form a Multi-Agency Steering Committee (MASC) to oversee operation of the Rocky Intertidal Monitoring Network, a Data Management Panel (DMP) to guide the development of network data management and communication protocols, and a Scientific Review Panel (SRP) to review the existing monitoring program for improvements and help integrate research and monitoring activities.

Each agency or organization sponsoring rocky intertidal monitoring has its particular goals and responsibilities; however, there are substantial common and overlapping needs that can best be met by a regional partnership approach (see Tables 1 & 2). The formation of a single guiding committee and two advisory panels would provide the basic structure for this network of cooperating monitoring programs. Recognizing the varying needs of each agency or organization, workshop participants envisaged a tiered operational system in which network

members could participate at different levels. At one end of the spectrum, some members would utilize the network primarily as a means to share data and otherwise improve communication among local programs through better coordinated efforts. At the other end, members would seek to operate jointly to understand regional processes and to reach agreement to present results in a unified manner. Most of the agencies represented agreed that they would be willing to make changes to their existing monitoring programs to benefit the common good. This could include adding sites, modifying protocols, and/or producing joint data reports. A few agencies were interested in going beyond that level to pool resources for a joint evaluation of regional trends.

A long-term, shared support base was considered essential to successful operation of the network. In many cases, consistent funding would enable agencies, particularly those with smaller budgets, to commit resources. A steering committee comprised of organizations committing monetary or other resources is needed to assure consistent support and to direct these resources.

Nine initial members of the Multi-Agency Steering Committee were agreed upon at the workshop (Table 3). Network support commitments by MASC members as well as other organizations are listed in Table 4. The MASC could also include the chairpersons of the advisory panels as has been done in the Southern California Bight Pilot Project. The representatives on the Steering Committee should be able to speak for their agencies on technical matters and address monetary issues. The first task of the committee is to refine goals of

Table 3. Initial Composition of the Multi-Agency Steering Committee.

1. U.S. Minerals Management Service
2. U.S. National Park Service
3. U.S. National Marine Sanctuary
4. U.S. Navy
5. California Coastal Commission
6. California Department of Fish and Game
7. Santa Barbara County
8. Southern California Coastal Water Research Project
9. Pacific Gas & Electric Company

the network and to obtain consensus on effective means to achieve those goals. The MASC should also identify a Data Management Panel and a Scientific Review Panel and specify the roles of these panels. Once the review panels are established and functioning, the Steering Committee would review each panel's findings and recommendations and decide how to adapt activities within the network for the common good, considering each agency's needs.

The Data Management Panel would focus on organization and transfer of standardized data collected throughout the regional network in order to optimize accessibility and usability of monitoring results. The DMP should be composed of a small group of data managers representing the current monitoring programs, as well as those with relevant experience in managing large scientific datasets, including expertise in developing biological relational databases, geographic information systems, and computer network communication (FTP access, Web sites, etc.).

Table 4. Current Commitments of Support for the Rocky Intertidal Monitoring Network.

- **U.S. Minerals Management Service:** Funding and staff field support for 17 sites, plus 2 Ventura sites starting Fall 1998; possible Geographic Information System support; possible other support.
- **U.S. National Park Service:** Perpetual funding and staff support for 15 sites, plus 3 San Diego sites starting Spring 1998, plus 6 Santa Cruz Island sites starting Fall 1998; protocol review support; possible other support.
- **U.S. Department of Energy:** Support for additional monitoring at 9 of the sites.
- **U.S. Geological Survey:** Funding and staff support for 5 sites at San Nicolas Island.
- **U.S. National Oceanic & Atmospheric Administration:**
 - Channel Islands National Marine Sanctuary:** Ship and staff support to access island sites; Geographic Information System support; possible other support.
 - Damage Assessment Center:** Funding for resource recovery research.
- **U.S. Navy:** Possible 5-yr funding for 2 new San Diego sites starting Spring 1997, plus 2 current San Diego sites starting Spring 1998; possible other support.
- **California Coastal Commission:** Funding for 12 sites through Spring 1998; opportunistic support thereafter.
- **California Department of Fish and Game:**
 - Marine Resources Division:** Staff support for additional monitoring at 4 sites; other staff field support.
 - Office of Oil Spill Prevention and Response:** Staff field and analysis support.
- **Santa Barbara County:** Partial funding; administrative support.
- **Southern California Coastal Water Research Project:** Staff support for regional data synthesis.
- **Pacific Gas & Electric Company:** Long-term funding for 5 sites associated with Diablo Canyon Power Plant.
- **A.W. Mellon Foundation:** Support for additional monitoring at 9 of the sites.
- **Tatman Foundation:** Funding, ship, and staff support for 2 Santa Catalina Island sites starting Fall 1998.

