

A Review of Marine Zones in the Monterey Bay National Marine Sanctuary

U.S. Department of Commerce
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The National Oceanic and Atmospheric Administration's Marine Sanctuary Division (MSD) administers the National Marine Sanctuary Program. Its mission is to identify, designate, protect and manage the ecological, recreational, research, educational, historical, and aesthetic resources and qualities of nationally significant coastal and marine areas. The existing marine sanctuaries differ widely in their natural and historical resources and include nearshore and open ocean areas ranging in size from less than one to over 5,000 square miles. Protected habitats include rocky coasts, kelp forests, coral reefs, sea grass beds, estuarine habitats, hard and soft bottom habitats, segments of whale migration routes, and shipwrecks.

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A Review of Marine Zones in the Monterey Bay National Marine Sanctuary

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A REVIEW OF MARINE ZONES IN THE MONTEREY BAY NATIONAL MARINE SANCTUARY

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Executive Summary

The Monterey Bay National Marine Sanctuary (MBNMS) is the largest marine protected area in the United States, spanning nearly 400 miles of the California coastline and encompassing over 5,300 square miles (Fig. 1). The MBNMS is famous for its scenic coastline, beautiful beaches, and diverse array of intertidal and subtidal plant and animal life. These characteristics make the Sanctuary a popular location for both local inhabitants and tourists to engage in a variety of commercial and recreational activities, such as boating, fishing, tidepooling, kayaking, snorkeling and SCUBA diving. The MBNMS is also a nationally recognized center for marine biological and oceanographic research, with over twenty research institutions located within a few miles of the coastline. Such a high intensity of human activity within the Sanctuary can have negative impacts on its sensitive physical and biological resources. Over the past century local, State, and Federal agencies have attempted to protect these resources by designating areas (e.g., Marine Life Refuges, Dredge Material Disposal sites) in which human activities are controlled. The purpose of this report is to identify and review these legislated areas and preliminarily evaluate their effectiveness in protecting resources within the MBNMS.

The MBNMS contains 72 sites in which specific human activities, both commercial and recreational, are either restricted or promoted (Fig. 1). For the purpose of this report, these sites are grouped into 13 categories (Table 1) - hereafter referred to as marine zones - which can be described as follows:

- 1) National Marine Sanctuary Zone. National Marine Sanctuaries are areas of special national significance due to their resource and human-use values. Their designation is intended to facilitate the coordinated and comprehensive conservation and management of the area. Zone regulations serve to protect the conservation, recreational, ecological, historical, research, educational, and esthetic resources in the area. Regulations restrict exploring for oil, gas, and minerals, modifying the seafloor, attracting white sharks, altering the natural water quality, and operating certain motorized vessels. The Sanctuary does not regulate commercial or recreational fishing.
- 2) Jade Collection Zones. Jade collection zones are areas in which traditional small-scale collection of loose jade is allowed in the MBNMS. Previous to the formation of jade collection zones, all such collection was prohibited within the Sanctuary. Zone regulations allow small-scale collection to support the local artisan industry while protecting the mineral resources of the Sanctuary from degradation.
- 3) Dredge Material Disposal Zones. Dredge material disposal zones are areas specifically designated as disposal sites for dredged material. Dredged material is sediment that has been removed from the sea floor, by means of suction or scooping. Dredging is often conducted to widen harbors and channels - therefore, the sediments can be contaminated with pollutants, such as industrial chemicals, oil, and gasoline. Dredge material disposal zones allow the disposal of certain types of dredge material while minimizing the possible negative impacts to the marine environment.

- 4) Restricted Overflight Zones. Restricted overflight zones are intertidal and subtidal areas over which motorized aircraft are restricted from flying below 1000 feet (305 meters). These zones often encompass areas with high densities of marine mammals or seabirds, such as pupping grounds and nesting sites. Restricted overflight zones do allow overflight below 1000 feet in cases of emergency, for law enforcement, and by the Department of Defense.
- 5) Motorized Personal Watercraft Zones. Motorized personal watercraft zones are areas specifically designated for the recreational use of motorized personal watercraft (MPWC). MPWC (e.g., jet skis) are motorized vessels that are less than 15 ft long, capable of exceeding 15 knots, and can carry only two or fewer people. The purpose of MPWC zones is to allow this form of recreation while protecting nearshore marine life from disturbance or injury and minimizing conflicts with other recreational users, such as SCUBA divers and kayakers.
- 6) Shark Attraction Prohibited Zones. Shark attraction prohibited zones are areas in which the attraction of white sharks is prohibited. Attraction is defined as the conduct of any activity that lures or may lure white sharks by using food, bait, chum, dyes, acoustics, or any other means, except the mere presence of human beings (e.g., swimmers, divers, surfers, kayakers, boaters). The purpose of zone regulations is to prevent the possible negative impacts of shark baiting or attraction events, such as conflicts among various user groups and behavioral changes in the attracted species (e.g., feeding and migration).
- 7) Military Zones. Military zones are areas of the Sanctuary in which military training operations are routinely conducted by the Department of Defense. Information about military zones, including the location of the zone and advisories to civilian users, are included on nautical and aeronautical charts. The purpose of military zones is to allow military training while avoiding interference from and harm to civilian vessels and aircraft.
- 8) Vessel Traffic Zones. Vessel traffic zones serve to manage large vessel traffic in such a way as to maximize protection of the physical and biological resources of the surrounding waters while allowing safe and efficient vessel operation. Vessel traffic zones apply primarily to the following vessel types: tankers, hazmat ships, barges, and large commercial vessels (LCVs).
- 9) No Harvest Zones. No harvest zones are intertidal and subtidal areas in which it is unlawful to take or possess any plants or animals. These areas are intended to provide habitat for the permanent residence of local marine life and possibly to replenish surrounding areas. Scientific research is allowed, and often encouraged, in no harvest zones because these areas represent a more "natural" state that can be compared to adjacent exploited habitats. With the appropriate permits, collection of plants or animals is allowed for the purpose of scientific research. Often access to the site or activities within the site are limited to decrease the potential negative impacts of ecotourism.

FIGURE 1. Summary of zoning in the Monterey Bay National Marine Sanctuary.

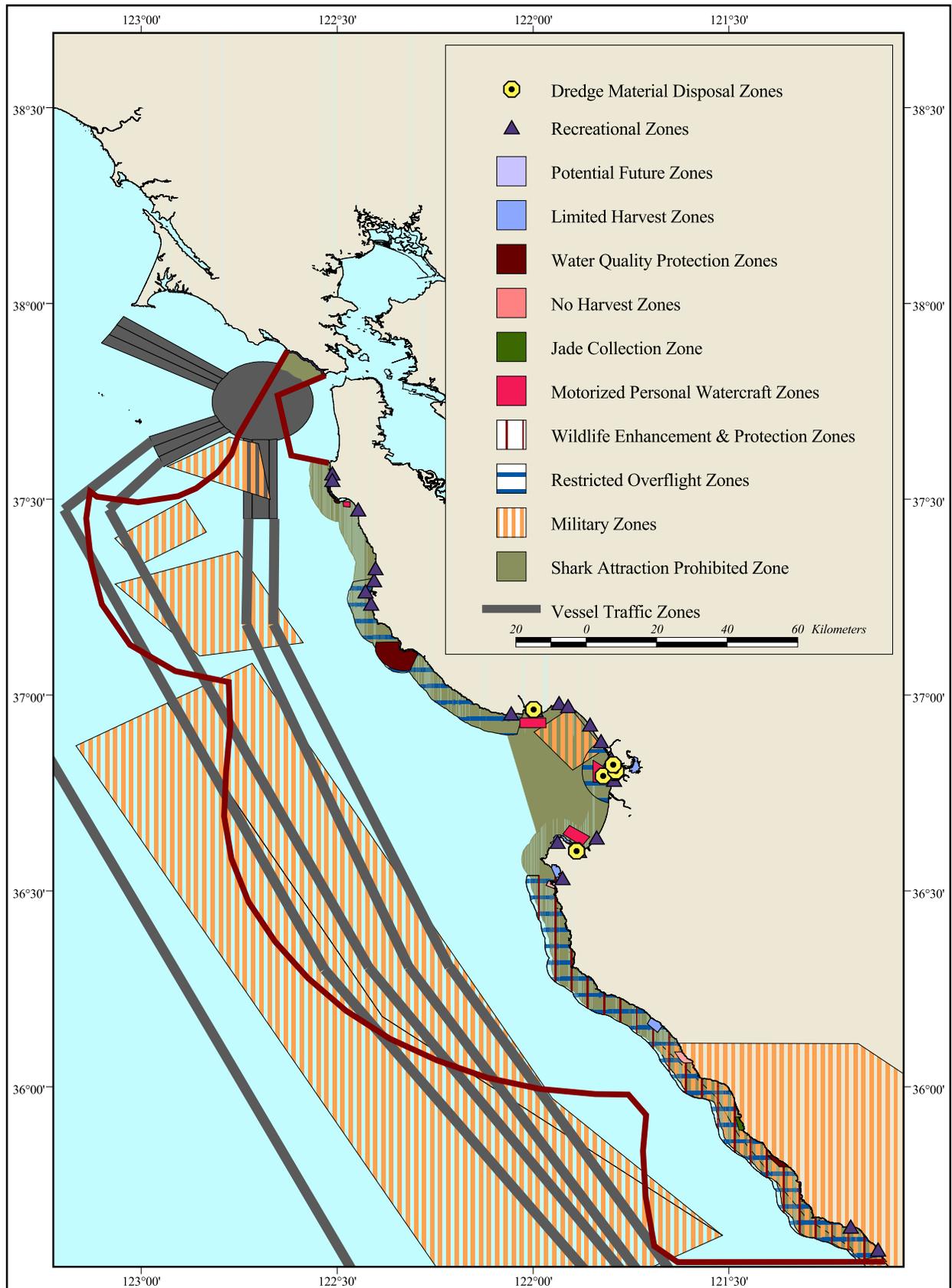


Table 1. Total area and percent of MBNMS encompassed by each marine zones type (bold) and by each site (italics). Sites are listed in order from north to south. N/A = not applicable; these are designated points, not areas.

	Name of Sites	Area (km ²)	% MBNMS
EXISTING ZONES			
National Marine Sanctuary (MBNMS)		13705.99	
Jade Collection Zone		4.15	0.030
Dredge Material Disposal	<i>SF-12</i>	N/A	N/A
	<i>SF-14</i>	0.97	0.007
	<i>Beach Replenishment</i>	N/A	N/A
	<i>Subtidal Disposal</i>	N/A	N/A
	<i>Beach Decant</i>	N/A	N/A
Restricted Overflight		1251.91	8.971
	<i>Site 1 - Coastline north of Point Santa Cruz</i>	332.86	2.429
	<i>Site 2 - Offshore of Moss Landing</i>	86.14	0.628
	<i>Site 3 - Elkhorn Slough</i>	2.91	0.021
	<i>Site 4 - Coastline south of Carmel River</i>	830.00	5.893
Motorized Personal Watercraft		48.34	0.353
	<i>Site 1 - Offshore of Pillar Point Harbor</i>	2.15	0.016
	<i>Site 2 - Offshore of Santa Cruz Harbor</i>	16.55	0.121
	<i>Site 3 - Offshore of Moss Landing Harbor</i>	13.18	0.096
	<i>Site 4 - Offshore of Monterey Harbor</i>	16.46	0.120
Shark Attraction Prohibited		2036.87	14.861
Military		5220.79	38.091
	<i>"U1" Submerged Submarine Operating Area</i>	210.29	1.534
	<i>"U2" Submerged Submarine Operating Area</i>	181.85	1.327
	<i>"U5" Submerged Submarine Operating Area</i>	704.67	5.141
	<i>Warning Area 285</i>	3559.33	25.969
	<i>Naval Operating Area</i>	138.64	1.012
	<i>Hunter Military Operations Area</i>	426.00	3.108
Vessel Traffic*		5599.14	40.852

* Area encompassed by lanes and approaches was estimated by calculating the area of the region between the eastern most vessel track (LCV northbound track) and the Sanctuary boundary.

Table 1 (con't). Total area and percent of MBNMS encompassed by each marine zones type (bold) and by each site (italics). Sites are listed in order from north to south. N/A = not applicable; these are designated points, not areas.

	Name of Sites	Area (km ²)	% MBNMS
EXISTING ZONES			
No Harvest⁺	<i>Hopkins Marine Life Refuge</i>	6.95	0.050
	<i>Point Lobos Ecological Reserve</i>	0.33	0.002
	<i>Point Lobos State Reserve</i>	2.79	0.020
	<i>Point Lobos State Reserve</i>	2.79	0.020
	<i>Big Creek MRPAs Ecological Reserve</i>	3.83	0.028
Limited Harvest⁺	<i>James V. Fitzgerald Marine Reserve</i>	27.95	0.204
	<i>Año Nuevo State Reserve</i>	1.98	0.014
	<i>Elkhorn Slough Ecological Reserve</i>	2.04	0.015
	<i>Elkhorn Slough Ecological Reserve</i>	5.90	0.043
	<i>Pacific Grove Marine Refuge</i>	1.96	0.014
	<i>Pacific Grove Marine Gardens Fish Refuge</i>	4.09	0.030
	<i>Carmel Bay Ecological Reserve</i>	6.41	0.047
	<i>Julia Pfeiffer Burns Underwater Park</i>	7.05	0.051
Recreational	<i>Golden Gate National Recreation Area</i>	N/A	N/A
	<i>State Beaches</i>	5.35	0.039
	<i>State Beaches</i>	N/A	N/A
Wildlife Enhancement and Protection	<i>Moss Landing Wildlife Area</i>	831.64	5.911
	<i>Elkhorn Slough NERR</i>	2.60	0.019
	<i>Elkhorn Slough NERR</i>	5.90	0.043
	<i>California Sea Otter Game Refuge</i>	823.14	5.849
Water Quality Protection	<i>James V. Fitzgerald Marine Reserve ASBS</i>	82.98	0.605
	<i>Año Nuevo Point and Island ASBS</i>	4.52	0.033
	<i>PGMG Fish Refuge and Hopkins MLR ASBS</i>	54.84	0.400
	<i>PGMG Fish Refuge and Hopkins MLR ASBS</i>	1.90	0.014
	<i>Carmel Bay ASBS</i>	6.41	0.047
	<i>Point Lobos Ecological Reserve ASBS</i>	2.79	0.020
	<i>Julia Pfeiffer Burns Underwater Park ASBS</i>	7.05	0.051
	<i>Ocean Area Surrounding the Mouth of Salmon Creek ASBS</i>	5.47	0.040
POTENTIAL FUTURE ZONES			
Limited Harvest	<i>Ed Ricketts Park</i>	0.49	0.004

⁺ Cumulative area of the zone type (bold) was calculated by summing the area of all sites (italicized) and subtracting areas of overlap.

10) Limited Harvest Zones. Limited harvest zones are intertidal and subtidal areas in which the take of certain species of plants and animals is limited. For example, zone regulations may protect all species of invertebrates and plants, but allow certain species of finfish to be taken within the designated area. Limited harvest zones also include sites in which the harvesting of plants or animals is limited to certain methods of take or during specific periods of time. For example, zone regulations may allow the taking of finfish by hook and line only. Limited harvest zones are intended to protect the natural resources of an area while allowing limited use.

11) Recreational Zones. Recreational zones are intertidal and subtidal habitats specifically designated to provide areas of open space for recreational uses, such as swimming, boating, fishing, and picnicking. These sites have regulations that limit the degradation of natural resources in order to maintain those resources for future enjoyment. The taking of plants and animals is allowed within recreational zones with some limitations on species, numbers, timing, and(or) method of take.

Table 2. Government agencies responsible for establishment, management, and number of sites in each marine zone type.

	Federal	State	Local	Federal and International	Federal and State	Federal, State and Local	State And Local
EXISTING ZONES							
National Marine Sanctuary	1						
Jade Collection	1						
Dredge Material Disposal						9	
Restricted Overflight	4						
Motorized Personal Watercraft	4						
Shark Attraction Prohibited	1						
Military	6						
Vessel Traffic				1			
No Harvest		2					2
Limited Harvest		6	1				
Recreational		22			1		
Wildlife Enhancement and Protection		2			1		
Water Quality Protection							7
POTENTIAL FUTURE ZONES							
Limited Harvest			1				

- 12) Wildlife Enhancement and Protection Zones. Wildlife enhancement and protection zones are intertidal and subtidal areas that are established to minimize human disturbance to especially sensitive wildlife populations and their habitats. Regulations governing access to the areas are designed to protect endangered or threatened species or their habitats. The protected sites often include bird nesting areas, marine mammal pupping grounds, and fish spawning and nursery habitats. Restrictions on recreational access may include no-access buffer zones or time periods. Research is often encouraged in wildlife enhancement and protection zones to determine the population dynamics and habitat requirements of the target species.
- 13) Water Quality Protection Zones. Water quality protection zones are established to protect the specified marine habitats from undesirable changes in water quality. The protected areas serve as habitat for certain species or biological communities that are deemed especially sensitive to changes in water quality.

A variety of federal, state, and local government agencies are responsible for establishing and managing the 72 sites within the MBNMS (Table 2). Federal agencies, including the National Oceanographic and Atmospheric Administration (NOAA), U.S. Coast Guard, and U.S. Environmental Protection Agency, are responsible for managing the zones that were created by the formation of the MBNMS. These agencies appear to be effectively managing the national marine sanctuary, dredge material disposal, jade collection, shark attraction prohibited, and vessel traffic zones. Effective management of the motorized personal watercraft and restricted overflight zones has been hampered by delays in regulation implementation due to lawsuits or interagency disagreements.

Many of the zones managed by state and local agencies fall under the title "marine reserve". Marine reserves have recently received attention due to their potential for: improving the status of exploited species; protecting marine habitats from degradation; protecting biodiversity; facilitating scientific research and fisheries management; and increasing ecotourism. However, reserves must be well designed and managed to achieve this potential. A well designed and managed reserve will have clearly defined goals, scientifically-based design, proper enforcement of regulations, rigorous evaluation, and the potential for adaptive management. Based on these criteria, few of the marine reserves in California are well designed or managed. Many sites suffer from poorly defined goals, confusing regulations, lack of enforcement, and (or) no scientific evaluation. However, a few sites in the MBNMS (e.g., Pt. Lobos State/Ecological Reserve, Hopkins Marine Life Refuge, Big Creek MRPA Ecological Reserve) appear to be fairly effective. Research to date suggests that these sites are achieving their purpose - to protect marine plant and animal populations - at least for certain species. The success of these sites appears to stem from community involvement and on-site enforcement and education.

Abstract

This report reviews marine zoning in the Monterey Bay National Marine Sanctuary (MBNMS). The 72 zoned areas in the MBNMS are of 13 different zone types. Each marine zone type has associated regulations that restrict or promote specific activities. For example, recreational activities such as boating, fishing, tidepooling, snorkeling, and SCUBA diving are limited in some zones. Scientific research is allowed at all sites, with appropriate permits, and is specifically promoted in a few sites. In addition, motorized personal watercraft use, dredge material disposal, large vessel traffic, jade collection, and aircraft overflight are allowed only in specific zones. The effectiveness of the marine zoning in the MBNMS is difficult to determine for two reasons. Firstly, many of the zones lack a clearly stated purpose or have confusing regulations. Secondly, the majority of the zones have not been evaluated formally by the managing agencies. Of the zones that have been evaluated, such as Dredge Material Disposal zones, Big Creek MRPA Ecological Reserve, and Pt. Lobos State/Ecological Reserve, the majority appear to be achieving their mandated purpose to some extent.

Many of the zones in the MBNMS fall under the title “marine reserve.” Marine reserves have recently received significant attention internationally, nationally, and in California due to their potential for: improving the status of exploited species; protecting marine habitats and ecosystems from degradation; facilitating scientific research and fisheries management; and increasing ecotourism. However, reserves must be well designed and managed to reach this potential. A well designed and managed reserve will have clearly defined goals, scientifically-based design, proper enforcement of regulations, rigorous evaluation of the reserve’s effectiveness, and adaptive management. Based on these criteria, the majority of the marine reserves in California are not well designed or managed. However, the State of California has recognized this problem and is in the process of re-evaluating the California system of marine managed areas.

Introduction

The Monterey Bay National Marine Sanctuary (MBNMS) is the largest marine protected area in the United States – approximately 5,300 square miles. It contains 13 different marine zone types comprised of 72 zoned areas. Of these 72 zoned areas, 60 encompass areas of coastline with adjacent marine habitats and are managed by the National Oceanic and Atmospheric Administration, Department of Defense, California Department of Fish and Game, California Department of Parks and Recreation, State and Regional Water Control Boards, National Park Service, and local government agencies. The 12 remaining zoned areas encompass offshore marine habitat and are managed by the National Oceanic and Atmospheric Administration, Army Corps of Engineers, U.S. Coast Guard, Department of Defense, and U.S. Environmental Protection Agency.

The purpose of this report is to identify and describe the 13 marine zone types that exist within the boundaries of the Sanctuary. A marine zone is defined as an area in which human activities, both commercial and recreational, are either restricted or promoted. The names given to zones in this report attempt to describe the human activities that are restricted or promoted. This report is organized into sections by zone type. One or more sites may occur within each zone type. For each site the following information is given:

- a) Type of zone;
- b) Legislated title of the site(s);
- c) Location and name of each site;
- d) Date of establishment for each site;
- e) The regulatory agency or legislative body and, when available, the name of the legislation or regulations that established the site(s);
- f) Agency (or agencies) responsible for management of the site(s);
- g) The legally mandated purpose of the site(s);
- h) Regulations, both general and site specific;
- i) A brief evaluation of the effectiveness of the site including regulation enforcement and research conducted within the site;
- j) A list of the sites with boundaries that overlap those of the site(s); and
- k) References.

This report focuses on regulations that potentially affect activities within the MBNMS. Regulations that apply to the entire California coast are not included in the report. These state-wide regulations are available from the California Department of Fish and Game or other managing agencies. In addition, this report does not include regulations that apply to: 1) terrestrial areas outside the Sanctuary boundaries; or 2) activities that do not impact the Sanctuary. All regulations included in this report are listed *as written* in the regulatory code to avoid improper interpretation of the regulations by the author of this report.

Many of the sites listed in this report have overlapping boundaries. For example the Point Lobos area has three overlapping marine sites: Point Lobos Ecological Reserve ASBS, Point Lobos Ecological Reserve, Point Lobos State Reserve. In addition, the Point Lobos area falls within the boundaries of the MBNMS, California Sea Otter Game Refuge, Shark Attraction Prohibited zone, and one of the four Restricted Overflight zones. The reader must examine the regulations of all overlapping sites to accurately understand the restrictions that apply to any specific site.

Two Appendices follow the main body of this report. Appendix I is a summary of the existing literature on marine reserves, focusing on research conducted either in the Monterey Bay National Marine Sanctuary or in temperate regions. Appendix II is a listing of the marine reserve

literature from both tropical and temperate regions and including the literature cited in Appendix I.

Existing Zones

Type of Zone: National Marine Sanctuary

Location of Zone

See Figure 1 for exact location.

Marin, San Mateo, Santa Cruz, Monterey, and San Luis Obispo Counties

1) Monterey Bay National Marine Sanctuary

Year Established

1992

Established By

National Marine Sanctuaries Act; National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce

Agency Responsible

National Marine Sanctuaries Program, NOAA, U.S. Department of Commerce

Purpose

In accordance with the standards set forth in title III of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended, also known as the National Marine Sanctuaries Act, the mission of the National Marine Sanctuary Program is to identify, designate, and manage areas of the marine environment of special national, and in some cases international, significance due to their conservation, recreational, ecological, historical, research, educational, or aesthetic qualities (15 Code of Federal Regulations (CFR), Part 922.2, Subpart A).

The goals of the Program are to carry out the mission to: (15 CFR, Part 922.2, Subpart A)

- 1) Identify and designate as National Marine Sanctuaries areas of the marine environment which are of special national significance;
- 2) Provide authority for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner which complements existing regulatory authorities;
- 3) Support, promote, and coordinate scientific research on, and monitoring of, the resources of these marine areas, especially long-term monitoring and research of these areas;
- 4) Enhance public awareness, understanding, appreciation, and wise use of the marine environment;
- 5) Facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities;
- 6) Develop and implement coordinated plans for the protection and management of these areas with appropriate Federal agencies, State and local governments, Native American tribes and organizations, international organizations, and other public and private interests concerned with the continuing health and resilience of these marine areas;
- 7) Create models of, and incentives for, ways to conserve and manage these areas;
- 8) Cooperate with global programs encouraging conservation of marine resources; and
- 9) Maintain, restore, and enhance living resources by providing places for species that depend upon these marine areas to survive and propagate.