The Scientific Review Panel would focus on sampling protocol, data analysis, and related research issues in order to maximize the usefulness of the data collected throughout the network. The SRP should be composed of a small group of scientists representing the ongoing monitoring programs or with relevant expertise to address key issues relating to sampling design and data analysis with respect to the goals and practical limitations of the core long-term monitoring.

Action for Recommendation 2: MMS should draft a letter to the relevant agencies to request their participation in the Multi-Agency Steering Committee and to assure management support for the MASC. The first meeting of the MASC should be in April 1997. The Data Management and Scientific Review Panels should be formed as soon as possible.

Recommendation 3: Develop data standardization procedures among participating monitoring programs and design an easily accessible and user-friendly data management and communication system for all network data.

Workshop participants identified a clear need for the monitoring programs to manage their datasets such that standardized information could be exchanged readily among network members and other user groups. The Data Management Panel should review the extent and type of data that have been collected in the extant monitoring programs, then recommend practical short- and long-term options for network data management and communication based on ease of access to relevant information and user-friendliness. Initially, this system should provide an efficient means to access standardized data from each monitoring program so that network-wide data are available to the Scientific Review Panel and others for review and analysis. There was a consensus that the long-term goal should be to manage all regional network data in a central repository maintained by a dedicated data specialist. If approved by the Steering Committee, short-term proposals could be implemented immediately, while long-term recommendations could be phased in depending on funding capabilities. The DMP should oversee all implementation and operation activities.

The Data Management and Communication Workgroup made specific recommendations about relatively simple (short-term) and more involved (long-term) database possibilities for the network. The simple, short-term design would be to pool the alpha-numeric data collected in the various monitoring programs and make it available over the internet via simple FTP (file transfer protocol) or by dispersing diskettes containing the data. FTP access could be made generally available through pointers on a web page and would be accompanied by short text files (README) that would provide data documentation. A shortcoming of this approach is that dataset construction (appending or parsing of files) and queries cannot be done from within the database. Also metadata (essentially all non-numeric data beyond the README documentation) would generally be unavailable. The advantages of such a system are that it could be implemented quickly and relatively cheaply. Moreover, it would be relatively easy to combine data collected by most network member programs since they have similar variables and formats.

Eventually a true relational database integrated with a Geographic Information System should be constructed for the Rocky Intertidal Monitoring Network. The scope of such a database would depend on the specific needs of interested parties. Also, data would be dealt with in different ways, depending on whether or not they conformed with standard protocols. The basic qualities of this relational type of database would include:

- Query and parse capabilities for at least some of the data.
- Open access to download data, but restricted access to modify the database.
- Quality assurance standards, ideally maintained by the database manager (alternatively by each project principal investigator).
- Standardized protocols, in which the network adopts a uniform set of protocols for inclusion of alpha-numeric data and metadata (e.g., adapted from existing National Park Service protocols).

Action for Recommendation 3: The MASC should pursue interagency support and funding for developing standardized data procedures, as well as the design and testing of a network data management/communication system.

Recommendation 4: Review pooled data from all programs in the regional network to provide an overview of the intertidal data resources in the region and to serve as the basis for decisions about potential modifications to the monitoring programs.

There was a consensus at the workshop that the monitoring network should have a periodic review mechanism for synthesizing the information gathered and considering modifications that might enhance the usefulness of current monitoring efforts (see Recommendation 5). Regular monitoring should continue during these review periods. The Scientific Review Panel should oversee this first region-wide review of the data collected thus far by the existing programs in central and southern California. Until now, each program has concentrated solely on its own data, which have been separately analyzed to varying degrees. Also, there is a recognized need to evaluate the power of the assembled data set to achieve the network monitoring goals. The National Park Service conducted a review of their Kelp Forest Monitoring Program, with beneficial results, and have expressed interest in supporting a similar effort for the rocky intertidal surveys.

The participants felt it was important to begin review of the existing data as soon as possible, since enhancements in the usefulness of the network monitoring data depend on this analysis; however, some aspects of data standardization and access must be resolved by the Data Management Panel before these data can be reviewed. To begin with, existing data should be assembled and briefly synthesized to provide the Scientific Review Panel with an overview of the nature of the data. This would allow the SRP to interact with the DMP on database design elements. After this initial review, the SRP would direct a more comprehensive evaluation that would aim at improving our understanding of rocky intertidal resources by looking for patterns in the data. For example, the data from different sites should be examined for evidence of spatial coherence to see whether groups of sites varied similarly through time. Patterns of temporal coherence (such as seasonality) and utility of key species also should be examined. After evaluation of the data, the SRP could recommend ways to modify, refine or expand the network protocol that would either increase the utility of member programs or lower the costs without decreasing the utility. For example, the presence of particular spatial or temporal patterns might indicate that the number of sites being sampled or the frequency of sampling should be changed.

The Scientific Review Panel would present its recommendations to the Multi-Agency Steering Committee. After the comprehensive data review, the SRP should continue to evaluate monitoring and other research activities associated with the intertidal network, but at a lower intensity of effort.

Action for Recommendation 4: After ensuring funding for continuation of current monitoring, the MASC should set a high priority on providing support and funding for a collective synthesis and review of survey results to date from network member programs.

OTHER RECOMMENDATIONS

Recommendation 5: Modify the existing monitoring protocols as recommended by the Scientific Review Panel, subject to feasibility determination by the Steering Committee.

There was a consensus that the existing monitoring protocol is an effective way to provide useful information about the status and dynamics of rocky intertidal communities. However, there was considerable discussion about possible ways to enhance the usefulness of the monitoring data. The decision about how to modify the existing monitoring programs depends on the outcome of the evaluation of existing data and the process established by the MASC. The basic premise should be to adopt modifications that would increase the usefulness of the information being collected at little or no additional cost. Possible means of refining the existing programs are summarized in Table 5.

Table 5. Potential Ways of Modifying the Current Rocky Intertidal Monitoring Programs.

- **Add or drop sites based on placement rationale.** The regional coverage of the 59 sites is already fairly good. However, even prior to the SRP data review, it is obvious that several sites are needed at San Clemente Island. Other current regional gaps identified by the Network Protocol Workgroup include northwest/southeast Santa Catalina Island, north Santa Rosa Island, north/central San Diego County, and central Los Angeles County.
- **Extend monitoring to boulder habitats if warranted.** A separate study evaluating the value and feasibility of monitoring these habitats would be necessary.
- **Add or drop key species based on appropriate rationale.** A high priority should be placed on analyzing existing data for species' suitability in achieving monitoring goals. There is a need to improve taxonomic skills for consistent identifications. Supra-species categories may be considered for monitoring if they provide ecologically meaningful information. There was a consensus that as many key species as possible be monitored at each site. Also, participants recommended collecting biodiversity data, even if only one time per site.
- **Reduce sampling frequency to once per year.** If analysis of existing data finds seasonal differences to be relatively unimportant for the key species (as a consensus thought likely), then it would be appropriate to reduce the sampling frequency and use the effort saved to sample more sites or more intensively at the same sites. However, monitoring parameters other than abundances may require more frequent sampling.
- **Characterize/monitor the physical environment at each site.** Parameters to be measured could include degree and direction of wave exposure, substrate angle/aspect, substrate type, sand influence, temperature, salinity, chlorophyll, and nutrients. Some of these would be measured only once to characterize the sites, while others would be measured frequently.
- **Modify sampling techniques if necessary based on data review by SRP.** Continuity with prior surveys should be a high priority. Specific procedures should be standardized among all studies using the NPS protocol. Other studies (e.g., Diablo Canyon, San Nicolas Island) should be evaluated for best means to integrate data with NPS protocol surveys.
- **Evaluate feasibility of extending at least a portion of the sampling to include other population parameters** such as recruitment, growth, size-structure, fecundity, or mortality. Participants particularly emphasized the value of size-structure data (which currently are collected for two key species).
- **Identify practical means to improve ability to extrapolate information within and among sites.** This would increase the value of the data for a variety of users (e.g., to help meet needs for NRDA).

Action for Recommendation 5: Direct the Scientific Review Panel to consider potential modifications to the monitoring protocol (see Table 5) in designing the data review so the results will indicate appropriate resolutions for these issues.

Recommendation 6: Conduct additional region-wide rocky intertidal studies to the extent feasible, based on prioritization by the SRP. Suggested projects that would increase the utility of monitoring results throughout the network are summarized in Table 6.

Table 6. Region-Wide Studies that Would Enhance Network Monitoring Results.

- **Compile current and historical rocky intertidal metadata** (written records, photographs, videotapes) for the central/southern California region.
- **Integrate existing physical and biological databases with the monitoring data.** These databases mostly deal with regional information, and include weather, wave, temperature, currents, upwelling, productivity, and so forth. Evaluate to what degree remote sensing data and models reflect conditions at the monitoring sites.
- **Conduct region-wide mapping** to put the existing monitoring sites in the context of available resources in the entire region. Start by compiling historical information, then consider aerial surveys in combination with ground truth visits. Consider use of MMS helicopter in tri-county area. Consider characterizing rocky shores according to differing types of physical conditions, key species, and access, for possible stratification of monitoring or research sites.
- **Re-survey Bureau of Land Management sites.** The surveys done for BLM (now MMS) in the late 70's provide an invaluable baseline against which changes over the past 20 years can be measured. Many of the current monitoring sites are located at or near BLM sites. However, the data are not directly comparable because sampling is not done at exactly the same spots, and different sampling methods are used. Plan to resurvey the exact BLM sites using the original BLM techniques. This 20+ year comparison study could be used to look for evidence of regional (global?) warming, as has recently been done in Monterey.