Regulations

General Regulations

15 CFR, Part 922, Subparts A-E

Site Specific Regulations (15 CFR, Part 922.132, Subpart M)

- a) Except as specified in paragraphs (b) through (f) of this section, the following activities are prohibited and thus unlawful for any person to conduct or cause to be conducted:
- 1) Exploring for, developing, or producing oil, gas, or minerals within the Sanctuary except: jade may be collected (meaning removed) from the area bounded by the 35°55'20" N latitude parallel, the 35°53'20" N latitude parallel, and from the mean high tide line seaward to the 90-foot isobath (the "authorized area") provided that:
 - i) Only jade already loose from the seabed may be collected;
 - ii) No tool may be used to collect jade except:
 - A) A hand tool (see Sec. 922.131) to maneuver or lift the jade or scratch the surface of a stone as necessary to determine if it is jade;
 - B) A lift bag or multiple lift bags with a combined lift capacity of no more than two hundred pounds; or
 - C) A vessel (except for motorized personal watercraft) (see paragraph (a)(7) of Sec. 922.132) to provide access to the authorized area;
 - iii) Each person may collect only what that person individually carries.
[See Figure 3 for exact location of jade collection zones.]
 - 2)(i) Discharging or depositing, from within the boundary of the Sanctuary, any material or other matter except:
 - A) Fish, fish parts, chumming materials or bait used in or resulting from traditional fishing operations in the Sanctuary;
 - B) Biodegradable effluent incidental to vessel use and generated by marine sanitation devices approved in accordance with Section 312 of the Federal Water Pollution Control Act, as amended, (FWPCA), 33 U.S.C. 1322 et seq.;
 - C) Water generated by routine vessel operations (e.g., cooling water, deck wash down and graywater as defined by Section 312 of the FWPCA), excluding oily wastes from bilge pumping;
 - D) Engine exhaust; or
 - E) Dredged material deposited at disposal sites authorized by the U.S. Environmental Protection Agency (EPA) (in consultation with the U.S. Army Corps of Engineers (COE)) prior to the effective date of Sanctuary designation (January 1, 1993), provided that the activity is pursuant to, and complies with the terms and conditions of, a valid Federal permit or approval existing on January 1, 1993.
[See Figure 4 for exact location of dredged material disposal zones.]
 - (ii) Discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality, except those listed in paragraphs (a)(2)(i) (A) through (D) of this section and dredged material deposited at the authorized disposal sites, provided that the dredged material disposal is pursuant to, and complies with the terms and conditions of, a valid Federal permit or approval.
 - 3) Moving, removing, or injuring, or attempting to move, remove, or injure, a Sanctuary historical resource. This prohibition does not apply to moving, removing, or injury resulting incidentally from kelp harvesting, aquaculture, or traditional fishing operations.
 - 4) Drilling into, dredging, or otherwise altering the seabed of the Sanctuary; or constructing, placing, or abandoning any structure, material, or other matter on the seabed of the Sanctuary, except as an incidental result of:
 - i) Anchoring vessels;
 - ii) Aquaculture, kelp harvesting, or traditional fishing operations;
 - iii) Installation of navigational aids;
 - iv) Harbor maintenance in the areas necessarily associated with Federal Projects in existence on January 1, 1993, including dredging of entrance channels and repair, replacement, or rehabilitation of breakwaters and jetties; or

- v) Construction, repair, replacement, or rehabilitation of docks or piers.
- 5) Taking any marine mammal, sea turtle, or seabird in or above the Sanctuary, except as permitted by regulations, as amended, promulgated under the Marine Mammal Protection Act (MMPA), as amended, 16 U.S.C. 1361 et seq., the Endangered Species Act (ESA), as amended, 16 U.S.C. 1531 et seq., and the Migratory Bird Treaty Act (MBTA), as amended, 16 U.S.C. 703 et seq.
- 6) Flying motorized aircraft, except as necessary for valid law enforcement purposes, at less than 1,000 feet above any of the four zones within the Sanctuary.
[See Figure 5 for the exact location of these four zones.]
- 7) Operating motorized personal watercraft within the Sanctuary except within the four designated zones and access routes within the Sanctuary.
[See Figure 6 for the exact location of these four zones.]
- 8) Possessing within the Sanctuary (regardless of where taken, moved, or removed from), except as necessary for valid law enforcement purposes, any historical resource, or any marine mammal, sea turtle, or seabird taken in violation of regulations, as amended, promulgated under the MMPA, ESA, MBTA.
- 9) Interfering with, obstructing, delaying, or preventing an investigation, search, seizure, or disposition of seized property in connection with enforcement of the National Marine Sanctuaries Act or any regulation or permit issued under the Act.
- 10) Attracting any white shark in that part of the Sanctuary out to the seaward limit of State waters. For the purposes of this prohibition, the seaward limit of State waters is a line three nautical miles distant from the coastline of the State, where the coastline is the line of ordinary low water along the portion of the coast in direct contact with the open sea. The coastline for Monterey Bay, which is inland waters, is the straight line marking the seaward limit of the Bay, determined by connecting the following two points: 36°57'6"N, 122°01'45"W and 36°38'16"N, 121°56'3"W.
[See Figure 7 for the exact location of this zone.]
- b) The prohibitions in paragraphs (a)(2) through (10) of this section do not apply to activities necessary to respond to emergencies threatening life, property or the environment.
- c)(1) All Department of Defense activities shall be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on Sanctuary resources and qualities. The prohibitions in paragraphs (a)(2) through (9) of this section do not apply to existing military activities carried out by the Department of Defense, as specifically identified in the Final Environmental Impact Statement and Management Plan for the Proposed Monterey Bay National Marine Sanctuary (NOAA, 1992). New activities may be exempted from the prohibitions in paragraphs (a)(2) through (9) of this section by the Director after consultation between the Director and the Department of Defense.
[See Figure 8 for the exact location of military zones.]
- (2) In the event of threatened or actual destruction of, loss of, or injury to a Sanctuary resource or quality resulting from an untoward incident, including but not limited to spills and groundings, caused by the Department of Defense, the cognizant component shall promptly coordinate with the Director for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the Sanctuary resource or quality.

Evaluation of Effectiveness

For evaluation of the Sanctuary regulations pertaining to jade collection, dredge material disposal, restricted overflight, motorized personal watercraft, shark attraction prohibited, and military zones refer to pages 16, 19, 23, 26, 29, and 32, respectively.

Enforcement of Regulations

Enforcement of Sanctuary regulations is accomplished by cooperative agreements and coordination efforts among several federal, state, and local law enforcement agencies such as the U.S. Coast Guard (USCG), National Marine Fisheries Service, U.S. Fish and Wildlife

Service, U.S. Customs Service, U.S. Environmental Protection Agency, Federal Bureau of Investigations, California Department of Fish and Game (CDFG), California Department of Parks and Recreation, California Highway Patrol, and local harbor masters and police. The USCG and CDFG conduct regular patrols within the Sanctuary from the land, sea, and air. State Parks Rangers conduct beach patrols. The Sanctuary conducts sea and air surveillance patrols to monitor permitted activities and to investigate incidents within the Sanctuary. In many cases, violation of Sanctuary regulations includes violation of other federal and state laws and carries the potential for additional penalties.

The following are informal estimates of the level of enforcement for each Sanctuary regulation (based on comments from Scott Kathey MBNMS):

Regulation (a)(1): This regulation is very effective - see Jade Collection Zone for details.

Regulation (a)(2)(i): This regulation is approximately 50% effective. No primary sewage is discharged into the Sanctuary and dredge material is only disposed of in EPA approved sites. There is still some discarding of plastics and discharging from bilge pumps and septic tanks into Sanctuary waters. This regulation requires voluntary compliance by boaters because it is impossible to police all boating activity in the Sanctuary.

Regulation (a)(2)(ii): The MBNMS personnel have successfully used this regulation as a tool to decrease the discharge of materials that will enter Sanctuary waters. For example, the MBNMS has decreased the dumping of harmful materials into the Sanctuary watershed and sediment into coastal waters during roadwork.

Regulation (a)(3): This regulation has not been effectively enforced because the term "historical resource" is not clearly defined. The current working definition is "anything that is either greater than 50 years old or of national significance."

Regulation (a)(4): This regulation has been successfully enforced. Part of the success is due to the California Coastal Commission's requirement that any developer proposing to drill or alter the seabed must get MBNMS permission. In addition, this regulation gives the MBNMS the power to force the owners of grounded vessels to remove them.

Regulation (a)(5): This regulation is not enforced directly by the MBNMS. The MMPA, ESA and MBTA are enforced by the National Marine Fisheries Service, U.S. Fish and Wildlife Service, U.S. Coast Guard, and California Department of Fish and Game. There is a good level of compliance with the ESA regulations in the MBNMS. However, there is a lower level of compliance with the MMPA and MBTA regulations in the Sanctuary. Problem areas include a regional fishery that is catching migratory birds and marine mammals in its nets and incidents of marine mammal, specifically pinniped, shootings (Roy Torres, NMFS, pers. comm.). This MBNMS regulation adds additional fines for violations of the MMPA, ESA, and MBTA in the Sanctuary and may aid in the prosecution of these cases.

Regulation (a)(6): Currently, enforcement of this Sanctuary regulation is limited - see Restricted Overflight Zone for details.

Regulation (a)(7): These regulations are effectively enforced - see Motorized Personnel Watercraft Zone for details.

Regulation (a)(8): This regulation adds additional penalties for violating the MMPA, the ESA, and the MBTA in the Sanctuary (see (a)(5) above).

Regulation (a)(9): This regulation levies penalties for obstructing an investigation.

Regulation (a)(10): This regulation is 100% effective - see Shark Attraction Prohibited Zone for details.

Regulation (c): Though military activities are difficult to monitor, it appears that this regulation has had a significant impact on Department of Defense (DOD) activities in the Sanctuary. For example, the DOD had advised military aircraft to stay above 1,000 feet when flying along the Big Sur coast. In addition, the DOD consults with the Sanctuary about its amphibious landing exercises in order to minimize impacts on Sanctuary resources. It appears that the DOD will consult with the MBNMS when it is planning

high-profile nearshore activities, but rarely consults with the Sanctuary when the activities are farther offshore.

Achievement of Purpose

The Sanctuary Advisory Council (SAC) was formed to help direct MBNMS activities towards achieving its goal of supporting, promoting, and coordinating research, education, and conservation efforts in the Sanctuary. The SAC has three Working Groups to help accomplish these goals. These three groups are the Research Activity Panel (RAP), the Sanctuary Education Panel (SEP), and the Conservation Working Group (CWG).

The RAP is presently composed of representatives from 21 research institutions and organizations. It meets approximately eight times per year to discuss a variety of topics including:

- 1) Setting research priorities that are primarily related to management of the MBNMS;
- 2) Promoting, encouraging, and reviewing research projects in the Sanctuary;
- 3) Providing scientific advice and objective information to the Sanctuary Council and Sanctuary management;
- 4) Reviewing and advising on research permits in the Sanctuary;
- 5) Assisting in the coordination of the annual MBNMS Currents Symposium; and
- 6) Assisting Sanctuary management with the organization and dissemination of information on research activities within the Sanctuary.

The SEP membership includes educators from aquariums, universities, conservation organizations and agencies, as well as classroom teachers. The SEP meets monthly to: 1) review program proposals; 2) advise on educational priorities; and 3) assist in the implementation of programs to increase understanding and stewardship of the MBNMS.

The CWG is composed of representatives from local and national conservation organizations. The roles of the CWG include:

- 1) Serving as a forum for identification and discussion of Sanctuary-specific resource protection issues;
- 2) Collaborating in building a well-informed and supportive constituency for the Sanctuary through education, public and media outreach, and citizen involvement activities;
- 3) Providing advice and factual information on resource protection, Sanctuary management, and other issues;
- 4) Identifying resource protection and management needs and making recommendations on related priorities, strategies, and policies;
- 5) Promoting communication and coordination among conservation organizations and other groups throughout the Sanctuary community.

The MBNMS, through SAC and its working groups, has started programs responsible for coordinating research and education efforts within the Sanctuary. Research programs have: significantly increased the connectivity between research institutions located along the Sanctuary coastline; encouraged collaborative research between these institutions; and helped to bring more funding for marine research into the region. The Sanctuary has started education programs which work with local schools to integrate information about marine ecosystems and the MBNMS into the curriculum. In addition, the MBNMS educates the general public about the Sanctuary and marine conservation through flyers, posters, booths at community events, and news stories (both on television and in newspapers). The National Marine Sanctuary designation has significantly helped to focus national and international attention on the central California coast. For example, the MBNMS has been featured in *National Geographic* and was the backdrop for the “National Ocean Conference” held in Monterey in June, 1998.

Overlapping Sites

- Jade Collection
- Dredge Material Disposal
- Restricted Overflight
- Motorized Personal Watercraft
- Shark Attraction Prohibited
- Military
- Vessel Traffic
- Hopkins Marine Life Refuge
- Pt. Lobos Ecological Reserve
- Pt. Lobos State Reserve
- Big Creek Marine Resources Protection Act Ecological Reserve
- James V. Fitzgerald Marine Reserve
- Año Nuevo State Reserve
- Elkhorn Slough Ecological Reserve and Carmel Bay Ecological Reserve
- Pacific Grove Marine Gardens Fish Refuge
- Pacific Grove Marine Reserve
- Julia Pfeiffer Burns State Park/Underwater Park
- Golden Gate National Recreation Area
- Grey Whale Cove SB, Montara SB, Half Moon Bay SB, San Gregorio SB, Pomponio SB, Pescadero SB, Bean Hollow SB, Natural Bridges SB, Twin Lakes SB, New Brighton SB, Seacliff SB, Manresa SB, Sunset SB, Zmudowski SB, Moss Landing SB, Salinas River SB, Marina SB, Monterey SB, Asilomar SB, Carmel River SB, William Randolph Hearst Memorial SB, and San Simeon SB
- Moss Landing Wildlife Area
- Elkhorn Slough National Ecological Research Reserve
- California Sea Otter Game Refuge
- James V. Fitzgerald Marine Reserve ASBS, Año Nuevo Point and Island ASBS, Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS, Carmel Bay ASBS, Point Lobos Ecological Reserve ASBS, Julia Pfeiffer Burns Underwater Park ASBS, and Ocean Area Surrounding the Mouth of Salmon Creek ASBS
- Ed Ricketts Park

References

National Oceanographic and Atmospheric Administration (NOAA). 1992. Final Environmental Impact Statement and Management Plan for the Proposed Monterey Bay National Marine Sanctuary. Sanctuary and Reserves Division, NOAA, U.S. Dept. of Comm., Washington, D.C.

Monterey Bay National Marine Sanctuary website. <http://bonita.mbnms.nos.noaa.gov>

Existing Zones

Type of Zone: Jade Collection

Location of Site

See Figure 2 for exact location

San Luis Obispo County

1) Jade Cove

Year Established

1998

Established By

National Marine Sanctuaries Act (Regulatory Amendment #2); NOAA, U.S. Department of Commerce

Agency Responsible

MBNMS, NOAA, U.S. Department of Commerce

Purpose

To allow traditional small-scale collection of loose jade in the Jade Cove area - an activity that was previously prohibited by the regulations of the MBNMS.

Regulations

The following activity is prohibited or otherwise restricted under [MBNMS] regulations (15 CFR, Part 922.132 (a)(1))

- 1) Exploring for, developing or producing oil, gas or minerals within the Sanctuary except: jade may be collected (meaning removed) from the area bounded by the 35°55'20" N latitude parallel (coastal reference point: beach access stairway at south Sand Dollar Beach), the 35°53'20" N latitude parallel (coastal reference point: westernmost tip of Cape San Martin), and from the mean high tide line seaward to the 90-foot isobath (depth line) (the "authorized area") provided that:
 - i) Only jade already loose from the seabed may be collected;
 - ii) No tool may be used to collect jade except:
 - A) A hand tool (see Sec. 922.131) to maneuver or lift the jade or scratch the surface of a stone as necessary to determine if it is jade;
 - B) A lift bag or multiple lift bags with a combined lift capacity of no more than two hundred pounds; or
 - C) A vessel (except for motorized personal watercraft) (see paragraph (a)(7) of Sec. 922.132) to provide access to the authorized area;
 - iii) Each person may collect only what that person individually carries.

Evaluation of Effectiveness

Enforcement of Regulations

Jade collection activities are not monitored currently in the Sanctuary. However, the MBNMS has not received any reports of regulatory abuses in the collection of jade from Sanctuary waters (Scott Kathey, MBNMS, pers. comm.).

Achievement of Purpose

Jade collection continues in the Jade Cove area. Area collectors welcome the access to loose jade resources. The regulation appears to have successfully achieved the intended purpose (Scott Kathey, MBNMS, pers. comm.).

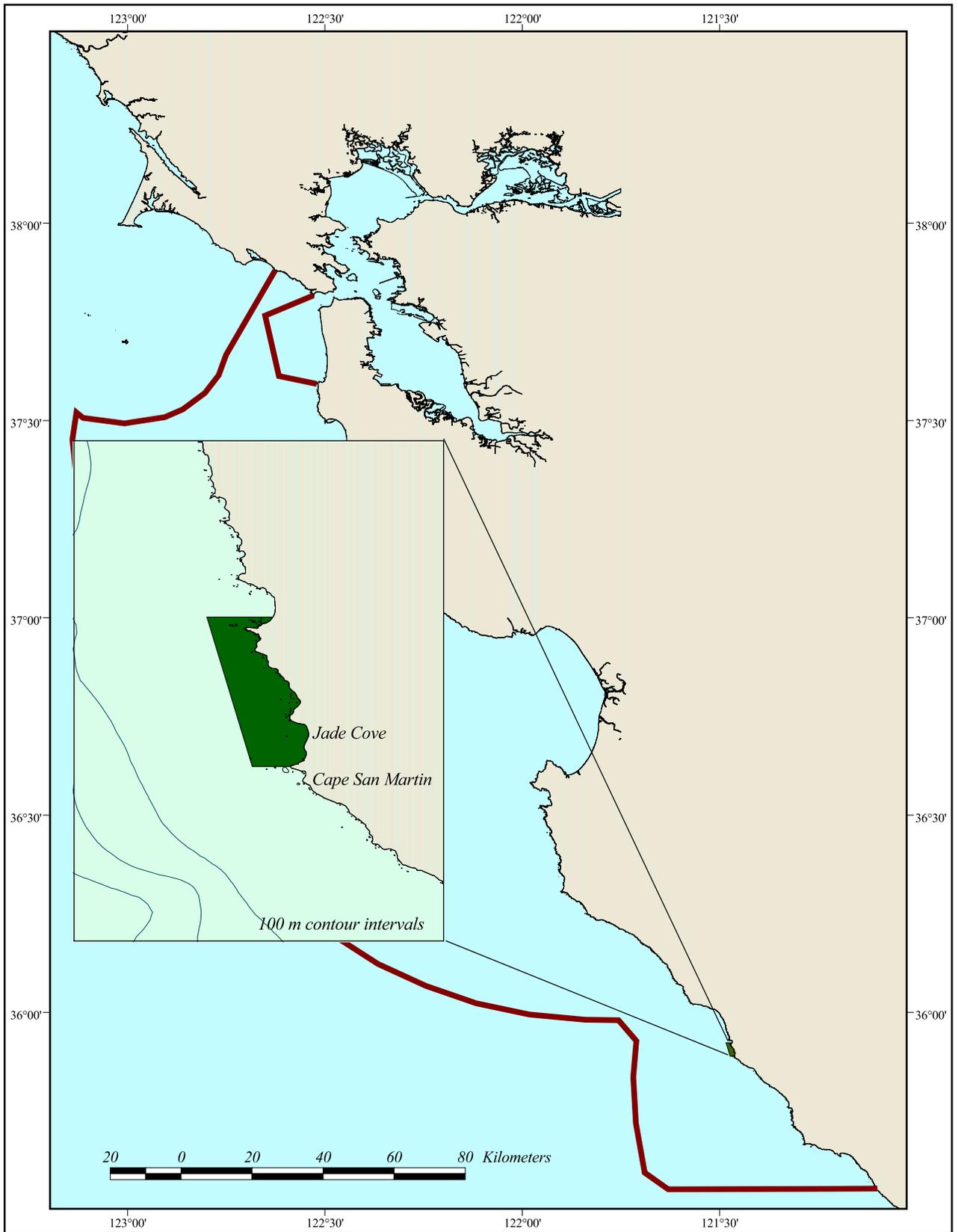
Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Shark Attraction Prohibited
- California Sea Otter Game Refuge

References

None

FIGURE 2. Location of Jade Collection Zone



Existing Zones

Type of Zone: Dredge Material Disposal

Location of Sites

See Figure 3 for exact locations

Santa Cruz County

- 1) Santa Cruz Harbor - subtidal disposal site
- 2) Twin Lakes State Beach - beach replenishment site

Monterey County

- 1) Moss Landing / Zmudowski State Beach - beach replenishment site
- 2) Moss Landing north jetty - beach replenishment site
- 3) Moss Landing south jetty - beach replenishment site
- 4) SF-12
 - i) center location: 36°48.05'N, 121°47.22'W
 - ii) radius: none (pipeline discharge)
 - iii) water depth: 48 feet
- 5) SF-14
 - i) center location: 36°47.53'N, 121°49.04'W
 - ii) radius: 500 yards
 - iii) water depth: 600 feet
- 6) Monterey Harbor Wharf 2 - proposed subtidal disposal site
- 7) Monterey Harbor Wharf 2 - beach decant site

Year Established

1972-1993*

Established By

Army Corps of Engineers (COE)

Agencies Responsible

Army Corps of Engineers

U.S. Environmental Protection Agency (EPA)

MBNMS, NOAA, U.S. Department of Commerce

California Coastal Commission (CCC)

California Department of Parks and Recreation

California State Lands Commission

California Department of Fish and Game (CDFG)

Regional Water Quality Control Board (RWQCB), Central Coast Region

Purpose

To provide clean sandy sediments for beach replenishment and to protect Sanctuary resources from the harmful effects of dredge material disposal, such as harmful changes in water quality, unnatural disturbance to benthic communities, and disposal of contaminated sediment that fails federal or state regulatory criteria.

* All dredge material disposal sites were established after enactment of the Clean Water Act in 1972 and before establishment of the MBNMS on January 1, 1993.

Beach replenishment sites are areas above mean high water (MHW) where clean, sandy, dredge material is deposited to replace sand lost by natural erosion.

Subtidal disposal sites are areas where fine, clean, dredge material is deposited when the dredge material is determined, due to certain characteristics, not to be appropriate for beach replenishment.

Beach decant sites are areas where dredge material containing a large amount of water is deposited. Depending on the site, decant water is either separated and then returned to the ocean or allowed to percolate into the sand.

Regulations

- 1) Except as specified in paragraphs (b) through (f) of this section, the following activities are prohibited and thus unlawful for any person to conduct or cause to be conducted:
 - (i) Discharging or depositing, from within the boundary of the Sanctuary, any material or other matter except: dredged material deposited at disposal sites authorized by the U.S. Environmental Protection Agency (EPA) (in consultation with the U.S. Army Corps of Engineers (COE)) prior to the effective date of Sanctuary designation (January 1, 1993), provided that the activity is pursuant to, and complies with the terms and conditions of, a valid Federal permit or approval existing on January 1, 1993 (15 CFR 922.132(a)(2)(i)(E)).

Evaluation of Effectiveness

Enforcement of Regulations

Sanctuary regulations pertaining to the disposal of dredge material are enforced within the MBNMS in the same manner as all other dredge material disposal sites managed by the COE's San Francisco District. Any discharge of dredge material into the water, including beach replenishment, requires a permit issued by the COE and approved by the EPA, MBNMS, RWQCB, and CCC. In addition, CDFG reviews all permits to evaluate impacts to state biological resources and issues permits for disposal on state beaches.