Action for Recommendation 6: Direct the SRP to prioritize and evaluate the feasibility of region-wide rocky intertidal projects. However, the MASC should ensure that adequate funding is available for the core monitoring before considering additional studies. Other sources of support (e.g., NOAA, Sea Grant, OSPR) should be explored for these projects.

Appendix A. Interagency Rocky Intertidal Workshop Agenda.

Appendix B. List of Participants.

Appendix C. Summary Information on Current Monitoring Surveys.

APPENDIX A

INTERAGENCY ROCKY INTERTIDAL MONITORING WORKSHOP

**FEBRUARY 26 & 27, 1997
CLIFF HOUSE, UCSB
SANTA BARBARA, CA**

AGENDA

Day One, Wednesday

- 8:15 Vans/Carpools leave hotel for the Cliff House.
- 8:30 Coffee and greetings at Cliff House
- 9:00 Welcome/Introductions --Mary Elaine Dunaway, Minerals Management Service
- 9:15 Purpose of the Workshop --Fred Piltz, Minerals Management Service
- 9:25 Workshop Format --Gary Davis, National Park Service

I. BACKGROUND

- 9:30 →Current Monitoring Projects --Jack Engle, UC Santa Barbara
- Handbook of Rocky Intertidal --Steve Murray, California State University
Sampling Methods Fullerton.
- So. California Bight Pilot Project --Steve Weisberg, Southern California
Coastal Water Research Project

10:30 **BREAK**

II. SUMMARY OF THE RATIONALE AND VISION FOR A REGIONAL NETWORK

- 10:45 Discussion items: Facilitator: Gary Davis, National Park Service
 - Goals and values of long-term monitoring
 - Integration of research and monitoring studies
 - Ways to increase effectiveness of monitoring
 - Advantages of a multi-agency regional network
 - Framework for operation of a regional network

12:00 **LUNCH -- CATERED AT THE CLIFF HOUSE**

III. WORKGROUPS IDENTIFY AND DISCUSS KEY ISSUES

1:00-3:00

GROUP 1 -- MULTI-AGENCY NETWORK ORGANIZATION
How should the Network be structured?

GROUP 2 – NETWORK PROTOCOL

Given the existing monitoring programs, what should the network protocol be?

GROUP 3 -- DATA MANAGEMENT AND COMMUNICATION

How can monitoring data best be managed for the users?

GROUP 4 -- RESEARCH INTEGRATION

How can research best be integrated with the monitoring network?

3:00 BREAK

IV. WORKGROUPS IDENTIFY OPTIONS TO RESOLVE KEY ISSUES

3:30 Workgroups reconvene to reach consensus on draft options and their pros and cons.

5:00 ADJOURN

6:00 DINNER AT PEPE'S

Day Two, Thursday

8:15 Vans/carpools leave hotel for the Cliff House

8:30 Coffee and Greetings at the Cliff House

V. RAPORTEURS SUMMARIZE WORKGROUP OPTIONS

9:00 Rapporteurs for each workgroup summarize their discussions from Day One.

10:30 BREAK

VI. ALL PARTICIPANTS DISCUSS WORKGROUP OPTIONS

10:45 Each of the workgroup options are discussed by the entire group to incorporate input from outside the individual workgroups.

12:00 LUNCH AT THE CLIFF HOUSE

VII. WORKGROUPS PREPARE DRAFT RECOMMENDATIONS

1:00 Participants return to their workgroups to draft their recommendations and the steps required to accomplish the recommendations.

2:45 BREAK

VIII. ALL PARTICIPANTS DISCUSS DRAFT RECOMMENDATIONS

3:15 All participants examine and comment on draft recommendations.

4:30 CONCLUSIONS AND ADJOURN

APPENDIX B

WORKSHOP PARTICIPANTS

FEDERAL AGENCIES

Channel Islands National Marine Sanctuary:

Mr. Edward Cassano

Channel Islands National Park:

Mr. Gary Davis

Mr. Daniel Richards

Monterey Bay National Marine Sanctuary:

Dr. Andrew DeVogelaere

National Center for Ecological Analysis and Synthesis:

Dr. James Reichman

Dr. Mark Schildhauer

NOAA Damage Assessment Center:

Dr. John Cubit

U S Fish and Wildlife Service:

Mr. Greg Sanders

U.S. Geological Survey

Biological Resources Division:

Dr. Gail Irvine

U.S. Minerals Management Service:

Mr. Thomas Ahlfeld

Ms. Mary Elaine Dunaway

Mr. Maurice Hill

Dr. Fred Piltz

Ms. Lynnette Vesco

U.S. Navy:

Mr. Mitchell Perdue

STATE AGENCIES

California Department of Fish and Game

Marine Resources Division:

Mr. Peter Haaker

Dr. Joseph Weinstein

California Department of Fish and Game

Office of Oil Spill Prevention and Response:

Mr. Michael Sowby

LOCAL AGENCIES

Santa Barbara County:

Mr. William Douros

Ms. Jackie Campbell

Southern California Coastal Water Research Project:

Dr. Stephen Weisberg

Southern California Marine Institute:

Mr. Dominic Gregorio

Ms. Carolyn Wolfe

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Applied Marine Sciences, Inc.:

Mr. Jordan Gold

Chambers Group, Inc.:

Dr. Noel Davis

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Dr. Stephen Schroeter

Tenera Environmental:

Mr. John Steinbeck

ACADEMIC INSTITUTIONS

California State University, Fullerton:

Dr. Steven Murray

California State University, Los Angeles:

Dr. Carlos Robles

Scripps Institution of Oceanography,

University of California, San Diego:

Dr. Sabine Harms

Mr. Jerry Wanetick

University of California, Los Angeles:

Dr. Richard Ambrose

University of California, Davis:

Dr. Robert Meese

Dr. Thomas Suchanek

University of California, Santa Barbara:

Dr. Joseph Connell

Dr. John Engle

Dr. Steven Gaines

Dr. Kevin Lafferty

Mr. Daniel Martin

Dr. Leal Mertes

Dr. Robert Rowley

Dr. Susan Swarbrick

Ms. Melissa Wilson

University of California, Santa Cruz:

Dr. John Pearse

Dr. Peter Raimondi

University of New York, Stony Brook:

Dr. Steven Morgan

University of Washington:

Dr. Megan Dethier

APPENDIX C

Figure 1.
Location of rocky intertidal monitoring sites along the central and southern California Coast.