Achievement of Purpose

Past Research

Previous research (Oliver and Slattery 1976; Oliver et al. 1977) examined the shallow water ecological impacts of the disposal of dredged material at site SF-12. These studies found no significant changes in ecosystem or community structure in the shallow water areas surrounding SF-12. The communities surrounding SF-12 are adapted to periodic disturbance because it is an area of naturally high sediment movement, therefore, the fauna at this site responds to the disposal of dredge material as if it were a natural disturbance. In addition, these studies found that the pollutants in the dredge material had no significant effect on benthic communities because the chemicals were rapidly diluted to undetectable levels.

Proposed Research

Stacy Kim of Moss Landing Marine Labs, in conjunction with researchers from MBARI, MLML, UCSC, CSUMB, CDFG, Texas A&M, University of Alaska, and the EPA, is proposing to assess the effects of the dumping of dredge material on deep water communities within the Monterey Submarine Canyon. The dredge material will be dumped at site SF-12 which is located at the head of the submarine canyon. The proposed research will measure: sediment chemistry, the volume of dredge material dumped, natural sediment movement patterns in the canyon, dredge material movement patterns in the canyon, chemical concentrations of both dredge material and natural sediments at the disposal site and in the canyon, and the short and long-term ecological impacts of dredge disposal on communities in the canyon.

Ecological Risk Assessment (ERA)

An ecological risk assessment is being developed for Moss Landing harbor sediments. Federal and state agency representatives, academic scientists, consultants, and the Moss Landing Harbor District are all working together to design the ERA.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Motorized Personal Watercraft
- Shark Attraction Prohibited
- Twin Lakes SB and Moss Landing SB

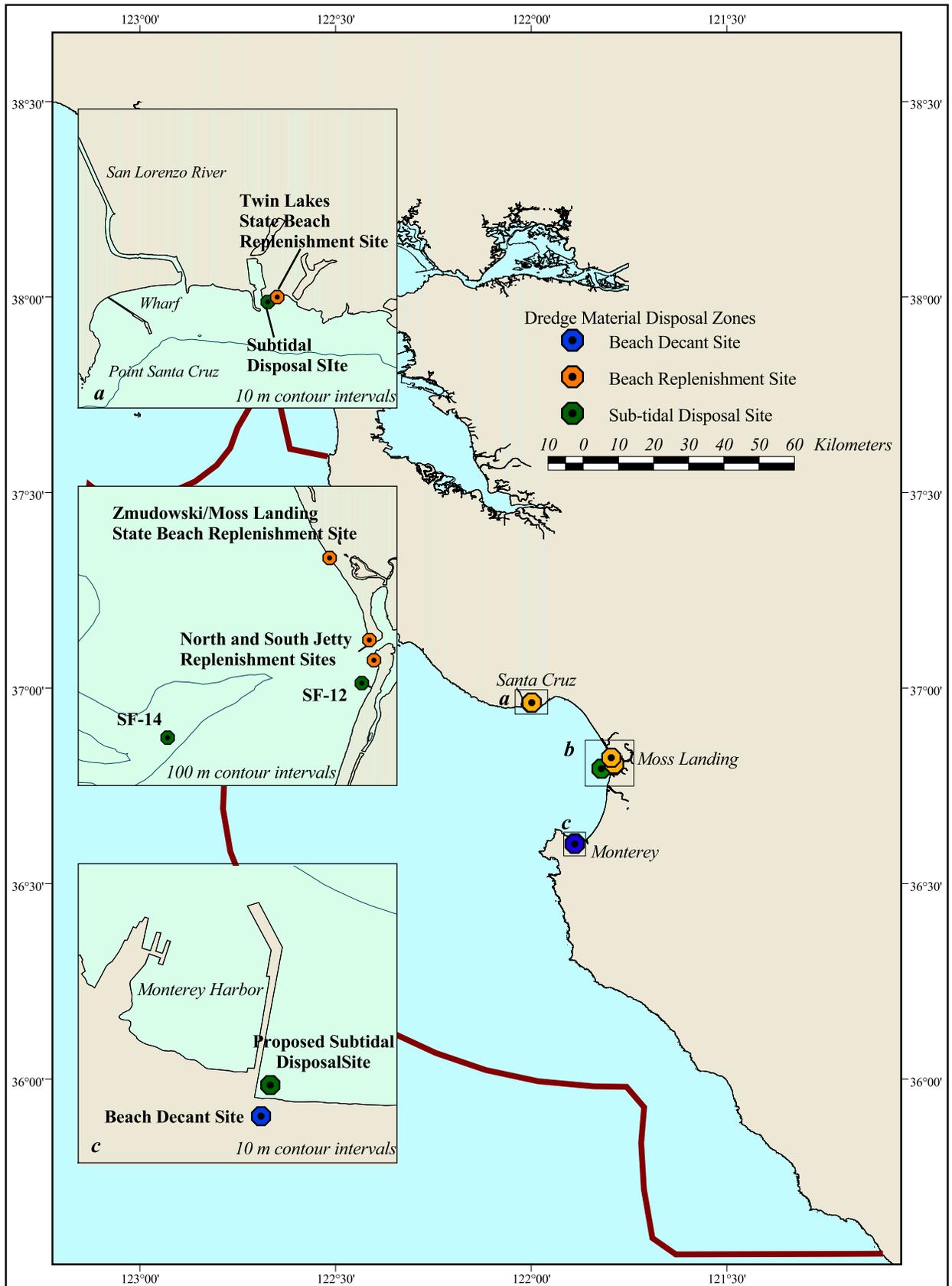
References

Oliver, J.S. and P.N. Slattery. 1976. Effects of dredging and disposal on the benthos in Monterey Bay, California. Tech. Paper 76-15, U.S. Army Corps of Engineers Coastal Engineering Research Center, Va.

Oliver, J.S., P.N. Slattery, L.W. Hulberg, and J.W. Nybakken. 1977. Patterns of succession in benthic infaunal communities following dredging and dredge spoil disposal in Monterey Bay, California. Tech. Rept. D-77-27. Dredged Material Research Program, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Miss. 186 p.

Environmental Protection Agency website, Laws and Regulations homepage.
<http://www.epa.gov/epahome/laws.htm>

FIGURE 3. Location of Dredge Material Disposal Zones



Existing Zones

Type of Zone: Restricted Overflight

Location of Sites

See Figure 4 for exact locations

San Mateo and Santa Cruz Counties

- 1) Site 1 - From mean high water out to three nautical miles between a line extending from Point Santa Cruz on a southwesterly heading of 220° and a line extending from 2.0 nautical miles north of Pescadero Point on a southwesterly heading of 240°.

Santa Cruz and Monterey Counties

- 1) Site 2 - From mean high water and within a five nautical mile arc drawn from a center point at the end of Moss Landing Pier.
- 2) Site 3 - Over the waters of Elkhorn Slough east of the Highway One bridge to Elkhorn Rd.

Monterey and San Luis Obispo Counties

- 1) Site 4 - From mean high water out to three nautical miles between a line extending from the Carmel River mouth on a westerly heading of 270° and a line extending due west along latitude 35°33'17.5612" off of Cambria.

Year Established

1992

Established By

National Marine Sanctuaries Act; NOAA, U.S. Department of Commerce

Agency Responsible

MBNMS, NOAA, U.S. Department of Commerce

Purpose

To limit potential visual, physical, and noise impacts, particularly those that might startle hauled-out seals and sea lions, sea otters, or birds nesting along the coastal margins of the MBNMS.

Regulations*

- 1) Except as specified in paragraphs (b) through (f) of this section, the following activities are prohibited and thus unlawful for any person to conduct or cause to be conducted:
 - i) Flying motorized aircraft, except as necessary for valid law enforcement purposes, at less than 1,000 feet above any of the four zones within the Sanctuary (15 CFR 922.132(a)(6)).

Evaluation of Effectiveness

Enforcement of Regulations

NOAA has had difficulty enforcing the restricted overflight zone regulations because the current Federal Aviation Administration (FAA) aeronautical charts improperly list the MBNMS regulations. The FAA charts recommend a minimum overflight altitude of 2,000

* This prohibition does not apply to overflights that:

- 1) Are necessary to respond to an emergency threatening life, property or the environment;
- 2) Are necessary for valid law enforcement purposes; or
- 3) Are conducted by the Department of Defense and specifically exempted by NOAA after consultation with that Department.

feet for the entire Sanctuary. NOAA and the FAA have come to an agreement to correct this discrepancy and, in the future, charts will contain an advisement of NOAA's restricted overflight zone regulations. As of January 2000, aeronautical charts have not been changed to correctly reflect Sanctuary regulations (Scott Kathey, MBNMS, pers. comm.).

Achievement of Purpose

The effectiveness of the restricted overflight regulations to minimize the impacts of aircraft on marine mammal and seabird populations in the MBNMS has not yet been evaluated.

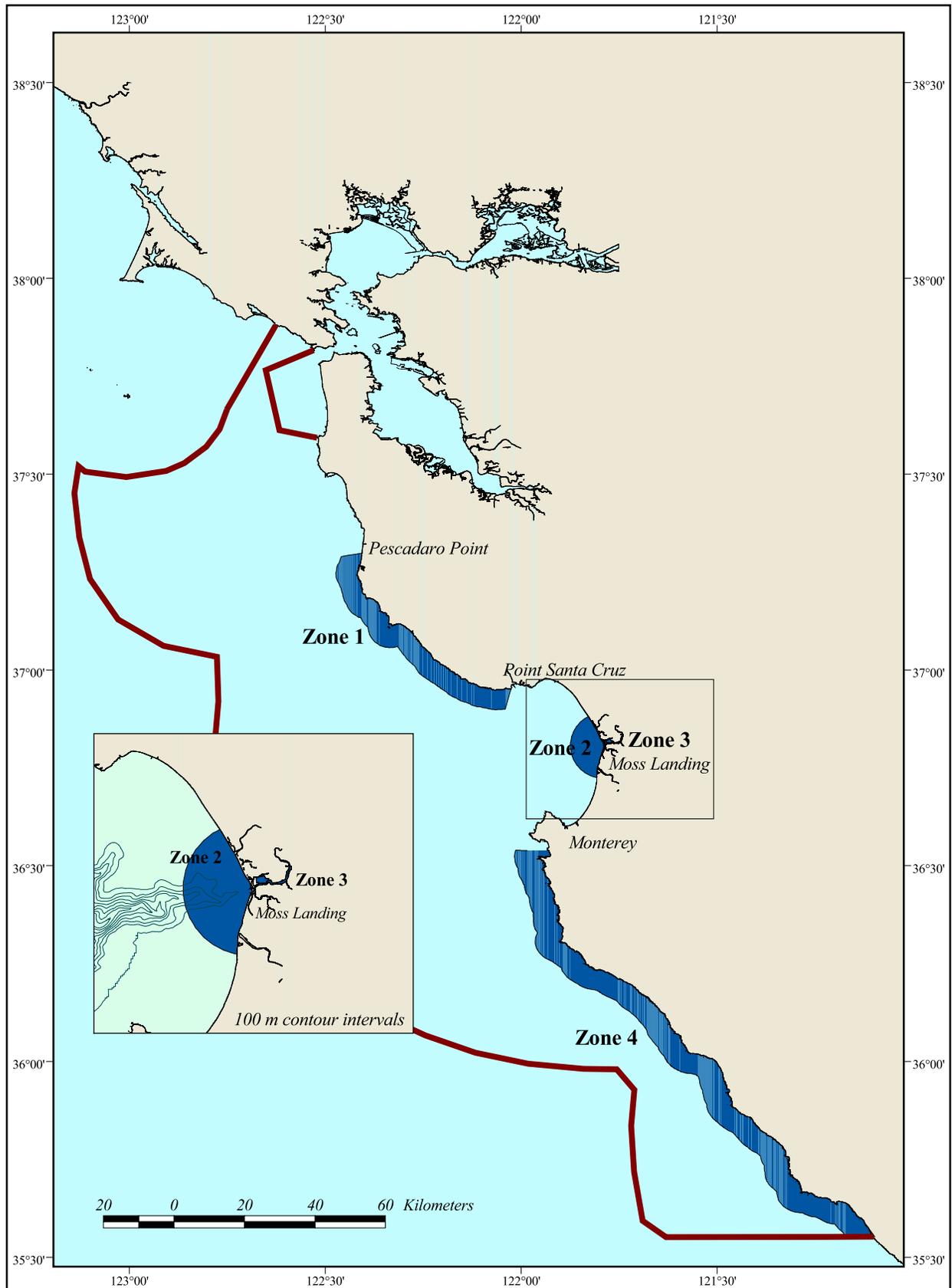
Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Jade Collection
- Dredge Material Disposal
- Motorized Personal Watercraft
- Shark Attraction Prohibited
- Military
- Pt. Lobos Ecological Reserve
- Pt. Lobos State Reserve
- Big Creek Marine Resources Protection Act Ecological Reserve
- Año Nuevo State Reserve
- Elkhorn Slough Ecological Reserve and Carmel Bay Ecological Reserve
- Julia Pfeiffer Burns State Park/Underwater Park
- Pomponio SB, Pescadero SB, Bean Hollow SB, Natural Bridges SB, Sunset SB, Zmudowski SB, Moss Landing SB, Salinas River SB, Carmel River SB, William Randolph Hearst Memorial SB, and San Simeon SB
- Moss Landing Wildlife Area
- Elkhorn Slough National Ecological Research Reserve
- California Sea Otter Game Refuge
- Año Nuevo Point and Island ASBS, Carmel Bay ASBS, Point Lobos Ecological Reserve ASBS, Julia Pfeiffer Burns Underwater Park ASBS, and Ocean Area Surrounding the Mouth of Salmon Creek ASBS
- Ed Ricketts Park

References

None

FIGURE 4. Location of Restricted Overflight Zones



Existing Zones

Type of Zone: Motorized Personal Watercraft*

Location of Sites

See Figure 5 for exact locations

San Mateo County

- 1) Site One - approximately 1.0 square nautical mile area off of Pillar Point Harbor

Santa Cruz County

- 1) Site Two - approximately 5.0 square nautical mile area off of Santa Cruz Harbor

Monterey County

- 1) Site Three - approximately 6.0 square nautical mile area off of Moss Landing Harbor
- 2) Site Four - approximately 5.0 square nautical mile area off of the U.S. Coast Guard Pier

Year Established

1992

Established By

National Marine Sanctuaries Act; NOAA, U.S. Department of Commerce

Agency Responsible

MBNMS, NOAA, U.S. Department of Commerce

Purpose

To allow the continuation of this form of recreation while:

- 1) enhancing resource protection by prohibiting the operation of MPWC in areas of high marine mammal and seabird concentrations, kelp forest areas, river mouths, estuaries, lagoons and other areas where sensitive marine resources are concentrated and most vulnerable to disturbance and injury from MPWC;
- 2) minimizing conflicts with other recreational users; and
- 3) reducing esthetic disturbance.

Regulations

- 1) Except as specified in paragraphs (b) through (f) of this section, the following activities are prohibited and thus unlawful for any person to conduct or cause to be conducted:
 - i) Operating motorized personal watercraft within the Sanctuary except within the four designated zones and access routes within the Sanctuary (15 CFR 922.132(a)(7)).

Evaluation of Effectiveness

A formal evaluation of the effectiveness of the MPWC regulations has not been conducted primarily due to delays in regulation implementation. The delays were caused by:

- 1) The MBNMS regulations restricting the use of MPWC were struck down by the U.S. District Court for the District of Columbia in 1993, in a lawsuit brought by the Personal Watercraft Industry Association (PWIA). NOAA appealed the decision to the U.S. Court of Appeals

* Motorized Personal Watercraft (MPWC) - any motorized vessel that meets all the following criteria:

- 1) is less than 15 ft in length (as manufactured);
- 2) is capable of exceeding a speed of 15 knots (17.27 mph); and
- 3) has the capacity to carry not more than two people while in operation.

Examples include: jet skis, wet bikes, surf jets, miniature speed boats, air boats, and hovercraft.

which, in 1995, reversed the district court's judgment. The Sanctuary regulations were reinstated in 1995.

- 2) Due to delays from the lawsuit and appeal, the buoys required to mark the boundary of the MPWC zones were not installed until the summer and fall of 1996.
- 3) Approximately half of the buoys that were installed during 1996 parted from their moorings during the two subsequent winter storm periods. These buoys were replaced in 1998.
- 4) Of the approximately 21 buoys deployed, three (2 in Santa Cruz and 1 in Moss Landing) are currently off station (as of January 2000) due to parted mooring lines. They will be replaced.

Enforcement of Regulations

Enforcement of MPWC regulations began in 1998. Enforcement of MPWC zone regulations is conducted by the U.S. Coast Guard and the California Department of Fish and Game on an ongoing basis. MPWC operators can be issued a summary settlement (ticket) by enforcement officers for violation of MPWC regulations. As of January 2000, tickets have been issued to MPWC operators maneuvering outside of the zone boundaries in Monterey and Moss Landing. Several verbal warnings have been issued to individuals operating MPWC outside the zones. The regulations appear to be effective and few violations have been reported (Scott Kathey, MBNMS, pers. comm.).

The Santa Cruz Harbor Patrol and Santa Cruz Police Department have commented that there has been a significant decrease in the use of MPWC in the Santa Cruz area (Scott Kathey, MBNMS, pers. comm.). The harbor patrol and police attribute the decline in MPWC to a general dislike of the offshore zones by MPWC users. The undesirable nature of the offshore zones appears to be acting as a deterrent to MPWC use in the MBNMS.

Achievement of Purpose

The effectiveness of the MPWC regulations to improve resource protection while reducing esthetic disturbance and conflict with other recreational users of the MBNMS has not yet been evaluated rigorously.

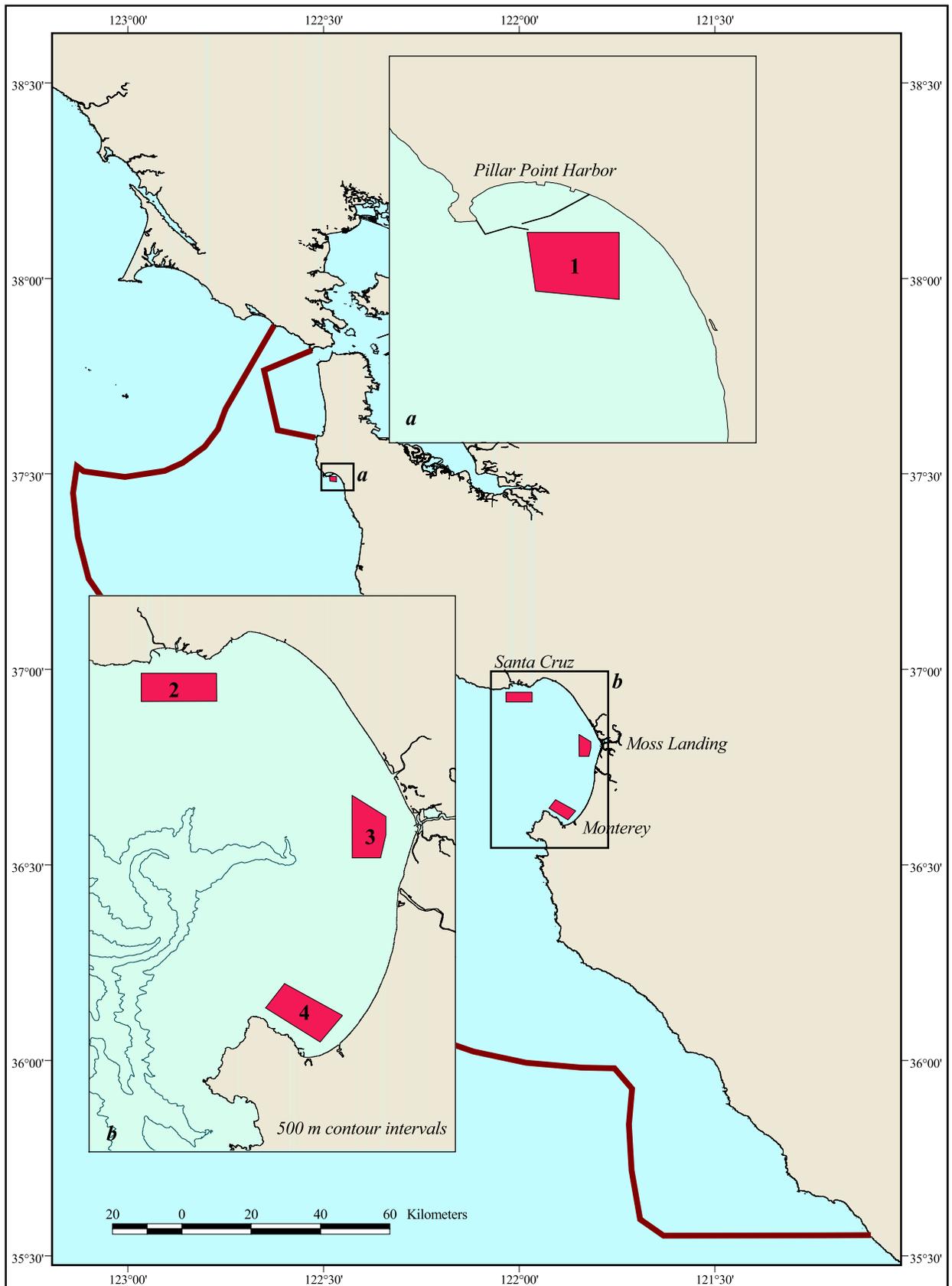
Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Dredge Material Disposal
- Restricted Overflight
- Shark Attraction Prohibited
- Military

References

None

FIGURE 5. Location of Motorized Personal Watercraft Zones



Existing Zones

Type of Zone: Shark Attraction Prohibited

Location of Site

See Figure 6 for exact location

Marin, San Francisco, San Mateo, Santa Cruz, Monterey and San Luis Obispo Counties

- 1) Any part of the MBNMS out to the seaward limit of State waters. The seaward limit of State waters is a line three nautical miles distant from the coastline of the State, where the coastline is the line of ordinary low water along the portion of the coast in direct contact with the open sea. The coastline for Monterey Bay, which is inland waters, is the straight line marking the seaward limit of the Bay, determined by connecting the following two points: 36°57'6"N, 122°01'45"W and 36°38'16"N, 121°56'3"W.

Year Established

1997

Established By

National Marine Sanctuaries Act (Regulatory Amendment #1); NOAA, U.S. Department of Commerce

Agency Responsible

MBNMS, NOAA, U.S. Department of Commerce

Purpose

To prohibit the attraction of white sharks by any means, within State territorial waters, where state law prohibits the take of white sharks. The zone protects white sharks from behavioral changes resulting from baiting or attraction events and Sanctuary users (e.g., surfers, divers, and swimmers) from increased risk of shark attack.

Regulations

- 1) Except as specified in paragraphs (b) through (f) of this section, the following activities are prohibited and thus unlawful for any person to conduct or cause to be conducted:
 - i) Attracting* any white shark in that part of the Sanctuary out to the seaward limit of State waters. For the purposes of this prohibition, the seaward limit of State waters is a line three nautical miles distant from the coastline of the State, where the coastline is the line of ordinary low water along the portion of the coast in direct contact with the open sea. The coastline for Monterey Bay, which is inland waters, is the straight line marking the seaward limit of the Bay, determined by connecting the following two points: 36°57'6"N, 122°01'45"W and 36°38'16"N, 121°56'3"W (15 CFR 922.132(a)(10)).

Evaluation of Effectiveness

Enforcement of Regulations

Commercial shark attraction activities occurring prior to the rulemaking have stopped within the affected zone. No violations have been reported (Scott Kathey, MBNMS, pers. comm.).

* Attract or attracting means the conduct of any activity that lures or may lure white sharks by using food, bait, chum, dyes, acoustics or any other means, except the mere presence of human beings (e.g., swimmers, divers, boaters, kayakers, surfers).

Achievement of Purpose

The zone appears to have successfully achieved the intended purpose of halting shark attraction activities in the nearshore waters of the MBNMS.

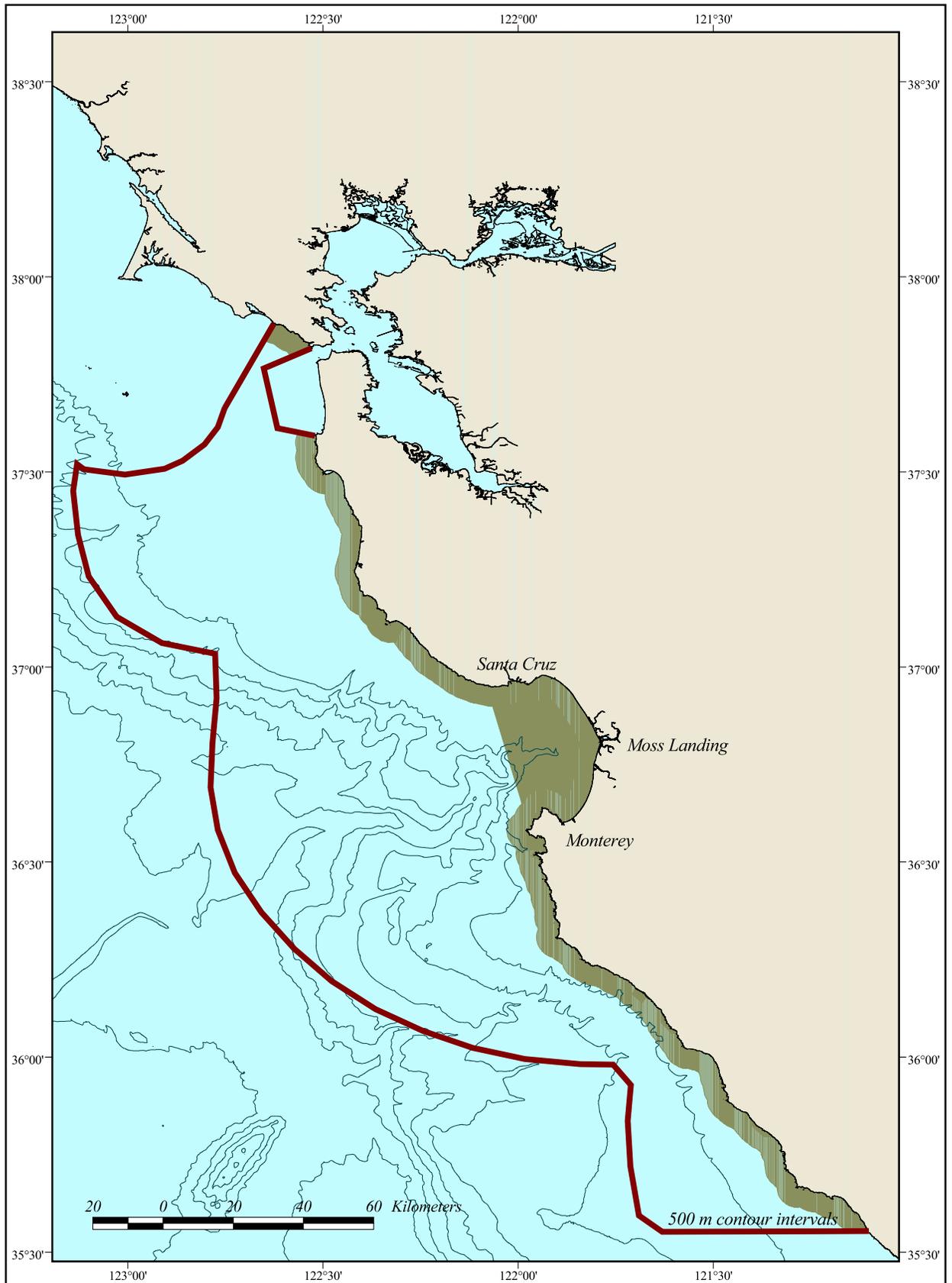
Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Jade Collection
- Dredge Material Disposal
- Restricted Overflight
- Motorized Personal Watercraft
- Military
- Hopkins Marine Life Refuge
- Pt. Lobos Ecological Reserve
- Pt. Lobos State Reserve
- Big Creek Marine Resources Protection Act Ecological Reserve
- James V. Fitzgerald Marine Reserve
- Año Nuevo State Reserve
- Carmel Bay Ecological Reserve
- Pacific Grove Marine Gardens Fish Refuge
- Pacific Grove Marine Reserve
- Julia Pfeiffer Burns State Park/Underwater Park
- Golden Gate National Recreation Area
- Grey Whale Cove SB, Montara SB, Half Moon Bay SB, San Gregorio SB, Pomponio SB, Pescadero SB, Bean Hollow SB, Natural Bridges SB, Twin Lakes SB, New Brighton SB, Seacliff SB, Manresa SB, Sunset SB, Zmudowski SB, Moss Landing SB, Salinas River SB, Marina SB, Monterey SB, Asilomar SB, Carmel River SB, William Randolph Hearst Memorial SB, and San Simeon SB
- California Sea Otter Game Refuge
- James V. Fitzgerald Marine Reserve ASBS, Año Nuevo Point and Island ASBS, Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS, Carmel Bay ASBS, Point Lobos Ecological Reserve ASBS, Julia Pfeiffer Burns Underwater Park ASBS, and Ocean Area Surrounding the Mouth of Salmon Creek ASBS
- Ed Ricketts Park

References

None

FIGURE 6. Location of Shark Attraction Prohibited Zone



Existing Zones

Type of Zone: Military

Location of Sites

See Figure 7 for exact locations

- 1) "U1" Submerged Submarine Operating Area
- 2) "U2" Submerged Submarine Operating Area
- 3) "U5" Submerged Submarine Operating Area
- 4) Warning Area 285
- 5) Naval Operating Area
- 6) Hunter Military Operations Area

Year Established

N/A

Established By

U.S. Department of Defense

Agency Responsible

U.S. Department of Defense

Purpose

U1, U2, and U5 Submerged Submarine Operating Areas:

The U.S. Navy uses these areas for submarine operations. As submarines may be operating in these areas, vessels should proceed with caution. During non-explosive torpedo practice firing, all vessels are cautioned to keep clear of Naval Target Vessels flying a large red flag from the highest masthead (NOAA 1992).

Warning Area 285:

This area is in frequent use for both air and surface training by the U.S. Navy. Air activities include aircraft carrier takeoffs and landings, and low-level air combat maneuvering. This activity results in the expenditure of smoke markers, sonobuoys and non-explosive ordnance in the Warning Area (NOAA 1992).

Naval Operating Area:

An area used by the U.S. Navy for mine sweeping practice maneuvers. Mine hunting training is conducted by Navy minesweeping ships in this section of Monterey Bay eight times a year; each exercise lasts about one week. Inert metal shapes are placed (or moored) on the bay floor and area located only by sonar; nothing is dragged through the water during these training exercises and all objects are recovered after completion. On occasion, U.S. Marines practice amphibious landings on the beaches adjacent to this area (NOAA 1992).

Hunter Military Operations Area:

This area is used for helicopter tactical training operations by the U.S. Army (Scott Kathey, MBNMS, pers. comm.).

Regulations

U1, U2, and U5 Submerged Submarine Operating Areas:

As submarines may be operating in these areas, vessels should proceed with caution. During non-explosive torpedo practice firing, all vessels are cautioned to keep clear of Naval Target Vessels flying a large red flag from the highest masthead (NOAA Nautical Chart 18-680).

Warning Area 285:

This area has flight restrictions for civilian aircraft because it is used for naval air operations including low level fighter jet and helicopter operations.

Naval Operating Area:

The Naval Operating Area will be used for training in various phases of mine warfare operations. During the period from August 1 to February 15, inclusive each year, no operations will be carried out which will involve placing any obstructions in the water nor will any operations be carried out at night. During the period from February 16 to July 31, inclusive each year, operations may be carried out which will involve laying exercise mines and other moored or bottom obstructions. In each case, when moored or bottom obstructions are laid, a notice to mariners will be issued giving notice of their approximate location within the danger zone, and vessels shall keep clear (NOAA 1995).

Hunter Military Operations Area:

This area has flight restrictions for civilian aircraft because it is used for helicopter tactical training operations by the U.S. Army.

Evaluation of Effectiveness

Information regarding the effectiveness of this zone was not available.

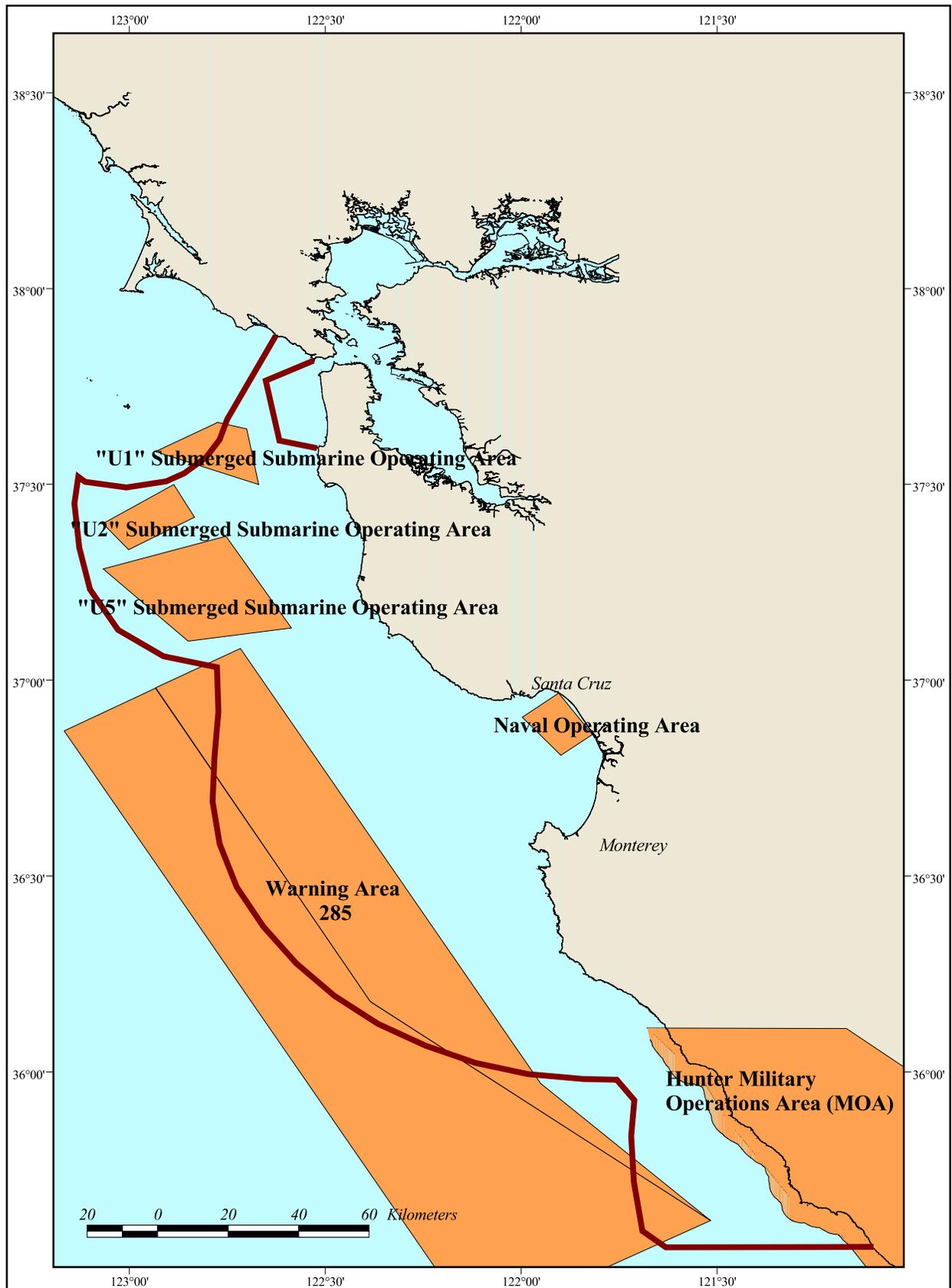
Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Motorized Personal Watercraft
- Shark Attraction Prohibited
- Vessel Traffic
- Big Creek MRPA Ecological Reserve
- Seacliff SB, Manresa SB, Sunset SB, William Randolph Hearst Memorial SB, and San Simeon SB
- California Sea Otter Game Refuge
- Ocean Area Surrounding the Mouth of Salmon Creek ASBS

References

- National Oceanographic and Atmospheric Administration (NOAA). 1995. United States Coast Pilot. Pacific Coast: California, Oregon, Washington, and Hawaii. 30th Edition. Sanctuary and Reserves Division, NOAA, U.S. Dept. of Comm., Washington, D.C.
- National Oceanographic and Atmospheric Administration (NOAA). 1992. Final Environmental Impact Statement and Management Plan for the Proposed Monterey Bay National Marine Sanctuary. Sanctuary and Reserves Division, NOAA, U.S. Dept. of Comm., Washington, D.C.

FIGURE 7. Location of Military Zone



Existing Zones

Type of Zone: Vessel Traffic

Location of Zones

See Figure 8 for location of the routes for tankers, barges, hazmat ships, and large commercial vessels (LCVs) that were proposed by NOAA and the U.S. Coast Guard (USCG) after development with the MBNMS Vessel Traffic Work Group.

Year Established

Proposed Routes - 2000

Established By

Ports and Waterways Safety Act (PWSA), USCG, U.S. Department of Transportation
National Marine Sanctuaries Act, NOAA, U.S. Department of Commerce

Agencies Responsible

USCG, U.S. Department of Transportation
NOAA, U.S. Department of Commerce
International Maritime Organization (IMO), United Nations

Purpose

Provide a vessel traffic management system that maximizes protection of Sanctuary resources while allowing for the continuation of safe, efficient, and environmentally sound transportation. Prevention of spills of oil or other hazardous materials is a key goal of the zone.

Zone management focuses primarily on four categories of vessels in transit between key ports in San Francisco Bay and Los Angeles/Long Beach. The four categories are defined as follows:

- **Tankers:** Any self-propelled laden tank vessel carrying crude oil, black oil, or other persistent liquid cargo in bulk.
- **Hazmat ships:** Any self-propelled vessel carrying hazardous materials in bulk, including explosives/munitions, ore concentrates, chemicals, liquefied natural gas, distillates, or other non-persistent liquid cargo.
- **Barges:** Any tank barges (and their associated tugs) carrying oil or hazardous material cargoes in bulk.
- **LCVs:** Vessels over 300 gross tons including, but not limited to container ships, vehicle carriers, bulk carriers, freighters, passenger ships, and tankers with non-hazardous cargoes.

Regulations

Current Regulations

Current vessel management measures in the approaches to San Francisco Bay are:

- 1) *San Francisco Traffic Separation Scheme (SF TSS)*: The existing SF TSS consists of three offshore approaches, a circular precautionary area, and a single approach into and out of the San Francisco Bay. The SF TSS is formally recognized by the International Maritime Organization (IMO), a body under the United Nations, and marked on NOAA's nautical charts. The precautionary area has a radius of 6 nm, with a center located 8.75 nm west southwest of the Bay entrance. Each of the three approaches is oriented so as to provide a minimum of 4 nm separation from adjacent approaches.
- 2) *San Francisco Vessel Traffic Service (VTS)*: The existing VTS covers the entire SF TSS area, including the northern third of the Sanctuary, and is managed by the USCG using VHF radio communications and direct radar surveillance. Vessels that enter the SF TSS are required to communicate with the VTS. Vessels are monitored to and from Pigeon

Point via the Offshore Vessel Movement Reporting System (OVMRS) which includes waters within approximately a 30 nm radius of the San Francisco Sea Buoy.

- 3) *Local Pilotage*: Local pilots board vessels and guide the vessels through the Golden Gate and into port which relieves foreign vessel masters from the burden of navigating the unfamiliar waters of the San Francisco Bay. The pilot boarding area is approximately a mile from the center of the circular precautionary area of the SF TSS.

⁺*Western States Petroleum Association (WSPA)*: Per industry agreement 1990, operators of tankers carrying crude oil from Alaska who are members of WSPA have voluntarily kept laden vessels a minimum of 50 nm (nautical miles) from shore.

Proposed Additional Regulations

- 1) *Distance from Shore*: (Distance from Point Sur and Pigeon Point - the two most prominent westerly points of land in the MBNMS):

- Tankers: 50 nm
- Barges: 25 nm northbound / 30 nm southbound
- Hazmat Ships: 25 nm northbound / 30 nm southbound
- LCV: Off Pigeon Point - 12.7 nm northbound / 16 nm southbound
Off Point Sur - 15 nm northbound / 20 nm southbound

- 2) *Traffic Separation Schemes*:

- i) Shifting the southern approach of the SF TSS to the west to reduce the risk of groundings along the San Mateo coastline and to improve north-south alignment with the proposed recommended route for LCVs. This shift has been pre-approved by the IMO in 1990, but not yet implemented.
- ii) Implementing an 18 nm extension of the Santa Barbara Channel traffic lanes to Point Arguello. This extension would connect with the proposed route for LCVs across the Sanctuary's southern boundary and aid mariners in tracking a course offshore of Point Sur. This extension was previously adopted by the IMO in 1985, but has not yet been implemented.

Evaluation of Effectiveness

Section 102(d) of Public Law 102-368 and section 2203(d) of the National Marine Sanctuaries Program Amendments Act of 1992 (Public Law 102-587) mandated that the Secretary of Commerce and the Secretary of Transportation report to Congress on measures for regulating vessel traffic in the MBNMS. To fulfill this mandate, NOAA and the USCG conducted a comprehensive study of vessel traffic along a large portion of the California coast. This study found that Sanctuary resources are sensitive to spilled oil and that oil tankers and other large vessels carrying significant amounts of bunker fuel operate within the Sanctuary thereby potentially placing Sanctuary resources at risk. NOAA and the USCG concluded that the current vessel management regulations should be further studied to identify potential ways to minimize the risk of spilled oil or other hazardous materials in the Sanctuary. Therefore, NOAA and the USCG established a working group of key stakeholders in the issue, including Federal, State and local governments, environmental groups, and industry, to review existing practices and risks. The objective of this working group was to recommend a vessel management system that would maximize protection of the Sanctuary resources while allowing for the continuation of vessel transport along the California coast.

The final recommendations (taking into account public comments) were compiled by NOAA and the USCG and submitted to the Navigation Safety Advisory Council (NAVSAC) in October 1998. In June 1999 the proposal was formally cleared by NOAA, the USCG, the Department of

⁺ Although the WSPA agreement does not apply to foreign tankers, limited spot checks by the USCG indicate that 90% of all crude oil tankers are complying voluntarily.

Defense and the State Department. TSS changes will be implemented in 2000. The proposal was approved by IMO's navigation subcommittee in September 1999. Final IMO approval is expected in May 2000, with implementation approximately six months later.

The effectiveness of the new regulations will ultimately be evaluated by an Automated Information System (AIS). An AIS is an automatic, electronic system that transmits the real-time position of a vessel to a shore-based station, such as the VTS. The AIS will be an international requirement and it is expected to be in place in the next 2 years. California needs to build the shore-based capacity to accept and analyze this data to track the effectiveness of these measures.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Military

References

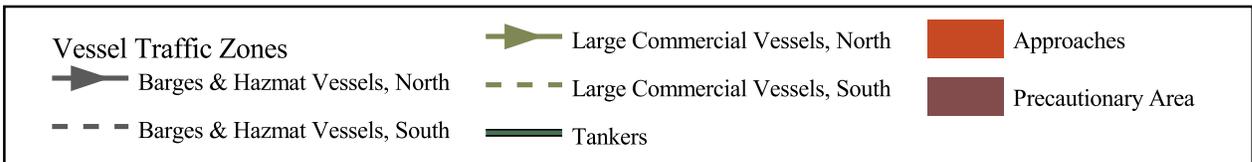
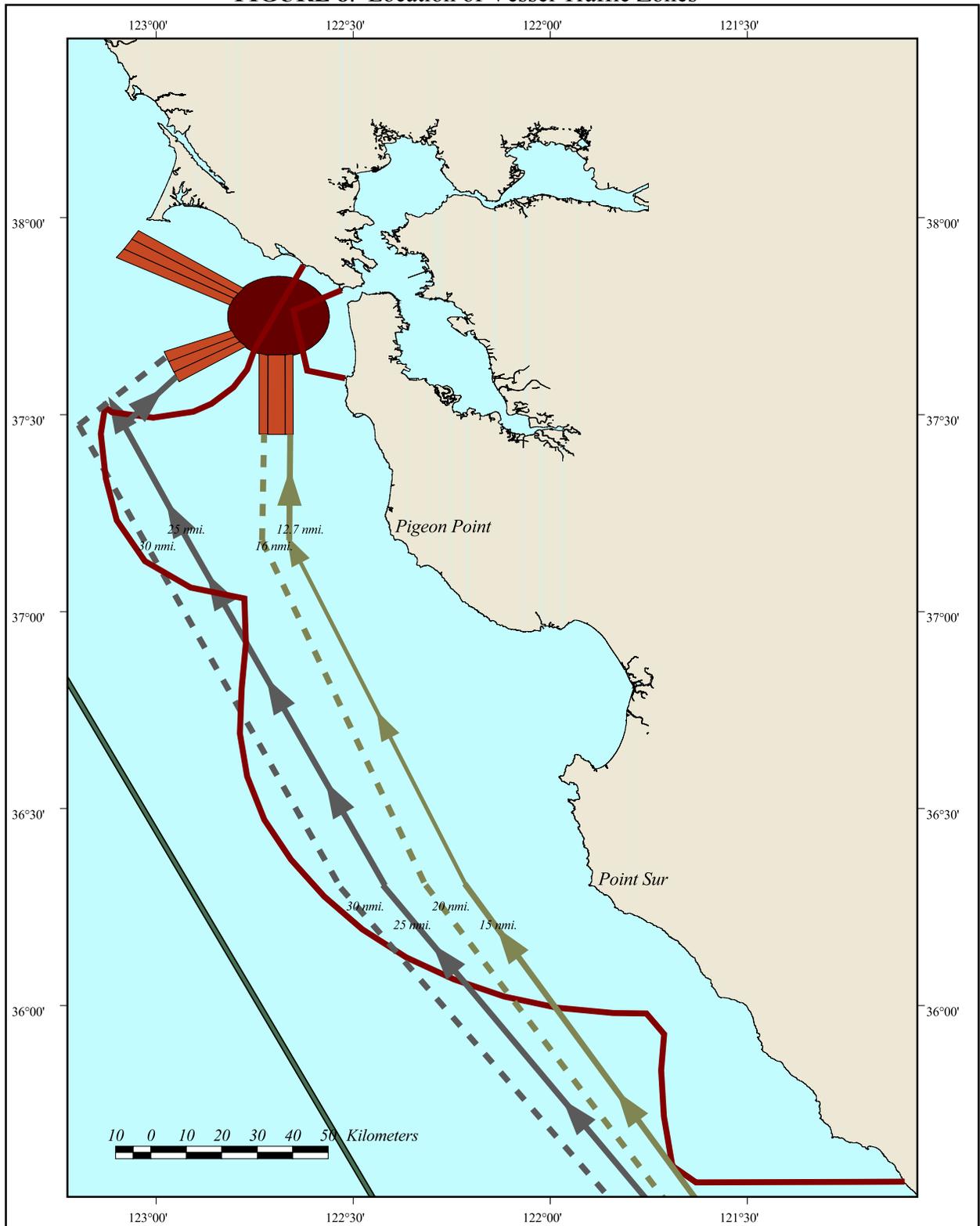
U.S. Coast Guard and National Oceanic and Atmospheric Administration. 1997. Report to Congress on Regulating Vessel Traffic in the Monterey Bay National Marine Sanctuary. 80 pp.

National Oceanic and Atmospheric Administration (NOAA). 1998. Monterey Bay National Marine Sanctuary Vessel Management Final Report. NOAA, U.S. Dept. of Comm., Washington D.C. 41 pp.

Vessel management work group produces concrete proposal. Fall 1998. Page 3 *In* J. Carless (ed.). News From the Monterey National Marine Sanctuary Newsletter.