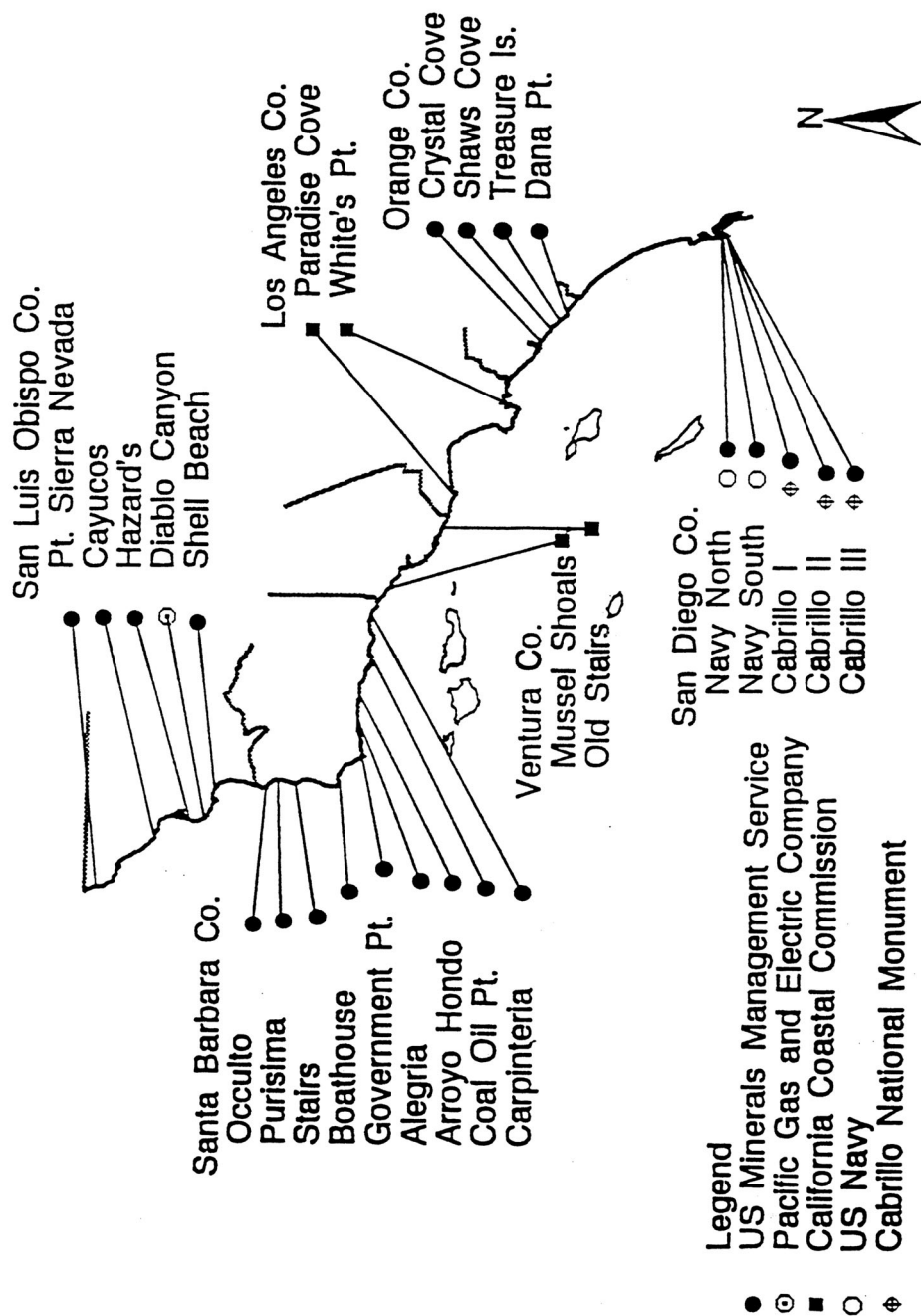


Figure 2. Location of rocky intertidal monitoring sites at the Channel Islands.