Monterey Bay National Marine Sanctuary website, Sanctuary Vessel Traffic Management page. <http://bonita.mbnms.nos.noaa.gov/vt/index.html>

FIGURE 8. Location of Vessel Traffic Zones



Existing Zones

Type of Zone: No Harvest

Legislated Title of Site: Marine Life Refuge

Location of Site

See Figure 9 for exact location

Monterey County

- 1) Hopkins Marine Life Refuge

Year Established

1931*

Established By

State Legislature

Agencies Responsible

Hopkins Marine Life Refuge Director
Fish and Game Commission
California Department of Fish and Game

Purpose

No legally mandated purpose accompanies the marine life refuge designation.

Regulations

General Regulations

- 1) Except under a permit or specific authorization, it is unlawful: to take or possess any invertebrate or specimen of marine plant life in a marine life refuge (Fish and Game Code 10500(f)).
- 2) Non-commercial Use of Invertebrates. Tidal invertebrates may not be taken in any tidepool or other areas between the high tide mark (defined as Mean Higher High Tide) and 1,000 feet seaward and lateral to the low tide mark (defined as Mean Lower Low Water) except as follows: In all other areas, except where prohibited within marine life refuges or other special closures: Abalone, limpets, moon snails, turban snails, chiones, clams, cockles, mussels, rock scallops, native oysters, octopuses, squid, crabs, lobsters, shrimp, sand dollars, sea urchins and worms may be taken (14 Cal. Code of Regs. 29.05(b)(2)).
- 3) Commercial Use of Invertebrates. No mollusks, crustaceans or other invertebrates may be taken in Marine Life Refuges (14 Cal. Code of Reg. 123(f)(2)(a)).
- 4) Non-commercial use of Marine Plants. Marine aquatic plants may not be cut or harvested in marine life refuges, marine reserves, ecological reserves, national parks or state underwater parks (14 Cal. Code of Regs. 30.00(b)).

Site Specific Regulations

* The HMLR was established by the State of California in 1931 to protect the waters and shoreline immediately adjacent to the Hopkins Marine Station of Stanford University. Legal statutes regulating human activities within the HMLR were established in 1984.

- 1) The director [of the Fish and Game Commission] may appoint the Director of the Hopkins Marine Life Refuge. The Director of the Hopkins Marine Life Refuge may issue a permit to any person under which the person may enter the Hopkins Marine Life Refuge for the purpose of taking fish or marine plants under the conditions that the department determines necessary for the protection and propagation of fish and wildlife and related scientific purposes in the refuge (Fish and Game Code 10502.5).
- 2) A person may be permitted by the Director of the Hopkins Marine Life Refuge to enter the Hopkins Marine Life Refuge under a permit (Fish and Game Code 10657(a)).
- 3) The Director of the Hopkins Marine Life Refuge, or any person to whom the Director has issued a permit under Section 10502.5, may take, for scientific purposes, any fish or specimen of marine plant life under the conditions prescribed by the department under Section 10502.5 (Fish and Game Code 10657(b)).
- 4) Except as expressly provided in this division, it is unlawful to enter Hopkins Marine Life Refuge for the purpose of taking or possessing any fish or marine plant or to take or possess any fish or marine plants in the Hopkins Marine Life Refuge. Section 10657 and this section do not prohibit or restrict navigation in the Hopkins Marine Life Refuge pursuant to federal law (Fish and Game Code 10657.5).
- 5) Snorkeling and SCUBA diving is limited to persons with legitimate scientific or educational purposes. Divers must check with the Hopkins/Stanford Diving Safety Officer (Hopkins Marine Life Refuge Guidelines).
- 6) Use of boats in the HMLR must have prior approval from the Refuge Manager (Hopkins Marine Life Refuge Guidelines).
- 7) The only part of the HMLR which may be accessed without prior approval is the continuous sandy area of Agassiz beach (Hopkins Marine Life Refuge Guidelines).

Evaluation of Effectiveness

Enforcement of Regulations

Regulations at Hopkins Marine Life Refuge are enforced by the California Department of Fish and Game wardens. Enforcement is intermittent and subject to warden availability. In addition to enforcement by CDFG wardens, regulations at HMLR are strictly enforced by the Director of the refuge and by the faculty, staff, and students of Hopkins Marine Station.

Achievement of Purpose

Evaluation of this zone is difficult because it lacks a legally mandated purpose. However, the following research demonstrates that regulations which limit activities, specifically fishing, in "no harvest" marine life refuges can help protect the animal resources in the refuges from human-induced degradation.

Paddack, M.J. 1996. SUMMARY: The influence of marine protected areas on population structure (density and size structure) of kelp forest fishes was assessed by counting and measuring the size of reef fishes within diver-swum transects inside and outside three marine reserves in central California [Hopkins Marine Life Refuge, Pt. Lobos Ecological Reserve, and Big Creek MRPA Ecological Reserve]. There were no significant differences in benthic fish density between reserve and non-reserve areas, although there was a trend of increased fish density within each of the reserves. The average length of rockfish (genus *Sebastes*) was significantly greater in 2 of the 3 reserve sites [Hopkins Marine Life Refuge and Pt. Lobos Ecological Reserve], and populations contained a greater proportion of larger fish in the reserve sites than they did in adjacent, non-reserve sites. These density and size differences combined to produce substantially greater reproductive potential for these reserve areas. The magnitude of these effects seems to be influenced by age of the reserve and fishing pressure in nearby areas. These findings demonstrate that existing levels of fishing pressure impact populations of kelp forest rockfishes; suggest that marine reserves help to sustain these populations; and provide

empirical support for the use of marine reserves in developing conservation strategies of nearshore fishes. However, the magnitude of these effects remains uncertain because the spatial scale of both larval and adult dispersal relative to the size of existing reserves is unknown.

Pollard, S. 1990. SUMMARY: Red abalone population characteristics were found to be markedly different between areas subject to sea otter predation, areas where recreational fishing pressure was relatively high, and reserve sites. Abalone densities were higher at the two central coast reserve sites [Hopkins Marine Life Refuge and Pt. Lobos Ecological Reserve] than at adjacent non-reserve sites. These local abalone populations may have grown in size since their initial decline following recolonization of the area by sea otters, as is indicated by the apparent increase in density reported in this study at HMLR, as compared to previous density estimates. This study suggests that marine reserves, which prohibit recreational fishing, can support increased densities of red abalone even in areas subject sea otter predation.

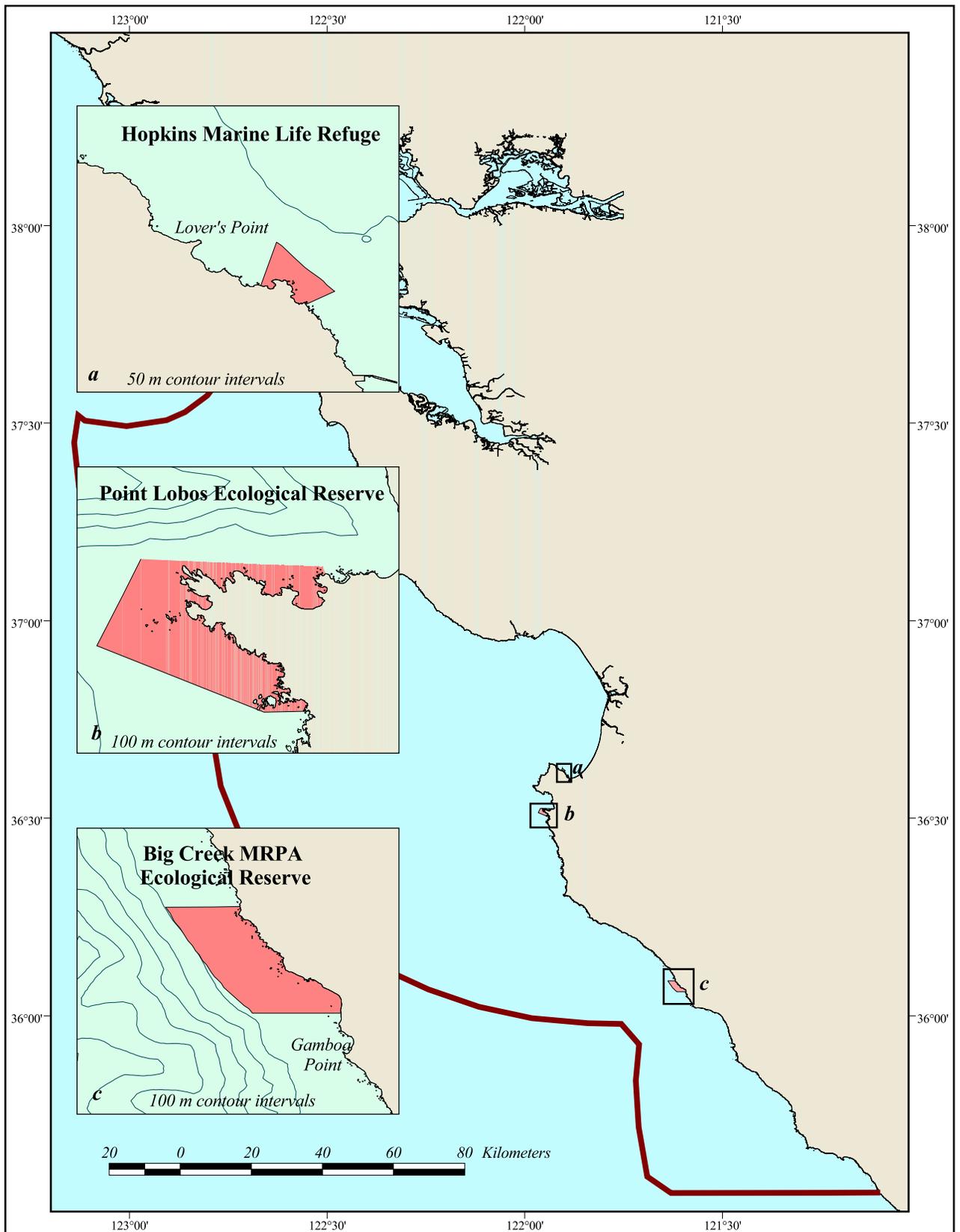
Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Shark Attraction Prohibited
- Pacific Grove Marine Reserve
- Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS

References

- McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.
- Paddack, M.J. 1996. The influence of marine reserves upon rockfish populations in central California kelp forests. M.S. Thesis. University of California, Santa Cruz. 40 pp.
- Pollard, S. 1990. Red abalone, *Haliotis rufescens*; relative impacts of recreational fisheries and sea otter predation on the abundance, size frequency and microhabitat distribution of red abalone populations in central and northern California. M.S. Thesis. University of California, Santa Cruz. 67 pp.
- Stanford University, Hopkins Marine Station, Hopkins Marine Life Refuge website.
<http://www-marine.stanford.edu/>

FIGURE 9. Location of No Harvest Zones



Existing Zones

Type of Zone: No Harvest

Legislated Title of Site: Ecological Reserve

Location of Site

See Figure 9 for exact location

Monterey County

- 1) Point Lobos Ecological Reserve

Year Established

1973

Established By

Ecological Reserve Act, State Legislature

Agencies Responsible

Fish and Game Commission

California Department of Fish and Game

Purpose

Ecological reserves are established to provide protection for rare, threatened, or endangered native plants, wildlife, aquatic organisms and specialized terrestrial or aquatic habitat types (14 Cal. Code of Regs. 630.0).

Regulations

General Regulations

- 1) Non-commercial Use of Marine Plants. Marine aquatic plants may not be cut or harvested in marine life refuges, marine reserves, ecological reserves, national parks or state underwater parks (14 Cal. Code of Regs. 30.00(b)).
- 2) Commercial Use of Invertebrates. In and offshore [between the high tide mark and 1,000 feet beyond the low tide mark] of all other state ecological reserves, state parks, state reserves, national parks, national monuments, or national seashores, only the following invertebrates may be taken: crabs, ghost shrimp, jackknife clams, sea urchins, squid, and worms, except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrate any other organisms, or break up, remove or destroy any rocks or other substrate or surfaces to which organisms are attached (14 Cal. Code of Regs. 123(f)(4)).
- 3) Protection of Resources. No person shall mine or disturb geological formations or archaeological artifacts, or take or disturb any bird, or nests or eggs thereof, or any plant, mammal, fish, mollusk, crustacean, amphibian, reptile, or any other form of plant or animal life except as provided in subsections 630.0 (a)(2) and (a)(8). The department may implement enhancement and protective measures to assure proper utilization and maintenance of ecological reserves (14 Cal. Code of Regs. 630.0(a)(1)).
- 4) Fishing. Fishing shall be allowed in accordance with the general fishing regulations of the commission, except that the method of taking fish shall be limited to angling from shore. No person shall take fish for commercial purposes, except by permit from the commission (14 Cal. Code of Regs. 630.0(a)(2)).
- 5) Collecting. No collecting shall be done in an ecological reserve except by permit issued pursuant to section 650 of these regulations. Any person applying for a permit must have a

- valid scientific collecting permit issued pursuant to part 3 of this title (14 Cal. Code of Regs. 630.0(a)(3)).
- 6) Swimming. No person shall swim, wade, dive, or use any diving equipment within an ecological reserve except as authorized under the terms of a permit issued pursuant to subsection (3) (14 Cal. Code of Regs. 630.0(a)(5)).
 - 7) Boating. No person shall launch or operate a boat or other floating device within an ecological reserve except by permit from the commission (14 Cal. Code of Regs. 630.0(a)(6)).
 - 8) Firearms. No person shall fire or discharge any firearm, bow and arrow, air or gas gun, spear gun, or any other weapon of any kind within or into an ecological reserve or possess such weapon within an ecological reserve, except law enforcement personnel and as provided for in individual area regulations that allow for hunting (14 Cal. Code of Regs. 630.0(a)(8)).
 - 9) Ejection. Employees of the department may eject any person from an ecological reserve for violation of any of these rules or regulations or for any reason when it appears that the general safety of the ecological reserve or persons thereon is endangered (14 Cal. Code of Regs. 630.0(a)(9)).
 - 10) Public Entry. Public entry may be restricted on any area at the discretion of the department to protect the wildlife, aquatic life, or habitat. No person, except state and local law enforcement officers, fire suppression agencies and employees of the department in the performance of their official duties or persons possessing written permission from the department, may enter any ecological reserve, or portion thereof, which is closed to public entry. No person may enter any ecological reserve between sunset and sunrise except with written permission from the department, which may be granted for purposes including night fishing in accordance with subsection 630.0(a)(2) from designated shore areas only (14 Cal. Code of Regs. 630.0(a)(10)).
 - 11) Introduction of Species. Unless authorized by the commission, the release of any fish or wildlife species, including domestic or domesticated species, or the introduction of any plant species, is prohibited. The department may reintroduce endemic species on ecological reserves for management purposes (14 Cal. Code of Regs. 630.0(a)(11)).
 - 12) Feeding of Wildlife. The feeding of wildlife is prohibited (14 Cal. Code of Regs. 630.0(a)(12)).
 - 13) Pesticides. The use of pesticides is prohibited on any ecological reserve unless authorized by the commission (14 Cal. Code of Regs. 630.0(a)(13)).
 - 14) Litter. No person shall deposit, drop, or scatter any debris on any ecological reserve except in a receptacle or area designated for that purpose. Where no designated receptacles are provided, any refuse resulting from a person's use of an area must be removed from that area by such person (14 Cal. Code of Regs. 630.0(a)(14)).
 - 15) Aircraft. No person shall operate any aircraft or hovercraft within a reserve, except as authorized by a permit from the commission (14 Cal. Code of Regs. 630.0(a)(17)).
 - 16) Pets. Pets, including dogs and cats, are prohibited from entering reserves unless they are retained on a leash of less than ten feet or are inside a motor vehicle (14 Cal. Code of Regs. 630.0(a)(18)).
 - 17) Fires. No person shall light fireworks or other explosive or incendiary devices, or start or maintain any fire on or in any reserve, except for management purposes as provided in subsection (a)(1) (14 Cal. Code of Regs. 630.0(a)(19)).
 - 18) Vandalism. No person shall tamper with, damage or remove any property not his own when such property is located within an ecological reserve (14 Cal. Code of Regs. 630.0(a)(21)).

Site Specific Regulations

- 1) Commercial Use of Invertebrates. No mollusks, crustaceans or other invertebrates may be taken in Point Lobos Ecological Reserve (14 Cal. Code of Reg. 123(f)(2)(c)).
- 2) All fishing is prohibited (14 Cal. Code of Regs. 630.0(b)(13)(A)).

- 3) Swimming, boating, and other aquatic sports are permitted. Boats may be launched and retrieved only in designated areas and may be anchored within the reserve only during daylight hours (14 Cal. Code of Regs. 630.0(b)(13)(B)).

Evaluation of Effectiveness

Enforcement of Regulations

Pt. Lobos Ecological Reserve overlaps in area with the Pt. Lobos State Reserve. Both state reserve and ecological reserve regulations are enforced by on-site State Park rangers. Park rangers give tickets to individuals who are caught violating the regulations. Park volunteer naturalists (docents) are trained to report any violations to park rangers. In addition, park rangers may call California Department of Fish and Game wardens for assistance with violations occurring offshore. (Jerry Loomis, State Park Ranger, pers. comm.)

Enforcement of park regulations pertaining to the subtidal portion of the reserve appears to be very effective. There is a low incidence of poaching in the reserve and human impacts on natural resources appears to be low (Jerry Loomis, pers. comm.).

Achievement of Purpose

The following research projects examined the effectiveness of the ecological reserve to protect animal populations. These studies demonstrate that reserves which limit fishing may help protect animal resources in the reserves from human-induced degradation.

Paddack, M.J. 1996. A summary of this research can be found on page 40.

Pollard, S. 1990. A summary of this research can be found page 41.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Shark Attraction Prohibited
- Pt. Lobos State Reserve
- California Sea Otter Game Refuge
- Point Lobos Ecological Reserve ASBS

References

California Department of Fish and Game, Fish and Game Laws and Regulations website.
<http://www.dfg.ca.gov/regs.html>

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Paddack, M.J. 1996. The influence of marine reserves upon rockfish populations in central California kelp forests. M.S. Thesis. University of California, Santa Cruz. 40 pp.

Pollard, S. 1990. Red abalone, *Haliotis rufescens*; relative impacts of recreational fisheries and sea otter predation on the abundance, size frequency and microhabitat distribution of red abalone populations in central and northern California. M.S. Thesis. University of California, Santa Cruz. 67 pp.

Existing Zones

Type of Zone: No Harvest

Legislated Title of Site: State Reserve

Location of Site

See Figure 9 for exact location

Monterey County

- 1) Point Lobos State Reserve

Year Established

1963

Established By

State Parks and Recreation Commission

Agencies Responsible

Department of Parks and Recreation
State Parks and Recreation Commission
California Department of Fish and Game
State Lands Commission

Purpose

The purpose of a state reserve is to preserve native ecological associations, unique faunal and floral characteristics, geological features, and scenic qualities in a condition of undisturbed integrity (Public Resources Code 5019.65).

Regulations

General Regulations

- 1) Living and non-living resources contained within state reserves shall not be disturbed or removed for other than scientific or management purpose (Public Resources Code 5019.65).
- 2) Non-commercial Use of Invertebrates. Tidal invertebrates may not be taken in any tidepool or other areas between the high tide mark (defined as Mean Higher High Tide) and 1,000 feet seaward and lateral to the low tide mark (defined as Mean Lower Low Water) except as follows: In state parks, state beaches, state recreation areas, state underwater parks, state reserves, national parks, national monuments or national seashores: Only abalones, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp and sea urchins may be taken. Worms may be taken except that no worms may be taken in any mussel bed, unless worms are taken incidental to the harvesting of mussels. Mussels may be taken in all areas except in state park system reserves or natural preserves (14 Cal. Code of Regs. 29.05(b)(1)).
- 3) Commercial Use of Invertebrates. In and offshore [between the high tide mark and 1,000 feet beyond the low tide mark] of all other state ecological reserves, state parks, state reserves, national parks, national monuments, or national seashores, only the following invertebrates may be taken: crabs, ghost shrimp, jackknife clams, sea urchins, squid, and worms, except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrate any other organisms, or break up, remove or destroy any rocks or other substrate or surfaces to which organisms are attached (14 Cal. Code of Regs. 123(f)(4)).

- 4) Aircraft. No person shall parachute into, fly an aircraft, ultralight vehicle, or hand glider over, or parasail or balloon over any State Park unit at an altitude of less than 500 feet unless authorized by the Department by posted order in accordance with Section 4301(i) (14 Cal. Code of Regs. 4304).
- 5) Animals. No person shall molest, hunt, disturb, injure, trap, take, net, poison, harm, kill, feed, touch, tease, or spotlight any kind of animal or fish, or so attempt, except that fish and bait may be taken other than for commercial purposes in accordance with the state laws and regulations, provided, however, that no person shall use or discharge a spear or bow and arrow in units under control of the Department (except in underwater parks or on designated archery ranges). This section does not apply to activities undertaken by the Department in conjunction with its resource management activities (14 Cal. Code of Regs. 4305(a)).
- 6) Driftwood. No person may gather more than 50 pounds or one piece of driftwood each day in the State Park System...Use of tools, vehicles, and equipment for the collection of driftwood is prohibited. Upon a finding that it will be in the interest of the Department of Parks and Recreation, the District Superintendent may, by posting, authorize the collection of driftwood from specified units on a temporary basis, either by the general public or by commercial operators, if necessary, in quantities, for purposes, and by means other than as specified by this section (14 Cal. Code of Regs. 4306).
- 7) Geological Features. No person shall destroy, disturb, mutilate, or remove earth, sand, gravel, oil, minerals, rocks, paleontological features, or features of caves except rockhounding may be permitted as defined and delineated in Sections 4610 through 4610.10 (14 Cal. Code of Regs. 4307).
- 8) Archaeological Features. No person shall remove, injure, disfigure, deface, or destroy any object of archaeological, or historical interest or value (14 Cal. Code of Regs. 4308).
- 9) Litter. No person shall leave, deposit, drop, or scatter bottles, broken glass, ashes, waste paper, cans or other litter in a unit except in a receptacle designated for that purpose, and no person shall import any litter, or import and deposit any litter into or in any unit from other places (14 Cal. Code of Regs. 4310).
- 10) Dogs. No person shall bring a dog into, permit a dog to enter or remain, or possess a dog in units under control of Department of Parks and Recreation unless the dog is on leash of no more than six feet in length and under the immediate control of a person or confined in a vehicle (14 Cal. Code of Regs. 4312(a)). No person shall bring a dog into, permit a dog to enter or remain, or possess a dog on any beach adjacent to any body of water in any unit except in portions of units designated for dogs (14 Cal. Code of Regs. 4312(c)).
- 11) Weapons and Traps. No person shall carry, possess or discharge across, in or into any portion of any unit any weapon, firearm, bow and arrow, trap, net, or device capable of injuring, or killing any person or animal, or capturing any animal, or damaging any public or private property, except where the Department of Parks and Recreation finds that it is in its best interests (14 Cal. Code of Regs. 4313).

Site Specific Regulations

- 1) Hand launchable boats, royak, and kayaks are permitted, but there are areas and beaches where boats cannot come ashore: including, but not limited to, Headland Cove, Bluefish Cove, and the beach at Whalers Cove (Pt. Lobos State Reserve Rules and Regulations).
- 2) Skin, free, and SCUBA diving in Whalers Cove and Bluefish Cove is allowed pursuant to the following regulations: (Pt. Lobos State Reserve Rules and Regulations)
 - i) Diving permits are limited to 15 teams on any one day, with each team consisting of 2 or 3 divers.
 - ii) All SCUBA divers must have a device capable of maintaining positive buoyancy.

- iii) Divers may enter and exit water only at the access ramp at Whalers Cove parking lot.
- iv) No teams will be permitted to register with less than two hours prior to the Reserve's posted closing time (5 P.M. winter, 7 P.M. summer).
- 3) No fishing equipment or collecting tools are permitted in the Reserve (Pt. Lobos State Reserve Rules and Regulations).
- 4) It is unlawful to fly any aircraft, including any airplane or helicopter...less than 1,000 feet above water or land over the Point Lobos State Reserve...except for rescue operations, in case of any emergency, or for scientific or filmmaking purposes under a permit issued by the department after a review of potential biological impacts (Fish and Game Code 10501.5(a)).

Evaluation of Effectiveness

Enforcement of Regulations

Pt. Lobos State Reserve overlaps in area with the Pt. Lobos Ecological Reserve. Both state reserve and ecological reserve regulations are enforced by on-site State Park rangers. Park rangers give tickets to individuals who are caught violating the regulations. Park volunteer naturalists (docents) are trained to report any violations to park rangers. In addition, park rangers may call California Department of Fish and Game wardens for assistance with violations occurring offshore. (Jerry Loomis, State Park Ranger, pers. comm.)

Enforcement of regulations pertaining to the marine portion of the reserve appears to be very effective. There is a low incidence of poaching in the reserve and human impacts on natural resources appears to be low (Jerry Loomis, State Park Ranger, pers. comm.).

Achievement of Purpose

The following research projects examined the effectiveness of the state reserve to protect animal populations. These studies demonstrate that reserves which limit fishing may help protect animal resources in the reserves from human-induced degradation.

Paddack, M.J. 1996. A summary of this research can be found on page 40.

Pollard, S. 1990. A summary of this research can be found page 41.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Shark Attraction Prohibited
- Pt. Lobos Ecological Reserve
- California Sea Otter Game Refuge
- Point Lobos Ecological Reserve ASBS

References

McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.

Paddack, M.J. 1996. The influence of marine reserves upon rockfish populations in central California kelp forests. M.S. Thesis. University of California, Santa Cruz. 40 pp.

Pollard, S. 1990. Red abalone, *Haliotis rufescens*; relative impacts of recreational fisheries and sea otter predation on the abundance, size frequency and microhabitat distribution of red abalone populations in central and northern California. M.S. Thesis. University of California, Santa Cruz. 67 pp.

Pt. Lobos State Reserve website. <http://www.pt-lobos.parks.state.ca.us/>

Existing Zones

Type of Zone: No Harvest

Legislated Title of Site: Marine Resources Protection Act Ecological Reserve

Location of Site

See Figure 9 for exact location

Monterey County

- 1) Big Creek Marine Resources Protection Act Ecological Reserve

Year Established

1994

Established By

Marine Resources Protection Act (MRPA), State Legislature

Agencies Responsible

Fish and Game Commission
California Department of Fish and Game
U.C. Santa Cruz Reserve Manager

Purpose

To provide for scientific research related to the management and enhancement of marine resources (14 Cal. Code of Regs. 630.5).

Regulations

General Regulations

- 1) Protection of Resources. No person shall disturb the geological formations or archaeological artifacts, or take or disturb any plant, animal, or habitat of any plant or animal, within an MRPA ecological reserve, except as authorized in conjunction with scientific research approved by the department (14 Cal. Code of Regs. 630.5(a)(1)).
- 2) Conditioning Research. Scientific research approved within an MRPA ecological reserve may be conditioned by the department to avoid adverse effects to the reserve and other research underway within the reserve, and to assure that activities are compatible with the research purposes of the reserve and activities adjacent to the reserve (14 Cal. Code of Regs. 630.5(a)(2)).
- 3) Fishing. Fishing is prohibited within an MRPA ecological reserve, except as authorized pursuant to scientific research approved by the department (14 Cal. Code of Regs. 630.5(a)(3)).
- 4) Collecting. No collecting shall be done, except as authorized pursuant to scientific research approved by the department. Any person collecting within an MRPA ecological reserve must have a valid scientific collecting permit issued pursuant to Subdivision 3 of this title commencing with Section 650 (14 Cal. Code of Regs. 630.5(a)(4)).
- 5) Swimming. No person shall swim, wade, dive, or use any diving equipment in an MRPA ecological reserve, except as authorized pursuant to scientific research approved by the department (14 Cal. Code of Regs. 630.5(a)(5)).
- 6) Boating. No person shall launch or operate a boat or other floating device within an MRPA ecological reserve except to pass through the area during the normal course of

- vessel transit along the coast, to avoid inclement weather, or pursuant to scientific research approved by the department (14 Cal. Code of Regs. 630.5(a)(6)).
- 7) Firearms. No person shall possess, fire, or discharge any firearm, bow and arrow, air or gas gun, spear gun, or any other weapon of any kind within, or into an MRPA ecological reserve except as authorized pursuant to scientific research approved by the department (14 Cal. Code of Regs. 630.5(a)(7)).
 - 8) Ejection. Employees of the department may eject any person from an MRPA ecological reserve for violation of any of these rules or regulations or for any reason when it appears that the general safety or welfare of the ecological reserve, persons thereon, or scientific research being conducted in the reserve are endangered (14 Cal. Code of Regs. 630.5(a)(8)).
 - 9) Public Entry. Public entry into an MRPA ecological reserve may be restricted at the discretion of the department to protect the wildlife, aquatic life, or habitat. No person, except state and local law enforcement officers, fire suppression agencies and employees of the department in the performance of their official duties or persons possessing written permission from the department, or institution or agency entering into a memorandum of understanding (MOU) with the department, may enter an area which is closed to public entry (14 Cal. Code of Regs. 630.5(a)(9)).
 - 10) Introduction of Species. The release of any fish or wildlife species, including domestic or domesticated species, or the introduction of any plant species into an MRPA ecological reserve, is prohibited unless authorized pursuant to scientific research approved by the department (14 Cal. Code of Regs. 630.5(a)(10)).
 - 11) Feeding of Wildlife. The feeding of fish or wildlife is prohibited except as authorized pursuant to scientific research approved by the department (14 Cal. Code of Regs. 630.5(a)(11)).
 - 12) Pesticides, Herbicides, and Other Regulated Chemicals. The use of pesticides, herbicides, and other regulated chemicals is prohibited in MRPA ecological reserves except as authorized pursuant to scientific research approved by the department. Where such chemicals are intended to be used as a part of any research program, any necessary authorizations and/or permits required to dispense such chemicals into state waters or tide and submerged lands shall be obtained prior to final approval of the research by the department (14 Cal. Code of Regs. 630.5(a)(12)).
 - 13) Litter. No person shall deposit, drop, or scatter any debris on any MRPA ecological reserve. Any refuse resulting from a person's use of an area must be removed from that area by such person (14 Cal. Code of Regs. 630.5(a)(13)).
 - 14) Aircraft. No person shall operate any aircraft or hovercraft within an MRPA ecological reserve, except as authorized pursuant to scientific research approved by the department (14 Cal. Code of Regs. 630.5(a)(14)).
 - 15) Pets. Pets, including but not limited to, dogs and cats, are prohibited from entering an MRPA ecological reserve unless authorized by the department (14 Cal. Code of Regs. 630.5(a)(15)).
 - 16) Research. Research related to the management and enhancement of marine resources may be approved within an MRPA ecological reserve by the department (14 Cal. Code of Regs. 630.5(a)(16)).
 - 17) Memorandum of Understanding (MOU). The department may enter into MOU's with colleges, universities, and other bonafide research organizations, including Vandenberg Air Force Base (VAFB), to conduct marine-related research within an MRPA Ecological Reserve (14 Cal. Code of Regs. 630.5(a)(17)).

Site Specific Regulations

- 1) The Department shall only approve research within the Big Creek MRPA Ecological Reserve which is compatible with research underway within the reserve area prior to its establishment by the commission, such research compatibility to be determined by

contacting the Reserve Manager for the Landels-Hill Big Creek Reserve prior to authorizing research within the reserve (14 Cal. Code of Regs. 630.5(b)(2)(A)).

Evaluation of Effectiveness

Enforcement of Regulations

CDFG wardens are responsible for enforcing regulations. CDFG wardens are aided by John Smiley, the UC Santa Cruz reserve manager, who notifies wardens when poaching or other violations are seen in the reserve. Local fishermen have begun to notify John Smiley or CDFG wardens when they see poachers in the reserve (John Smiley, pers. comm.).

In the past few years, the incidence of poaching in the reserve has declined significantly. Most of the initial poaching incidents were unintentional because fishermen were unfamiliar with the reserves boundaries. The decrease in poaching over the last few years is probably due to increased awareness of the reserve boundaries and increased local enforcement of regulations (John Smiley, pers. comm.).

Achievement of Purpose

The purpose of this zone is to provide a location for scientific research related to the management and enhancement of marine resources. The following research projects illustrate that this zone appears to be achieving its purpose.

Paddack, M.J. 1996. A summary of this research can be found on page 40.

Pomeroy, C. and J. Beck. 1998. SUMMARY: To determine the effectiveness of Marine Ecological Reserves (MERs) in protecting and enhancing fishery resources it is essential to allocate resources and develop mechanisms for monitoring them over time. This, however, requires financial and personnel resources that may or may not be readily available from the state. An alternative or complement lies in the possibility of involving local fishermen in the collection of data and other management tasks. Big Creek Ecological Reserve, is unique among the four MERs in that such a system of cooperative management had emerged well before its formal establishment. Since 1991, the manager of the adjacent terrestrial reserve and local fishermen have mapped and systematically collected data on rockfish catches at sites near the marine reserve in an attempt to monitor the effects of local fishing on the MER and *vice versa*. This research explores the Big Creek arrangement, its history and evolution, as well as current efforts to refine and enhance the system so that it may better serve research and management needs. The cooperative arrangement is discussed in connection with its benefits for both local fishers and managers including: 1) the provision of low cost, high quality fishery-dependent data to the MER and local fisheries; and 2) the maintenance of ongoing communication among local fishermen, researchers and managers. Taken together, these elements may enhance the effectiveness of the MER.

VenTresca, D.A., M.L. Gingras, J. Ugoretz, A. Voss, S. Blair, J. Plant, R. Hornady, and C. Yoshiyama. 1998. SUMMARY: The establishment of the Big Creek Ecological Reserve (BCER), approximately 50 miles south of Monterey, California, presents a unique opportunity to evaluate the effects of a marine reserve on central California's rockfish resource. Obtaining baseline information on species composition, densities, and length frequencies of rockfish populations within and adjacent to BCER is the crucial first step for determining change in population parameters and future benefits to adjacent and distant fisheries. This information will allow resource managers to evaluate marine reserves as an alternative management tool for rockfish populations. Population parameters of selected fish species in nearshore habitats within and adjacent to BCER have been assessed visually (densities) by SCUBA divers and recorded with an

underwater video camera equipped with paired lasers (length frequencies) along permanent and random transects. Preliminary analysis of the data suggest that: 1) the mean count of rockfish/permanent transect was significantly greater in BCER than in adjacent areas; and 2) mean length of gopher rockfish was significantly greater in BCER than in adjacent areas.

Yoklavich, M., R. Starr, J. Steger, H.G. Greene, F. Schwing, C. Malzone. 1997.

SUMMARY: Characterizations of benthic fish habitat and coastal ocean circulation patterns are critical steps in evaluating the effectiveness of the Big Creek Ecological Reserve at protecting and enhancing coastal fishery resources. With the coordinated efforts of geologists, biologists, and physical oceanographers, geophysical and oceanographic data were collected during a 4-day (3-6 June 1996) research cruise onboard the NOAA ship *McArthur*. Maps of bottom types were made using side scan sonar to survey 24.6 km² of the continental shelf along the Big Sur coast in water depths from 30 to 200 m. Eight types of potential benthic habitats were identified and quantified. About eight percent of the survey area, both inside and outside the reserve, was made up of complex rock bottom types with relatively high relief; these areas appeared to be suitable habitats for many benthic species of rockfishes. These habitat characterizations will help direct future efforts to assess fishes and their habitat associations within the reserve.

Patterns of ocean circulation over the continental shelf and upper slope to a distance of 40 km offshore were also characterized. Upwelling and substantial offshore transport off Point Sur and Lopez Point were evident in temperature, salinity, and current data collected at sea and in satellite sea surface temperature (SST) imagery. A coherent 10-20 km-wide coastal current was found flowing northward at a rate of 8-15 cm/sec through the Big Creek Ecological Reserve and extending from the surface to 200 m in depth. This information will help define the physical processes that affect the distribution, transport, and survival of young fishes, and clarify expectations for recruitment from the reserve to nearby unprotected areas.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Shark Attraction Prohibited
- Military
- California Sea Otter Game Refuge

References

California Department of Fish and Game website, Fish and Game Laws and Regulations homepage. <http://www.dfg.ca.gov/regs.html>

McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.

Paddack, M.J. 1996. The influence of marine reserves upon rockfish populations in central California kelp forests. M.S. Thesis. University of California, Santa Cruz. 40 pp.

Pomeroy, C. and J. Beck. 1998. Cooperative management of the state's Marine Ecological Reserves: Preliminary evidence from Big Creek. Pages 105-116 *In* O.T. Magoon, H. Converse, B. Baird, and M. Miller-Henson, eds. California and the World Ocean '97. Taking a Look at California's Ocean Resources: An Agenda for the Future. ASCE, Reston, Virginia.

VenTresca, D.A., M.L. Gingras, J. Ugoretz, A. Voss, S. Blair, J. Plant, R. Hornady, and C. Yoshiyama. 1998. The potential of marine reserves to enhance fisheries. Pages 400-411 *In*

O.T. Magoon, H. Converse, B. Baird, and M. Miller-Henson, eds. California and the World Ocean '97. Taking a Look at California's Ocean Resources: An Agenda for the Future. ASCE, Reston, Virginia.

Yoklavich, M., R. Starr, J. Steger, H.G. Greene, F. Schwing, C. Malzone. 1997. Mapping Benthic Habitats and Ocean Currents in the Vicinity of Central California's Big Creek Ecological Reserve. U.S. Dept. of Comm. NOAA/NMFS Tech. Memo. NOAA-TM-NMFS-SWFSC-245. 52 pp.

Existing Zones

Type of Zone: Limited Harvest

Legislated Title of Site: Marine Life Refuge

Location of Site

See Figure 10 for exact location

San Mateo County

- 1) James V. Fitzgerald Marine Reserve

Year Established

1969

Established By

State Legislature

Agency Responsible

California Department of Fish and Game

Purpose

No legally mandated purpose accompanies the marine life refuge designation.

Regulations

General Regulations

- 1) Except under a permit or specific authorization, it is unlawful: to take or possess any invertebrate or specimen of marine plant life in a marine life refuge (Fish and Game Code 10500(f)).
- 2) Non-commercial Use of Invertebrates. Tidal invertebrates may not be taken in any tidepool or other areas between the high tide mark (defined as Mean Higher High Tide) and 1,000 feet seaward and lateral to the low tide mark (defined as Mean Lower Low Water) except as follows: In all other areas, except where prohibited within marine life refuges or other special closures: Abalone, limpets, moon snails, turban snails, chiones, clams, cockles, mussels, rock scallops, native oysters, octopuses, squid, crabs, lobsters, shrimp, sand dollars, sea urchins and worms may be taken (14 Cal. Code of Regs. 29.05(b)(2)).
- 3) Non-commercial Use of Marine Plants. Marine aquatic plants may not be cut or harvested in marine life refuges, marine reserves, ecological reserves, national parks or state underwater parks (14 Cal. Code of Regs. 30.00(b)).

Site Specific Regulations

- 1) In the James V. Fitzgerald Marine Reserve, the following fish and mollusks may be taken under the authority of a sportfishing license, as authorized by this code: abalone, rockfish (*Sebastes*), lingcod, surfperch (Embiotocidae), monkeyface eel, rock eel, white croaker, halibut, cabezon (*Scopaenichthys marmoratus*), kelp greenling (*Hexagrammos decagrammus*), and smelt (Osmeridae and Antherinidae). No such fish having fins may be taken except by hook and line or by spearfishing. All other fish and forms of aquatic life are protected and may not be taken without a written permit from the department (Fish and Game Code 10666).
- 2) Commercial Use of Invertebrates. No mollusks, crustaceans or other invertebrates may be taken in Marine Life Refuges, except the James V. Fitzgerald Marine Reserve

pursuant to subsection 8305.5(b), Fish and Game Code (14 Cal. Code of Reg. 123(f)(2)(a)).

Evaluation of Effectiveness

Enforcement of Regulations

Reserve regulations are enforced by reserve staff and volunteers, CDFG wardens, and the San Mateo County sheriff's department. Currently, approximately 90% of enforcement is by reserve staff and volunteers due to their frequent presence in the reserve while leading educational and monitoring programs. The frequent (approximately 25% of daylight hours), yet unpredictable, presence of staff and volunteers in the reserve may act to deter poaching in the reserve. In addition, having regulations posted at every entrance to the reserve appears to help educate visitors about activities that are restricted in the reserve (Bob Breen, supervising naturalist, James V. Fitzgerald Marine Reserve).

Achievement of Purpose – (based on comments from Bob Breen, supervising naturalist, James V. Fitzgerald Marine Reserve)

Evaluation of this zone is difficult because it lacks a legally mandated purpose. However, there are a number of ongoing programs at the reserve that act to monitor biological resources, educate visitors, and involve the community in management.

Seashore Docents. The seashore docents program began in 1972 and currently has 55 adult volunteers. Docents act as roving naturalist interpreters on weekends. In addition, docents lead field trips for children (grades 3 –12). Approximately 4,000 school children attend field trips in the reserve each year.

High School Naturalists. The high school naturalist program began in 1995. Each year 29 juniors and seniors from Half Moon Bay High School attend classes in the fall and winter to learn the natural history of central California marine habitats. In the spring these students lead tidepool discovery walks for visiting children (grades 3-12).

Friends of the Fitzgerald Marine Reserve. Friends of the Fitzgerald Marine Reserve is a non-profit organization that began in 1985. This organization publishes a newsletter, financially supports the reserve's education programs, and acts as a political advocate for the reserve at the city, county, and state level.

S.E.A.L.S. The S.E.A.L.S. program monitors harbor seals and sea otters to determine if human activities impact the behavior of these animals. Determining changes in the animal's reproductive behavior is the major focus of this program. The S.E.A.L.S. program is run through the Gulf of the Farallones National Marine Sanctuary.

Junior Naturalists. The junior naturalist program, which began in 1992, teaches junior high school students how to assist reserve staff with ongoing projects that monitor human impacts on the plants and animals in the reserve.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Shark Attraction Prohibited
- Montara SB
- James V. Fitzgerald Marine Reserve ASBS

References

McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.

FIGURE 10. Location of Limited Harvest Zones



Existing Zones

Type of Zone: Limited Harvest

Legislated Title of Site: State Reserve

Location of Site

See Figure 10 for exact location

Santa Cruz County

- 1) Año Nuevo State Reserve

Year Established

1958

Established By

State Parks and Recreation Commission

Agencies Responsible

Department of Parks and Recreation
State Parks and Recreation Commission
California Department of Fish and Game
State Lands Commission

Purpose

The purpose of a state reserve is to preserve native ecological associations, unique faunal and floral characteristics, geological features, and scenic qualities in a condition of undisturbed integrity (Public Resources Code 5019.65).

Regulations

General Regulations

- 1) Living and non-living resources contained within state reserves shall not be disturbed or removed for other than scientific or management purpose (Public Resources Code 5019.65).
- 2) Non-commercial Use of Invertebrates. Tidal invertebrates may not be taken in any tidepool or other areas between the high tide mark (defined as Mean Higher High Tide) and 1,000 feet seaward and lateral to the low tide mark (defined as Mean Lower Low Water) except as follows: In state parks, state beaches, state recreation areas, state underwater parks, state reserves, national parks, national monuments or national seashores: Only abalones, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp and sea urchins may be taken. Worms may be taken except that no worms may be taken in any mussel bed, unless worms are taken incidental to the harvesting of mussels. Mussels may be taken in all areas except in state park system reserves or natural preserves (14 Cal. Code of Regs. 29.05(b)(1)).
- 3) Commercial Use of Invertebrates. In and offshore [between the high tide mark and 1,000 feet beyond the low tide mark] of all other state ecological reserves, state parks, state reserves, national parks, national monuments, or national seashores, only the following invertebrates may be taken: crabs, ghost shrimp, jackknife clams, sea urchins, squid, and worms, except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrate any other organisms, or break up, remove or destroy any rocks or other substrate or surfaces to which organisms are attached (14 Cal. Code of Regs. 123(f)(4)).

- 4) Aircraft. No person shall parachute into, fly an aircraft, ultralight vehicle, or hand glider over, or parasail or balloon over any State Park unit at an altitude of less than 500 feet unless authorized by the Department [of Parks and Recreation] by posted order in accordance with Section 4301(i) (14 Cal. Code of Regs. 4304).
- 5) Animals. No person shall molest, hunt, disturb, injure, trap, take, net, poison, harm, kill, feed, touch, tease, or spotlight any kind of animal or fish, or so attempt, except that fish and bait may be taken other than for commercial purposes in accordance with the state laws and regulations, provided, however, that no person shall use or discharge a spear or bow and arrow in units under control of the Department [of Parks and Recreation] (except in underwater parks or on designated archery ranges). This section does not apply to activities undertaken by the Department in conjunction with its resource management activities (14 Cal. Code of Regs. 4305(a)).
- 6) Driftwood. No person may gather more than 50 pounds or one piece of driftwood each day in the State Park System...Use of tools, vehicles, and equipment for the collection of driftwood is prohibited. Upon a finding that it will be in the interest of the Department of Parks and Recreation, the District Superintendent may, by posting, authorize the collection of driftwood from specified units on a temporary basis, either by the general public or by commercial operators, if necessary, in quantities, for purposes, and by means other than as specified by this section (14 Cal. Code of Regs. 4306).
- 7) Geological Features. No person shall destroy, disturb, mutilate, or remove earth, sand, gravel, oil, minerals, rocks, paleontological features, or features of caves except rockhounding may be permitted as defined and delineated in Sections 4610 through 4610.10 (14 Cal. Code of Regs. 4307).
- 8) Archaeological Features. No person shall remove, injure, disfigure, deface, or destroy any object of archaeological, or historical interest or value (14 Cal. Code of Regs. 4308).
- 9) Litter. No person shall leave, deposit, drop, or scatter bottles, broken glass, ashes, waste paper, cans or other litter in a unit except in a receptacle designated for that purpose, and no person shall import any litter, or import and deposit any litter into or in any unit from other places (14 Cal. Code of Regs. 4310).
- 10) Dogs. No person shall bring a dog into, permit a dog to enter or remain, or possess a dog in units under control of Department of Parks and Recreation unless the dog is on leash of no more than six feet in length and under the immediate control of a person or confined in a vehicle (14 Cal. Code of Regs. 4312(a)). No person shall bring a dog into, permit a dog to enter or remain, or possess a dog on any beach adjacent to any body of water in any unit except in portions of units designated for dogs (14 Cal. Code of Regs. 4312(c)).
- 11) Weapons and Traps. No person shall carry, possess or discharge across, in or into any portion of any unit any weapon, firearm, bow and arrow, trap, net, or device capable of injuring, or killing any person or animal, or capturing any animal, or damaging any public or private property, except where the Department of Parks and Recreation finds that it is in its best interests (14 Cal. Code of Regs. 4313).

Site Specific Regulations

- 1) Tidal invertebrates may not be taken in any tidepool or other areas between the high tide mark (defined as Mean Higher High Tide) and 1,000 feet seaward and lateral to the low tide mark (defined as Mean Lower Low Water) except as follows: Special Closure. No invertebrates shall be taken on the mainland shore within the boundaries of Año Nuevo State Reserve between the high tide mark and 100 feet beyond the low tide mark between November 30 and April 30 (14 Cal. Code of Regs. 29.05(b)(3)).
- 2) It is unlawful to fly any aircraft, including any airplane or helicopter...less than 1,000 feet above water or land over the Año Nuevo State Reserve...except for rescue operations, in case of any emergency, or for scientific or filmmaking purposes under a permit issued by

the department after a review of potential biological impacts (Fish and Game Code 10501.5(a)).

Evaluation of Effectiveness

Enforcement of Regulations

Regulations are enforced by on-site State Park rangers. Park rangers give tickets to individuals who are caught violating reserve regulations. Park volunteer naturalists (docents) are trained to report any regulation violations to park rangers. In addition, park rangers may call CDFG wardens for assistance with violations occurring offshore (Jerry Loomis, State Park Ranger, pers. comm.).

Achievement of Purpose

No research to date has examined the effectiveness of the state reserve regulations to preserve native ecological associations, unique faunal and floral characteristics, geological features, and scenic qualities in a condition of undisturbed integrity.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Shark Attraction Prohibited
- Año Nuevo Point and Island ASBS

References

Año Nuevo State Reserve website. <http://www.anonuevo.org>

McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.