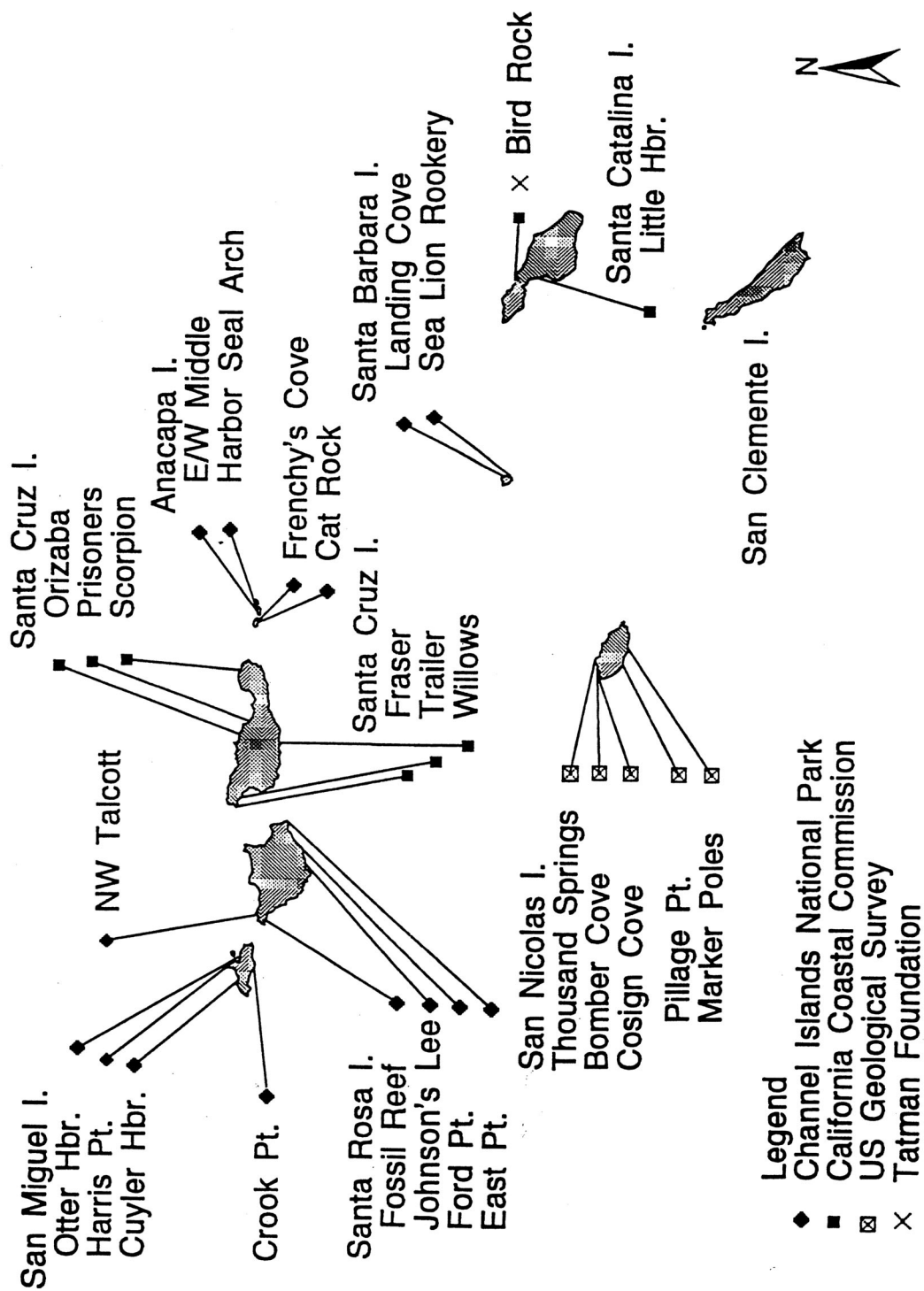


Table 1. Overview of rocky intertidal monitoring surveys in central and southern California. All surveys except those at Diablo Canyon and San Nicolas Island are based on the Channel Islands National Park protocol (semi-annual monitoring of key species in replicated fixed plots or transects). The dark timeline indicates the duration of each monitoring program from initiation until the last future sample that has reasonably assured funding (up to the year 2000).

Location	# of Sites	Funding Agency	Sampling Schedule	Timeline	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	0
Mainland																									
Diablo Canyon (Tenera)	var+	PG&E	Sum/WIn	Since 1966																					
Salt Luis Obispo Co.	4*	MMS	Spr/Fall																						
Santa Barbara Co.	9*	MMS	Spr/Fall																						
Ventura Co.	2	CCC	Spr/Fall																						
Los Angeles Co.	2	CCC	Spr/Fall																						
Orange Co.	4	MMS	Spr/Fall																						
San Diego: Pt. Loma No.	2~	Navy/MMS	Spr/Fall																						
San Diego: Pt. Loma So.	3~	CNM/MMS	Spr/Fall																						
Islands																									
San Nicolas I.	5	USGS	Spr/Fall																						
San Miguel I.	4	CINP	Spr/Fall																						
Santa Rosa I.	5*	CINP	Spr/Fall																						
Santa Cruz I.	6	CCC	Spr/Fall																						
Anacapa I.	4	CINP	Spr/Fall																						
Santa Barbara I.	2	CINP	Spr/Fall																						
Santa Catalina I.	2~	CINP/TF/CCC	Spr/Fall																						
San Clemente I.	0																								

CCC = California Coastal Commission

CINP = Channel Islands National Park

CNIM = Cabrillo National Monument

MMS = U.S. Minerals Management Service

PG&E = Pacific Gas & Electric Company

TF = Talman Foundation

USGS = U.S. Geological Survey

S = Spring

F = Fall

+At Diablo Canyon, the number of sites has varied over the years. Generally there are 5 areas (impact, north transition, north control, south transition, south control).

*The Pt. Sierra Nevada site also has been surveyed for MMS by Kinetics (semi-annually from 1985 to 1991) and by MMS MINT biologists (biannually since 1992).

*In Santa Barbara Co., 1 of the 9 sites was established in 1993.

On Santa Rosa I., 2 of the 5 sites were established in 1986, and 1 in 1988.

~The Pt. Loma North sites were surveyed for the Navy in 1995, then for MMS starting in Fall 1996.

The Pt. Loma South sites were surveyed for CNM from 1990 to 1995, then for MMS starting in Fall 1996.

On Santa Catalina I., 1 site has been surveyed for CINP from 1982 to 1983, for TF from 1984 to 1994, and for CCC since 1994. The second site was established in 1994 for CCC.

Table 2. Key species (or higher taxa) plus tar sampled at rocky intertidal monitoring sites. Survey methods are indicated for those taxa specifically targeted within their optimum zone, and for those with sufficient abundances for following population dynamics. Dots indicate taxa that were not targeted at a particular site, but are scored if present in plots or transects. Other species or higher taxa may be scored as well.

Mainland Sites	Tar	Boa	H. Rock	P. Rock	Sarg.	E. Turf	G. Turf	I. Turf	M. Turf	Red	Turf	Grass	Green	Goose	Pink	White	Black	Black	Owl	Calif.	Ochre	Purp.	Red	Birds	Mamm.	People	Spp.	Tot.
Diablo Canyon (5 sites, S.L.O. Co.) [*]	21
San Luis Obispo Co.	12
PL Sierra Nevada	12
Cayucos	11
Hazard's	9
Shell Beach	6
Santa Barbara Co.	1
Oculito	10
Purisima	11
Stair's	11
Boathouse	7
Government Pt.	6
Alegría	4
Arroyo Hondo	9
Coal Oil Pt.	7
Carpinteria	8
Ventura Co.	7
Mussel Shoals	8
Old Stairs	7
Los Angeles Co.	5
Paradise Cove	10
White's Pt.	10
Orange Co.	8
Crystal Cove	9
Shaw's Cove	13
Treasure Island	14
Dana Point	16
San Diego Co.	16
Navy North	13
Navy South	14
Cabrillo I	16
Cabrillo II	16
Cabrillo III	16

c = % cover (fixed plot or transect)
n = number (regular or irregular fixed plot)
s = size frequency
t = timed searches of large areas (to document rarity or absence)
. = not targeted, but scored if present