Existing Zones

Type of Zone: Limited Harvest

Legislated Title of Sites: Ecological Reserve

Location of Sites

See Figure 10 for exact locations

Monterey County

- 1) Elkhorn Slough Ecological Reserve
- 2) Carmel Bay Ecological Reserve

Year Established

Elkhorn Slough Ecological Reserve - 1980
Carmel Bay Ecological Reserve - 1976

Established By

Ecological Reserve Act, State Legislature

Agencies Responsible

Fish and Game Commission
California Department of Fish and Game

Purpose

Ecological reserves are established to provide protection for rare, threatened, or endangered native plants, wildlife, aquatic organisms and specialized terrestrial or aquatic habitat types (14 Cal. Code of Regs. 630.0).

Regulations

General Regulations

- 1) Non-commercial Use of Marine Plants. Marine aquatic plants may not be cut or harvested in marine life refuges, marine reserves, ecological reserves, national parks or state underwater parks (14 Cal. Code of Regs. 30.00(b)).
- 2) Commercial Use of Invertebrates. In and offshore [between the high tide mark and 1,000 feet beyond the low tide mark] of all other state ecological reserves, state parks, state reserves, national parks, national monuments, or national seashores, only the following invertebrates may be taken: crabs, ghost shrimp, jackknife clams, sea urchins, squid, and worms, except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrate any other organisms, or break up, remove or destroy any rocks or other substrate or surfaces to which organisms are attached (14 Cal. Code of Regs. 123(f)(4)).
- 3) Protection of Resources. No person shall mine or disturb geological formations or archaeological artifacts, or take or disturb any bird, or nests or eggs thereof, or any plant, mammal, fish, mollusk, crustacean, amphibian, reptile, or any other form of plant or animal life except as provided in subsections 630.0 (a)(2) and (a)(8). The department may implement enhancement and protective measures to assure proper utilization and maintenance of ecological reserves (14 Cal. Code of Regs. 630.0(a)(1)).
- 4) Fishing. Fishing shall be allowed in accordance with the general fishing regulations of the commission, except that the method of taking fish shall be limited to angling from shore. No person shall take fish for commercial purposes, except by permit from the commission (14 Cal. Code of Regs. 630.0(a)(2)).

- 5) Collecting. No collecting shall be done in an ecological reserve except by permit issued pursuant to section 650 of these regulations. Any person applying for a permit must have a valid scientific collecting permit issued pursuant to part 3 of this title (14 Cal. Code of Regs. 630.0(a)(3)).
- 6) Swimming. No person shall swim, wade, dive, or use any diving equipment within an ecological reserve except as authorized under the terms of a permit issued pursuant to subsection (3) (14 Cal. Code of Regs. 630.0(a)(5)).
- 7) Boating. No person shall launch or operate a boat or other floating device within an ecological reserve except by permit from the commission (14 Cal. Code of Regs. 630.0(a)(6)).
- 8) Firearms. No person shall fire or discharge any firearm, bow and arrow, air or gas gun, spear gun, or any other weapon of any kind within or into an ecological reserve or possess such weapon within an ecological reserve, except law enforcement personnel and as provided for in individual area regulations that allow for hunting (14 Cal. Code of Regs. 630.0(a)(8)).
- 9) Ejection. Employees of the department may eject any person from an ecological reserve for violation of any of these rules or regulations or for any reason when it appears that the general safety of the ecological reserve or persons thereon is endangered (14 Cal. Code of Regs. 630.0(a)(9)).
- 10) Public Entry. Public entry may be restricted on any area at the discretion of the department to protect the wildlife, aquatic life, or habitat. No person, except state and local law enforcement officers, fire suppression agencies and employees of the department in the performance of their official duties or persons possessing written permission from the department, may enter any ecological reserve, or portion thereof, which is closed to public entry. No person may enter any ecological reserve between sunset and sunrise except with written permission from the department, which may be granted for purposes including night fishing in accordance with subsection 630.0(a)(2) from designated shore areas only (14 Cal. Code of Regs. 630.0(a)(10)).
- 11) Introduction of Species. Unless authorized by the commission, the release of any fish or wildlife species, including domestic or domesticated species, or the introduction of any plant species, is prohibited. The department may reintroduce endemic species on ecological reserves for management purposes (14 Cal. Code of Regs. 630.0(a)(11)).
- 12) Feeding of Wildlife. The feeding of wildlife is prohibited (14 Cal. Code of Regs. 630.0(a)(12)).
- 13) Pesticides. The use of pesticides is prohibited on any ecological reserve unless authorized by the commission (14 Cal. Code of Regs. 630.0(a)(13)).
- 14) Litter. No person shall deposit, drop, or scatter any debris on any ecological reserve except in a receptacle or area designated for that purpose. Where no designated receptacles are provided, any refuse resulting from a person's use of an area must be removed from that area by such person (14 Cal. Code of Regs. 630.0(a)(14)).
- 15) Aircraft. No person shall operate any aircraft or hovercraft within a reserve, except as authorized by a permit from the commission (14 Cal. Code of Regs. 630.0(a)(17)).
- 16) Pets. Pets, including dogs and cats, are prohibited from entering reserves unless they are retained on a leash of less than ten feet or are inside a motor vehicle (14 Cal. Code of Regs. 630.0(a)(18)).
- 17) Fires. No person shall light fireworks or other explosive or incendiary devices, or start or maintain any fire on or in any reserve, except for management purposes as provided in subsection (a)(1) (14 Cal. Code of Regs. 630.0(a)(19)).
- 18) Vandalism. No person shall tamper with, damage or remove any property not his own when such property is located within an ecological reserve (14 Cal. Code of Regs. 630.0(a)(21)).

Site Specific Regulations

Elkhorn Slough Ecological Reserve:

- 1) Notwithstanding the provisions of subsections (a)(1), (3), (5), (6), and (12), the department may issue permits to conduct biological research projects with the reserve. Such projects shall be compatible with the primary purposes of the reserve (14 Cal Code of Regs. 630.0(b)(37)(A)).
- 2) Fishing shall be conducted from only those specific areas of the reserve designated by the Department (14 Cal Code of Regs. 630.0(b)(37)(B)).
- 3) Hunting shall be permitted in accordance with the general hunting regulations, but only at such times and in specific areas as designated by the Department (14 Cal Code of Regs. 630.0(b)(37)(C)).
- 4) Grazing shall be allowed under permit from the department. The department may restrict the use of horses by grazing permittees (14 Cal Code of Regs. 630.0(b)(37)(D)).
- 5) All designated public access trails are opened to foot access only (14 Cal Code of Regs. 630.0(b)(37)(E)).
- 6) The causing of excessive noise especially that amplified electronically is prohibited (14 Cal Code of Regs. 630.0(b)(37)(F)).
- 7) Picnicking shall be conducted in only those areas designated by the Department (14 Cal Code of Regs. 630.0(b)(37)(G)).

Carmel Bay Ecological Reserve:

- 1) Commercial Use of Invertebrates. No mollusks, crustaceans or other invertebrates may be taken in Carmel Bay Ecological Reserve (14 Cal. Code of Reg. 123(f)(2)(c)).
- 2) Sport fishing with hook and line, spear gun or hand-held implements shall be permitted from boats as well as from shore. No invertebrates may be taken, possessed or destroyed (14 Cal. Code of Regs. 630.0(b)(26)(A)).
- 3) Swimming, boating, surfing, skin and SCUBA diving are permitted (14 Cal. Code of Regs. 630.0(b)(26)(B)).
- 4) Within Stillwater Cove kelp may be removed at any time to allow the passage and mooring of boats between Pescadero Rocks and Arrowhead Point (14 Cal. Code of Regs. 630.0(b)(26)(C)).
- 5) If, at any time, the director of the department finds that the harvesting of kelp will tend to destroy or impair any kelp bed or beds, or parts thereof, or tend to impair or destroy the supply of any food for fish or wildlife, the director shall serve on every person licensed to harvest kelp a 48-hour advance, written notice that the kelp bed, or a part thereof, will be closed to the harvesting of kelp for a period not to exceed one year. After service of such a notice the person upon whom notice is served may appeal to the commission for a hearing to reopen the kelp bed or part thereof (14 Cal. Code of Regs. 630.0(b)(26)(D)).
- 6) Not more than five percent (5%) of the total weight of kelp harvested in any one day shall consist of *Nereocystis* (bull kelp) (14 Cal. Code of Regs. 630.0(b)(26)(E)).
- 7) Any licensed person or company intending to harvest kelp within the ecological reserve shall give the department's regional manager of the Marine Resources Region, or his designee, at least 48-hours oral notice of the intention to harvest. At the option of the department, an observer selected by the department may accompany the harvester during such a harvesting (14 Cal. Code of Regs. 630.0(b)(26)(F)).
- 8) Not more than 50 percent of the kelp within Bed 219 shall be harvested in any four-month period (14 Cal. Code of Regs. 630.0(b)(26)(G)).

Evaluation of Effectiveness

Enforcement of Regulations

The regulations of the Elkhorn Slough and Carmel Bay ecological reserves are enforced by California Department of Fish and Game wardens. Enforcement is intermittent and subject to warden availability.

Achievement of Purpose

The following research projects have examined the effectiveness of the regulations to protect plant and animal populations. These studies demonstrate that regulations limiting activities, such as fishing or hiking, within marine zones can help protect plant and animal resources from human-induced degradation.

Elkhorn Slough Ecological Reserve

Woolfolk, A. 1999. SUMMARY: The effects of human trampling on *Salicornia virginica* assemblages in Elkhorn Slough, California were experimentally tested using 9 levels of trampling intensity over 6 months, then allowing plots to recover for 1 year. Responses to cattle grazing also were examined. Human trampling at all levels decreased *S. virginica* height and flower production. Percent cover of *S. virginica* remained high (~90%) in intermediate and lightly trampled plots, but bare ground dominated in heavily trampled areas. Once trampling ceased, open space was first colonized by non-native upland plants or algae, and later, *S. virginica*. After 1 year of recovery, *S. virginica* in heavily trampled areas was shorter than untrampled controls, bare patches remained in some plots, and there were significant differences between invertebrates present in heavily trampled areas and controls. Actively grazed cattle pasture was characterized by high percentages of bare ground and *Distichlis*, while ungrazed marsh was comprised of ~100% *S. virginica*. However, plants responded quickly to the removal of cattle. After 15 months of recovery, *Distichlis* and bare ground declined, and *S. virginica* increased. Overall, trampling and grazing can decrease *S. virginica* abundance, lead to changes in community organization, promote invasions by introduced species, and contribute to loss of marsh habitat.

Carmel Bay Ecological Reserve

Schlining, K. L. (in progress). SUMMARY: Due to a recent 5-fold increase in spot prawn (*Pandalus platyceros*) landings, data were collected at sea to establish the current status of the Carmel Canyon trap fishery. Prawn traps were set within the boundaries of the Carmel Bay Ecological Reserve and in the neighboring fishing grounds in order to quantify the importance of the reserve relative to spot prawns. Significant differences were found inside the reserve compared to outside the reserve including: higher mean catch-per-unit-effort (kg per trap), higher male to female sex ratio, and differences in mean carapace lengths. The Carmel Canyon spot prawn resource appears to be in healthy condition overall. However, monitoring should be continued in the future if catches continue to increase.

Overlapping Sites

Elkhorn Slough Ecological Reserve

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Elkhorn Slough National Ecological Research Reserve

Carmel Bay Ecological Reserve

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Shark Attraction Prohibited
- Carmel River SB
- California Sea Otter Game Refuge
- Carmel Bay ASBS

References

- California Department of Fish and Game website, Fish and Game Laws and Regulations homepage. <http://www.dfg.ca.gov/regs.html>
- McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.
- Schlining, K. L. (in progress). The spot prawn *Pandalus platyceros* trap fishery in Carmel submarine canyon, CA. M.S. Thesis. Moss Landing Marine Laboratories.
- Woolfolk, A. 1999. The effects of human trampling and cattle grazing on salt marsh assemblages in Elkhorn Slough, California. M.S. Thesis. Moss Landing Marine Laboratories.

Existing Zones

Type of Zone: Limited Harvest

Legislated Title of Site: Marine Refuge

Location of Site

See Figure 10 for exact location

Monterey County

- 1) Pacific Grove Marine Refuge (PGMR)

Year Established

1952

Established By

City Ordinance, Pacific Grove City Council*

Agencies Responsible

Pacific Grove City Manager

Pacific Grove Public Works Department

Pacific Grove Police Department

Pacific Grove City Council, Natural Resources Committee

Purpose

To protect certain kinds of marine life and to provide a marine garden for the City of Pacific Grove (Pacific Grove City Code, Chapter 14.04.010).

Regulations

General Regulations

None

Site Specific Regulations

- 1) Unlawful Acts. Anyone taking specimens of marine plant life, or who willfully disturbs, injures or destroys marine animal habitats or who removes sand, gravel, or rocks therefrom shall be guilty of a misdemeanor (PG City Code, Chapter 14.04.020).⁺
- 2) Removal of Certain Material Permitted. Notwithstanding the provisions of Section 14.04.020, nonliving animals or portions thereof, detached plants, pebbles, flotsam and jetsam may be removed for noncommercial purposes and reduced to possession, but the quantity of nonliving animals and pebbles that may be taken shall not exceed the possession of one handful. The marine refuge shall not be subject to habitat destruction by the relocation and repositioning of large rocks. The city manager or his or her delegated

* A 1931 act of the California Legislature granted to the City of Pacific Grove all the right, title, interest, and estate of the lands from the mean high tide line to the 60 foot depth contour between the southeasterly corporate limit line and the westerly corporate limit line of the city. The City of Pacific Grove has authority to regulate disposition of substrate within its land holdings, including the PGMR.

⁺ The California Department of fish and Game (CDFG) has authority to regulate all living marine resources (animal and plants) within the sovereign waters of the State of California, including the PGMR. The City cannot restrict the take of marine plants unless such restriction is consistent with regulations imposed by the State. The State allows take of most marine plants within the area of the PGMR (see Pacific Grove Marine Gardens Fish Refuge regulations).

authority may issue permits for scientific collecting of specific organisms or objects in specific quantities within the Marine Preserve of the city of Pacific Grove (PG City Code, Chapter 14.04.020).[∇]

Evaluation of Effectiveness

Enforcement of Regulations

Enforcement of the PGMR regulations is difficult to assess independently of the Pacific Grove Marine Gardens Fish Refuge and the Hopkins Marine Life Refuge, which have overlapping boundaries with the PGMR. For a summary of enforcement in the Hopkins Marine Life Refuge and the Pacific Grove Marine Gardens Fish Refuge see pages 40 and 67, respectively.

Achievement of Purpose

Evaluation of the PGMR is difficult because its boundaries overlap with those of the Pacific Grove Marine Gardens Fish Refuge and the Hopkins Marine Life Refuge. Please refer to the Hopkins Marine Life Refuge and the Pacific Grove Marine Gardens Fish Refuge evaluation sections on pages 40 and 67, respectively.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Shark Attraction Prohibited
- Hopkins Marine Life Refuge
- Asilomar SB
- Pacific Grove Marine Gardens Fish Refuge
- Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS

References

None

[∇] State regulations prohibit collection of shells or other parts of invertebrates (except sand dollars, sea urchins, and worms) within the PGMR (see Pacific Grove Marine Gardens Fish Refuge regulations)

Existing Zones

Type of Zone: Limited Harvest

Legislated Title of Site: Fish Refuge

Location of Site

See Figure 10 for exact locations

Monterey County

- 1) Pacific Grove Marine Gardens Fish Refuge

Year Established

1963

Established By

State Legislature

Agencies Responsible

Fish and Game Commission

California Department of Fish and Game

Purpose

No legally mandated purpose accompanies the fish refuge designation.

Regulations

General Regulations

- 1) Except under a permit or specific authorization, it is unlawful to take or possess any species of fish or amphibian, or part thereof, in any fish refuge, or to use or have in possession in such refuge any contrivance designed to be used for catching fish (Fish and Game Code 10500(c)).

Site Specific Regulations

- 1) In the Pacific Grove Marine Gardens Fish Refuge, fish, other than mollusks and crustaceans, may be taken under the authority of a sportfishing license as authorized by this code (Fish and Game Code 10660(a)).
- 2) Notwithstanding any other provision of this section, holders of scientific collectors' permits issued by the commission, or students working under their direction, may take marine life for scientific purposes in this refuge (Fish and Game Code 10660(b)).
- 3) In this refuge, sardines, mackerel, anchovies, squid, and herring may be taken by ring net, lampara net, or bait net as authorized by this code (Fish and Game Code 10660(c)).

Evaluation of Effectiveness

Enforcement of Regulations

Regulations are enforced primarily by California Department of Fish and Game wardens. Enforcement is intermittent and subject to availability of wardens. The City of Pacific Grove Police Department helps the CDFG wardens enforce fish and game regulations. Officers patrol the Pacific Grove coastline daily and, through their presence, act as a deterrent to poaching activity in the refuge. There are five levels of action that a police officer may take when a violation is observed (actions are listed in order of decreasing frequency): 1) issue a verbal warning; 2) issue a warning citation; 3) detain individual(s)

for CDFG wardens; 4) issue a citation; or 5) make an arrest. Violation of the fish and game code is a misdemeanor offense (Captain Carl Miller, Pacific Grove Police Department, pers. comm.).

A local organization - The Coalition to Preserve and Protect Pacific Grove Tidepools - is attempting to increase the protection of plant and animal populations in the Pacific Grove Marine Gardens Fish Refuge.

Achievement of Purpose

Evaluation of this site is difficult because it lacks a legally mandated purpose. No research to date has examined the effectiveness of the fish refuge regulations to protect invertebrate and fish populations from over-exploitation.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Shark Attraction Prohibited
- Pacific Grove Marine Reserve
- Asilomar SB
- Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS

References

McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.

Existing Zones

Type of Zone: Limited Harvest

Legislated Title of Site: State Park

Location of Site

See Figure 10 for exact location

Monterey County

- 1) Julia Pfeiffer Burns State Park/State Underwater Park

Year Established

1970

Established By

State Parks and Recreation Commission

Agencies Responsible

Department of Parks and Recreation
Parks and Recreation Commission
California Department of Fish and Game
State Lands Commission

Purpose

The purpose of state parks shall be to preserve outstanding natural, scenic, and cultural values, indigenous aquatic and terrestrial fauna and flora, and the most significant examples of such ecological regions (Public Resources Code 5019.53). Underwater parks are leased by the State Parks Service from the State Lands Commission as underwater extensions of existing classified park units.

Regulations

General Regulations

- 1) Non-commercial Use of Invertebrates. Tidal invertebrates may not be taken in any tidepool or other areas between the high tide mark (defined as Mean Higher High Tide) and 1,000 feet seaward and lateral to the low tide mark (defined as Mean Lower Low Water) except as follows: In state parks, state beaches, state recreation areas, state underwater parks, state reserves, national parks, national monuments or national seashores: Only abalones, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp and sea urchins may be taken. Worms may be taken except that no worms may be taken in any mussel bed, unless worms are taken incidental to the harvesting of mussels. Mussels may be taken in all areas except in state park system reserves or natural preserves (14 Cal. Code of Regs. 29.05(b)(1)).
- 2) Non-commercial Use of Marine Plant. Marine aquatic plants may not be cut or harvested in marine life refuges, marine reserves, ecological reserves, national parks or state underwater parks (14 Cal. Code of Regs. 30.00(b)).
- 3) Commercial Use of Invertebrates. In and offshore [between the high tide mark and 1,000 feet beyond the low tide mark] of all other state ecological reserves, state parks, state reserves, national parks, national monuments, or national seashores, only the following invertebrates may be taken: crabs, ghost shrimp, jackknife clams, sea urchins, squid, and worms, except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrate any other organisms, or break up, remove or destroy

- any rocks or other substrate or surfaces to which organisms are attached (14 Cal. Code of Regs. 123(f)(4)).
- 4) No person shall enter an underwater park unit or scenic or scientific reserve for the purpose of engaging in underwater activities, including skin, free and SCUBA diving, other than through an established water entry point for underwater activities (14 Cal. Code of Regs. 4664(c)).
 - 5) No person shall take or disturb any marine plant or geological feature within the boundaries of an underwater park or scenic or scientific reserve (14 Cal. Code of Regs. 4664(d)).
 - 6) Aircraft. No person shall parachute into, fly an aircraft, ultralight vehicle, or hand glider over, or parasail or balloon over any State Park unit at an altitude of less than 500 feet unless authorized by the Department [of Parks and Recreation] by posted order in accordance with Section 4301(i) (14 Cal. Code of Regs. 4304).
 - 7) Animals. No person shall molest, hunt, disturb, injure, trap, take, net, poison, harm, kill, feed, touch, tease, or spotlight any kind of animal or fish, or so attempt, except that fish and bait may be taken other than for commercial purposes in accordance with the state laws and regulations, provided, however, that no person shall use or discharge a spear or bow and arrow in units under control of the Department [of Parks and Recreation] (except in underwater parks or on designated archery ranges). This section does not apply to activities undertaken by the Department in conjunction with its resource management activities (14 Cal. Code of Regs. 4305(a)).
 - 8) Driftwood. No person may gather more than 50 pounds or one piece of driftwood each day in the State Park System...Use of tools, vehicles, and equipment for the collection of driftwood is prohibited. Upon a finding that it will be in the interest of the Department of Parks and Recreation, the District Superintendent may, by posting, authorize the collection of driftwood from specified units on a temporary basis, either by the general public or by commercial operators, if necessary, in quantities, for purposes, and by means other than as specified by this section (14 Cal. Code of Regs. 4306).
 - 9) Geological Features. No person shall destroy, disturb, mutilate, or remove earth, sand, gravel, oil, minerals, rocks, paleontological features, or features of caves except rockhounding may be permitted as defined and delineated in Sections 4610 through 4610.10 (14 Cal. Code of Regs. 4307).
 - 10) Archaeological Features. No person shall remove, injure, disfigure, deface, or destroy any object of archaeological, or historical interest or value (14 Cal. Code of Regs. 4308).
 - 11) Litter. No person shall leave, deposit, drop, or scatter bottles, broken glass, ashes, waste paper, cans or other litter in a unit except in a receptacle designated for that purpose, and no person shall import any litter, or import and deposit any litter into or in any unit from other places (14 Cal. Code of Regs. 4310).
 - 12) Dogs. No person shall bring a dog into, permit a dog to enter or remain, or possess a dog in units under control of Department of Parks and Recreation unless the dog is on leash of no more than six feet in length and under the immediate control of a person or confined in a vehicle (14 Cal. Code of Regs. 4312(a)). No person shall bring a dog into, permit a dog to enter or remain, or possess a dog on any beach adjacent to any body of water in any unit except in portions of units designated for dogs (14 Cal. Code of Regs. 4312(c)).
 - 13) Weapons and Traps. No person shall carry, possess or discharge across, in or into any portion of any unit any weapon, firearm, bow and arrow, trap, net, or device capable of injuring, or killing any person or animal, or capturing any animal, or damaging any public or private property, except where the Department of Parks and Recreation finds that it is in its best interests (14 Cal. Code of Regs. 4313).

Site Specific Regulations

None

Evaluation of Effectiveness

Enforcement of Regulations

Regulations are enforced by Department of Parks and Recreation rangers and California Department of Fish and Game wardens. Enforcement is subject to warden or ranger availability.

Achievement of Purpose

No research to date has examined the effectiveness of the state park regulations to protect plant, invertebrate, and fish populations and other natural resources in Julia Pfeiffer Burns State Park/State Underwater Park from over-exploitation.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Shark Attraction Prohibited
- California Sea Otter Game Refuge
- Julia Pfeiffer Burns Underwater Park ASBS

References

McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.

Existing Zones

Type of Zone: Recreational

Legislated Title of Site: National Recreation Area

Location of Site

See Figure 11 for exact location

Marin, San Francisco, and San Mateo County

- 1) Golden Gate National Recreation Area

Year Established

1972

Established By

U.S. Department of Interior, National Park Service

Agencies Responsible

U.S. Department of Interior, National Park Service
California Department of Fish and Game

Purpose

National parks are designed to conserve scenery, natural and historic objects, and wildlife, and to provide for the enjoyment of those resources in a manner that will leave them unimpaired for the enjoyment of future generations (36 Code of Fed. Regs. 1.1). Specifically, National Recreation Areas preserve and provide areas for the maintenance of recreational open space necessary to the urban environment and for land use planning.