Boa kelp = *Egria menziesii*
H. rock weed = *Hesperophycus harveyanus*
P. rock weed = *Polvetia fastigiala*
Sarg. weed = *Sargassum muticum*
E. turf weed = *Endocladia muricata*
G. turf weed = *Galidium* spp.
I. turf weed = *Irdaea* spp.
M. turf weed = *Mastocarpus papillatus*
Red Turf = *Corallina algal turf*
Surf grass = *Phyllospadix* spp.
Green anemone = *Anthopleura elegantissima*
Goose barnacle = *Pollicipes polymerus*
Pink barnacle = *Tetractia rubescens*
White barnacle = *Chthamalus* spp. / *Balanus glandula*
Black alabone = *Haliotis cracherodii*
Black turban = *Tegula funebralis*
Owl limpet = *Lottia gigantea*
California Mussel = *Mytilus californianus*
Ochre star = *Pisaster ochraceus*
Purp. urchin = *Strongylocentrotus purpuratus*
Red urchin = *Strongylocentrotus franciscanus*
Mamm. = Mammals

^{*}At Diablo Canyon, the number of sites has varied over the years. Generally there are 5 areas (Impact, north transition, north control, south transition, south control).

Table 2. Continued:

Island Sites	Tar Kelp	Boa Weed	H. Rock Weed	P. Rock Weed	Sarg. Weed	E. Turf Weed	G. Turf Weed	L. Turf Weed	M. Turf Weed	Red Turf Weed	Surf Grass	Green Anem.	Barn. Barn.	Pink Barn.	White Barn.	Black Ab.	Turban Barn.	Black Turban	Black Turban	Owl Limpet	Calif. Mussel	Ochre Star	Purp. Urchin	Red Urchin	Mamm.	Spp. Tot.
San Nicolas Island (5 sites)																										16
San Miguel Island																										
Cuyler Harbor																										7
Harris Pt.																										7
Oliver Harbor																										9
Crook Pt.																										9
Santa Rosa Island																										
East Pt.																										9
Ford Pt.																										8
Johnson's Lee																										7
Fossil Reef																										9
Northwest Talcott																										7
Santa Cruz Island																										
Scorpion																										9
Orizaba																										7
Prisoners																										9
Willows																										8
Trailer																										10
Fraser/Forney																										12
Anacapa Island																										
Frenchy's Cove, West																										7
Cat Rock, West																										9
Harbor Seal Arch, Mid. E/W Middle																										1
Santa Barbara Island																										7
Landing Cove																										6
Sea Lion Rookery																										7
Santa Catalina Island																										
Bird Rock																										7
Little Harbor																										5
San Clemente Island																										
—none—																										
Mainland Site Total	0	8	2	21	3	16	5	7	7	10	20	14	18	10	29	22	5	5	21	29	25	5	5	30	10	
Island Site Total	1	0	9	23	0	22	6	0	0	5	7	6	7	9	26	20	5	16	26	14	5	5	22	22	0	
Total Sites	1	8	11	44	3	38	11	7	7	15	27	20	25	19	55	42	10	37	55	39	10	10	52	52	10	

c = % cover (fixed plot or transect)

n = number (regular or irregular fixed plot)

s = size frequency

t = timed searches of large areas (to document rarity or absence)

• not targeted, but scored if present

Boa kelp = *Egregia menziesii*H. rock weed = *Hesperophycus harveyanus*P. rock weed = *Pelvetia fastigiata*Sarg. weed = *Sargassum muticum*E. turf weed = *Endocladia muricata*G. turf weed = *Gelidium* spp.I. turf weed = *Ulva* spp.M. turf weed = *Mastocarpus papillatus*Red Turf = *Coraline* algal turfSurf grass = *Phyllospadix* spp.Green anemone = *Anthopleura elegantissima*Goose barnacle = *Pollicipes polymerus*Pink barnacle = *Tetrastia rubescens*White barnacle = *Chthamalus* spp. / *Balanus glandula*Black abalone = *Haliotis cracherodii*Black turban = *Tegula funebralis*Owl limpet = *Lottia gigantea*California Mussel = *Mytilus californianus*Ochre star = *Pisaster ochraceus*Purp. urchin = *Strongylocentrotus purpuratus*Red urchin = *Strongylocentrotus franciscanus*

Mamm. = Mammals



The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.



The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The **MMS Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.