Regulations

General Regulations

- 1) Non-commercial Use of Invertebrates. Tidal invertebrates may not be taken in any tidepool or other areas between the high tide mark (defined as Mean Higher High Tide) and 1,000 feet seaward and lateral to the low tide mark (defined as Mean Lower Low Water) except as follows: In state parks, state beaches, state recreation areas, state underwater parks, state reserves, national parks, national monuments or national seashores: Only abalones, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp and sea urchins may be taken. Worms may be taken except that no worms may be taken in any mussel bed, unless worms are taken incidental to the harvesting of mussels. Mussels may be taken in all areas except in state park system reserves or natural preserves (14 Cal. Code of Regs. 29.05(b)(1)).
- 2) Non-commercial Use of Marine Plant - Marine aquatic plants may not be cut or harvested in marine life refuges, marine reserves, ecological reserves, national parks or state underwater parks (30.00(b)).
- 3) Commercial Use of Invertebrates. In and offshore [between the high tide mark and 1,000 feet beyond the low tide mark] of all other state ecological reserves, state parks, state reserves, national parks, national monuments, or national seashores, only the following invertebrates may be taken: crabs, ghost shrimp, jackknife clams, sea urchins, squid, and worms, except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrate any other organisms, or break up, remove or destroy any rocks or other substrate or surfaces to which organisms are attached (14 Cal. Code of Regs. 123(f)(4)).

- 3) Preservation of natural, cultural and archeological resources. Except as otherwise provided in this chapter, the following is prohibited: (36 CFR 2.1)
 - i) Possessing, destroying, injuring, defacing, removing, digging, or disturbing from its natural state:
 - a) Living or dead wildlife or fish, or the parts or products thereof, such as antlers or nests.
 - b) Plants or the parts or products thereof.
 - c) Nonfossilized and fossilized paleontological specimens, cultural or archeological resources, or the parts thereof.
 - d) A mineral resource or cave formation or the parts thereof.
 - ii) Introducing wildlife, fish or plants, including their reproductive bodies, into a park area ecosystem.
 - iii) Unauthorized removal of natural products from the park area.
 - iv) Sale or commercial use of natural products.
- 4) Fishing: (36 CFR 2.3)
 - (i) Except in designated areas or as provided in this section, fishing shall be in accordance with the laws and regulations of the State within whose exterior boundaries a park area or portion thereof is located. Nonconflicting State laws are adopted as a part of these regulations.
 - (ii) The following are prohibited:
 - a) Commercial fishing, except where specifically authorized by Federal statutory law.
 - b) Fishing by the use of drugs, poisons, explosives, or electricity.
 - c) Digging for bait, except in privately owned lands.
 - d) Failing to return carefully and immediately to the water from which it was taken a fish that does not meet size or species restrictions or that the person chooses not to keep. Fish so released shall not be included in the catch or possession limit: provided that, at the time of catching, the person did not possess the legal limit of fish.
 - e) Fishing from motor road bridges, from or within 200 feet of a public raft or float designated for water sports, or within the limits of locations designated as swimming beaches, surfing areas, or public boat docks, except in designated areas.
- 5) Weapons, traps and nets: (36 CFR 2.4)
 - i) Weapons, traps or nets may be carried, possessed or used:
 - a) At designated times and locations in park areas where:
 - 1) The taking of wildlife is authorized by law in accordance with Sec. 2.2 of this chapter;
 - 2) The taking of fish is authorized by law in accordance with Sec. 2.3 of this part.
 - ii) The superintendent may issue a permit to carry or possess a weapon, trap or net under the following circumstances:
 - a) When necessary to support research activities conducted in accordance with Sec. 2.5.
- 6) Research specimens: (36 CFR 2.5)
 - i) A specimen collection permit may be issued only to an official representative of a reputable scientific or educational institution or a State or Federal agency for the purpose of research, baseline inventories, monitoring, impact analysis, group study, or museum display when the superintendent determines that the collection is necessary to the stated scientific or resource management goals of the institution or agency and that all applicable Federal and State permits have been acquired, and that the intended use of the specimens and their final disposal is in accordance with applicable law and Federal administrative policies. A permit shall not be issued if removal of the specimen would result in damage to other natural or cultural resources, affect adversely environmental or scenic values, or if the specimen is readily available outside of the park area.

- ii) A permit to take an endangered or threatened species listed pursuant to the Endangered Species Act, or similarly identified by the States, shall not be issued unless the species cannot be obtained outside of the park area and the primary purpose of the collection is to enhance the protection or management of the species.
- iii) In park areas where the enabling legislation prohibits the killing of wildlife, issuance of a collecting permit for wildlife or fish or plants, is prohibited.
- 7) Boating and Water Use Activities. The following are prohibited: (36 CFR 3.6)
 - i) Failing to observe restrictions established by a regulatory marker.
 - ii) Operating a vessel in excess of 5 mph or creating a wake:
 - a) In areas so designated; or
 - b) Within 100 feet of a diver's marker, downed water skier or swimmer.
 - iii) Operating a vessel not propelled by hand within 500 feet of a location designated as a swimming beach. This prohibition does not apply in locations such as rivers, channels, or narrow coves where passage is restricted to less than 500 feet. In such restrictive locations, the operation of a vessel in excess of 5 mph or creating a wake is prohibited.
 - iv) Using trailers to launch or recover vessels, except at designated launching sites.
 - v) Launching a vessel propelled by machinery at other than designated launch sites.
 - vi) Operating a vessel propelled by machinery on waters not directly accessible by road.
 - vii) Launching or operating airboats.
 - viii) Operating a vessel in excess of designated size, length or width restrictions.
- 8) Swimming and bathing: (36 CFR 3.21)
 - i) The following are prohibited:
 - a) Swimming or bathing in locations designated as closed.
 - b) Swimming or bathing in violation of designated restrictions.
 - c) Swimming from vessels which are underway, except in circumstances where a capable operator is on board and all propulsion machinery is off and/or sails are furled.
- 9) Surfing. The use of surfboards and similar rigid devices within locations designated as swimming beaches is prohibited (36 CFR 3.22).
- 10) SCUBA and snorkeling. The following are prohibited: (36 CFR 3.23)
 - i) SCUBA diving and snorkeling within locations designated as swimming, docking, or mooring areas, except in accordance with conditions which may be established by the superintendent.
 - ii) Diving in waters open to the use of vessels, other than those propelled by hand, without displaying a standard diver flag.

Site Specific Regulations

None

Evaluation of Effectiveness:

Enforcement of Regulations

Regulations are enforced by law enforcement rangers and park police officers, both employees of the National Park Service. In addition, park naturalist volunteers (docents) report violations to rangers or officers. Boat patrol is not available to GGNRA staff for enforcement, therefore, regulations are enforced along the shoreline only. Shoreline enforcement focuses on violations of fishing regulations, such as illegal take of crabs and abalone. CDFG wardens may enforce fishing regulations in some portions of the GGNRA. The USCG enforces boating regulations throughout the marine portions of the GGNRA. The incidence of poaching in the GGNRA is low (Gill Soper, GGNRA head ranger, pers. comm.).

Achievement of Purpose

No research to date has examined the effectiveness of the GGNRA regulations to conserve scenery, natural and historical objects, and wildlife, while providing recreational open space for the public.

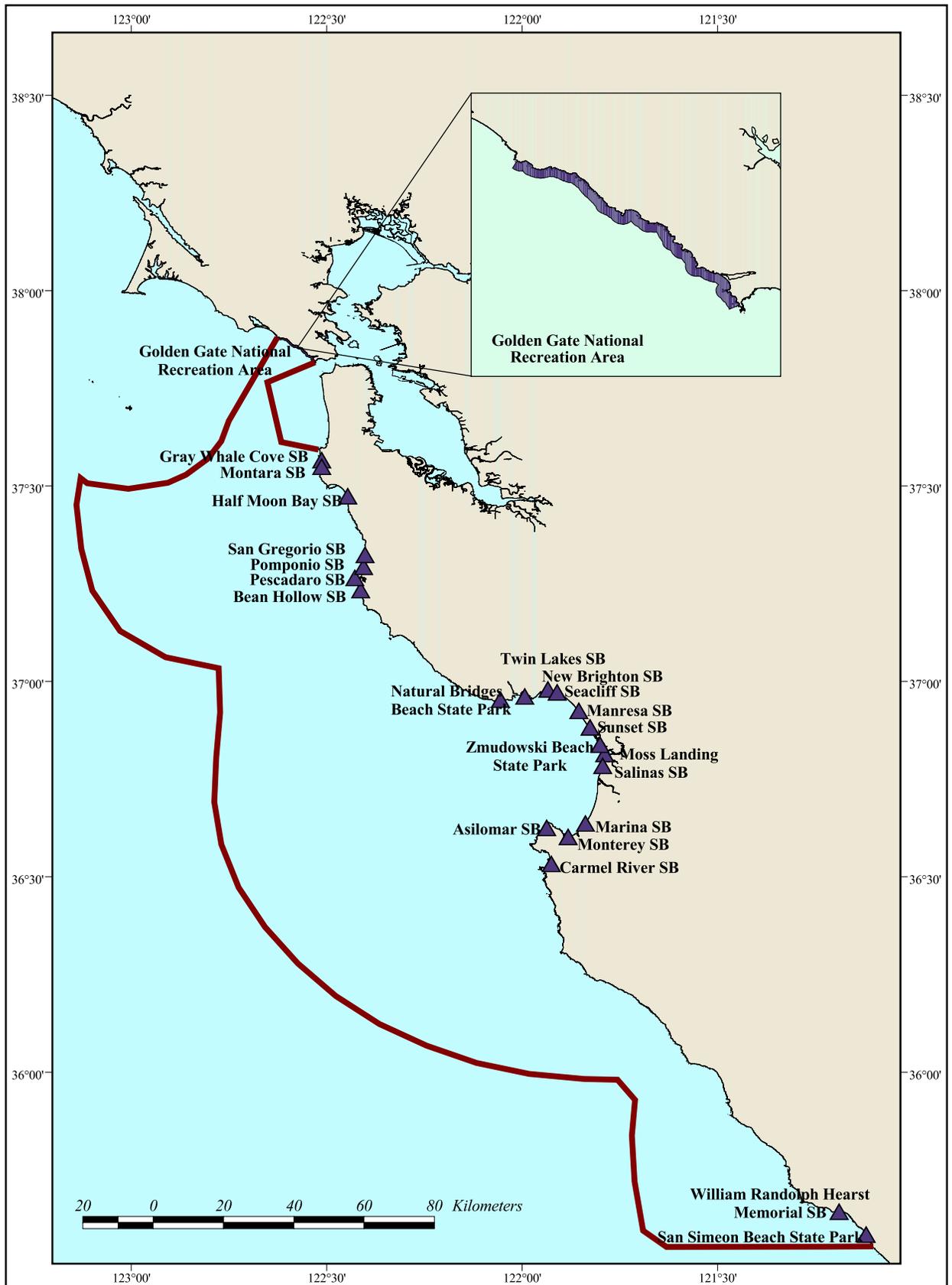
Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Shark Attraction Prohibited

References

McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.

FIGURE 11. Location of Recreational Zones



Existing Zones

Type of Zone: Recreational

Legislated Title of Sites: State Beach (SB)

Location of Sites

See Figure 11 for exact locations

San Mateo County

- 1) Grey Whale Cove SB
- 2) Montara SB
- 3) Half Moon Bay SB
- 4) San Gregorio SB
- 5) Pomponio SB
- 6) Pescadero SB
- 7) Bean Hollow SB

Santa Cruz County

- 1) Natural Bridges SB
- 2) Twin Lakes SB
- 3) New Brighton SB
- 4) Seacliff SB
- 5) Manresa SB
- 6) Sunset SB

Monterey County

- 1) Zmudowski SB
- 2) Moss Landing SB
- 3) Salinas River SB
- 4) Marina SB
- 5) Monterey SB
- 6) Asilomar SB
- 7) Carmel River SB

San Luis Obispo County

- 1) William Randolph Hearst Memorial SB
- 2) San Simeon SB

Year Established

Not Available

Established By

State Parks and Recreation Commission

Agencies Responsible

Department of Parks and Recreation
State Parks and Recreation Commission
California Department of Fish and Game
State Lands Commission

Purpose

Areas with frontage on the ocean or bays designed to provide swimming, boating, fishing, and other beach-oriented activities (Public Resources Code 5019.56).

Regulations

General Regulations (14 Cal. Code of Regs.)

- 1) Non-commercial Use of Invertebrates. Tidal invertebrates may not be taken in any tidepool or other areas between the high tide mark (defined as Mean Higher High Tide) and 1,000 feet seaward and lateral to the low tide mark (defined as Mean Lower Low Water) except as follows: In state parks, state beaches, state recreation areas, state underwater parks, state reserves, national parks, national monuments or national seashores: Only abalones, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp and sea urchins may be taken. Worms may be taken except that no worms may be taken in any mussel bed, unless worms are taken incidental to the harvesting of mussels. Mussels may be taken in all areas except in state park system reserves or natural preserves (14 Cal. Code of Regs. 29.05(b)(1)).
- 2) Commercial Use of Invertebrates. In and offshore [to 1,000 feet offshore] of all other state ecological reserves, state parks, state reserves, national parks, national monuments, or national seashores, only the following invertebrates may be taken: crabs, ghost shrimp, jackknife clams, sea urchins, squid, and worms, except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrate any other organisms, or break up, remove or destroy any rocks or other substrate or surfaces to which organisms are attached (14 Cal. Code of Reg. 123(f)(4)).
- 3) Aircraft. No person shall parachute into, fly an aircraft, ultralight vehicle, or hand glider over, or parasail or balloon over any State Park unit at an altitude of less than 500 feet unless authorized by the Department [of Parks and Recreation] by posted order in accordance with Section 4301(i) (14 Cal. Code of Regs. 4304).
- 4) Animals. No person shall molest, hunt, disturb, injure, trap, take, net, poison, harm, kill, feed, touch, tease, or spotlight any kind of animal or fish, or so attempt, except that fish and bait may be taken other than for commercial purposes in accordance with the state laws and regulations, provided, however, that no person shall use or discharge a spear or bow and arrow in units under control of the Department [of Parks and Recreation] (except in underwater parks or on designated archery ranges). This section does not apply to activities undertaken by the Department in conjunction with its resource management activities (14 Cal. Code of Regs. 4305(a)).
- 5) Driftwood. No person may gather more than 50 pounds or one piece of driftwood each day in the State Park System...Use of tools, vehicles, and equipment for the collection of driftwood is prohibited. Upon a finding that it will be in the interest of the Department of Parks and Recreation, the District Superintendent may, by posting, authorize the collection of driftwood from specified units on a temporary basis, either by the general public or by commercial operators, if necessary, in quantities, for purposes, and by means other than as specified by this section (14 Cal. Code of Regs. 4306).
- 6) Geological Features. No person shall destroy, disturb, mutilate, or remove earth, sand, gravel, oil, minerals, rocks, paleontological features, or features of caves except rockhounding may be permitted as defined and delineated in Sections 4610 through 4610.10 (14 Cal. Code of Regs. 4307).
- 7) Archaeological Features. No person shall remove, injure, disfigure, deface, or destroy any object of archaeological, or historical interest or value (14 Cal. Code of Regs. 4308).
- 8) Litter. No person shall leave, deposit, drop, or scatter bottles, broken glass, ashes, waste paper, cans or other litter in a unit except in a receptacle designated for that purpose, and no person shall import any litter, or import and deposit any litter into or in any unit from other places (14 Cal. Code of Regs. 4310).

- 9) Dogs. No person shall bring a dog into, permit a dog to enter or remain, or possess a dog in units under control of Department of Parks and Recreation unless the dog is on leash of no more than six feet in length and under the immediate control of a person or confined in a vehicle (14 Cal. Code of Regs. 4312(a)). No person shall bring a dog into, permit a dog to enter or remain, or possess a dog on any beach adjacent to any body of water in any unit except in portions of units designated for dogs (14 Cal. Code of Regs. 4312(c)).
- 10) Weapons and Traps. No person shall carry, possess or discharge across, in or into any portion of any unit any weapon, firearm, bow and arrow, trap, net, or device capable of injuring, or killing any person or animal, or capturing any animal, or damaging any public or private property, except where the Department of Parks and Recreation finds that it is in its best interests (14 Cal. Code of Regs. 4313).

Site Specific Regulations

- 1) Units Open for Rockhounding. Rockhounding may be practiced in the following units or portions of units: (14 Cal. Code of Regs. 4610.1)
 - i) San Simeon State Beach - Department jurisdiction within the wave action zone.
 - ii) William Randolph Hearst Memorial State Beach - Department jurisdiction within the wave action zone.

Evaluation of Effectiveness

Enforcement of Regulations

Regulations enforced by Department of Parks and Recreation rangers. Enforcement is intermittent and subject to availability of rangers.

Achievement of Purpose

No research to date has examined the effectiveness of the state beach regulations to protect natural resources within state beaches from overexploitation while promoting swimming, boating, fishing, and other beach-oriented activities. However, the following research examined the effects of human trampling on rocky intertidal communities adjacent to a state beach. This research suggests that high levels of recreational use of the rocky intertidal surrounding a state beach can have negative impacts on animal and plant resources.

Natural Bridges SB

Beauchamp, K.A. and M. M. Gowing. 1982. SUMMARY: The density and diversity of algae and invertebrates in the rocky marine intertidal were studied at three sites differing in degree of human trampling. Quantitative sampling showed that (1) a general pattern of higher density and diversity occurred at the less trampled sites, (2) the densities of [redacted] trampled site [adjacent to Natural Bridges State Beach], the brown alga *Pelvetiopsis limitata* was absent and the small bivalves *Lasaea* spp. were found in lower densities.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Dredge Material Disposal
- Restricted Overflight
- Shark Attraction Prohibited
- Military
- James V. Fitzgerald Marine Reserve
- Carmel Bay Ecological Reserve
- California Sea Otter Game Refuge
- James V. Fitzgerald Marine Reserve ASBS, Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS, and Carmel Bay ASBS

References

Beauchamp, K.A. and M. M. Gowing. 1982. A quantitative assessment of human trampling effects on a rocky intertidal community. *Marine Environmental Research*. 7:279-293.

California State Parks website. <http://cal-parks.ca.gov/>

Monterey Bay National Marine Sanctuary web site, Visitor Information homepage.
<http://bonita.mbnms.nos.noaa.gov/Visitor/Access/beach.html>

Existing Zones

Type of Zone: Wildlife Enhancement and Protection

Legislated Title of Site: Wildlife Area

Location of Site

See Figure 12 for exact location

Monterey County

- 1) Moss Landing Wildlife Area

Year Established

1984

Established By

California Department of Fish and Game

Agency Responsible

California Department of Fish and Game

Purpose

The Moss Landing Wildlife Area (MLWA) was acquired to preserve and enhance the saltmarsh/saltpond ecosystem for resident and migratory water-associated birds, including shorebirds (sandpipers, plovers and allies), other waders such as herons and egrets, as well as waterfowl and wetland-associated songbirds and raptors. The acquisition provides important foraging, resting, and breeding habitat for many species of wildlife, especially the water-associated birds mentioned above (excerpt from MLWA management plan).

Multiple recreational use of wildlife management areas is desirable and that use shall be encouraged by the commission. Except for hunting and fishing purposes, only minimum facilities to permit other forms of multiple recreational use, such as camping, picnicking, boating, or swimming, shall be provided (Fish and Game Code 1528).

Regulations

General Regulations

- 1) Motor Driven Vehicles. No person shall drive, operate, leave, place, or stop any motor driven vehicle on any State wildlife area except on public or established roads or on designated jeep trails and such other areas as designated by the Department (14 Cal. Code of Regs. 550(b)(2)(A)).
- 2) Boats.
 - (i) The department may restrict the use and operation of boats on State wildlife areas, department administered national wildlife refuges, and State recreation areas to protect natural resources or provide for the orderly operation of hunting and fishing programs on these areas. Boating restrictions may include, but not be limited to, limiting boat speeds, limiting motor size and type, or prohibiting the use of motors (14 Cal. Code of Regs. 550(b)(4)(A)).
 - (ii) Except as prohibited in subsection 551(q), boats may be used under the following regulations on State wildlife areas, department administered national wildlife refuges, and State recreation areas: (14 Cal. Code of Regs. 550(b)(4)(B)(1-4))
 - a) When launch sites are designated by the department, all boats must be launched and removed from those sites.

- b) All persons shall remove their boats from the waters when instructed to do so by an employee of the department.
- c) The use of boats may be restricted to certain zones designated by the department.
- d) Boat speeds shall not exceed five miles per hour.
- 3) Vandalism and Litter. No person shall leave, deposit, drop, bury, or scatter bottles, broken glass, feathers, hides, wastepaper, cans, sewage, or other rubbish in any State wildlife areas except in a receptacle or area designated for that purpose, and no person shall import and deposit any rubbish or toxic substance into State wildlife areas from other places (14 Cal. Code of Regs. 550(b)(5)(B)).
- 4) Trees and Minerals: (14 Cal. Code of Regs. 550(b)(6)(A-B))
 - (i) No person shall dig up, cut, damage, or remove from a wildlife area any trees, shrubs, vines, plants, or wood, except that vegetation may be cut and used for the purpose of building blinds, unless otherwise directed by the area manager.
 - (ii) No person shall dig up or remove any humus, soil, sand, gravel, or rock.
- 5) Bottle and Artifact Collecting. No person shall collect or remove bottles or artifacts, or dig or otherwise disturb the soil to locate or remove bottles or artifacts, from any Wildlife Area (14 Cal. Code of Regs. 550(b)(7)).
- 6) Pesticide Use. No person, other than authorized federal, state, or local employee conducting a pest control program approved by the department, shall apply any pesticide in any State wildlife area (14 Cal. Code of Regs. 550(b)(11)).
- 7) Fish and Frogs. Frogs may not be taken for commercial purposes (14 Cal. Code of Regs. 550(b)(13)).
- 8) Hunting and Trapping. Hunting and trapping shall be allowed on State wildlife areas during the regular open season [subject to use regulations]. The department may limit the number of persons hunting or trapping on areas during any period for safety reasons, to reduce crowding, to provide for the limited take of a species, or may close areas entirely to hunting or trapping to protect a species (14 Cal. Code of Regs. 550(b)(14)).
* See Fish and Game Code 551 for specific hunting regulations.
- 9) Except in accordance with the regulations of the commission, it is unlawful to enter upon any wildlife management areas or public shooting grounds established under the provisions of this article, or to take therein any bird or the nest or eggs thereof, or any mammal (Fish and Game Code 1530).

Site Specific Regulations

- 1) Method of Take Restrictions: No rifles or pistols may be used or possessed (14 Cal. Code of Regs. 551(q)(43)(A)).
- 2) Hunt Days: Saturdays, Sundays, and Wednesdays during open seasons for authorized species (14 Cal. Code of Regs. 551(q)(43)(B)).
- 3) Authorized Species: Waterfowl, coots, and moorhens (14 Cal. Code of Regs. 551(q)(43)(C)).
- 4) Camping and Trailers: Not allowed (14 Cal. Code of Regs. 551(q)(43)(D)).
- 5) Special Regulations: The Salt Ponds are closed to hunting (14 Cal. Code of Regs. 551(q)(43)(E)).

Evaluation of Effectiveness

Enforcement of Regulations

Regulations enforced by California Department of Fish and Game wardens. Enforcement is intermittent and subject to warden availability.

Achievement of Purpose

The Point Reyes Bird Observatory (PRBO) has been studying the nesting success of snowy plovers in the Monterey Bay area since 1984 and in the MLWA salt ponds since 1988. Preliminary results from 1997 show a consistent increasing trend in the number of nests, clutch rate, the number of chicks, and the number of juveniles in the MLWA since

1988. These increasing trends may be due to current management practices that are specific to the needs of the snowy plover, such as altering salt pond water levels, decreasing human use, and removing predators (Gary Page, PRBO, pers. comm.).

This is the only research to date that has examined the effectiveness of the Elkhorn Slough Wildlife Area regulations to preserve and enhance the saltmarsh/saltpond ecosystem for resident and migratory water-associated birds.

Overlapping Sites

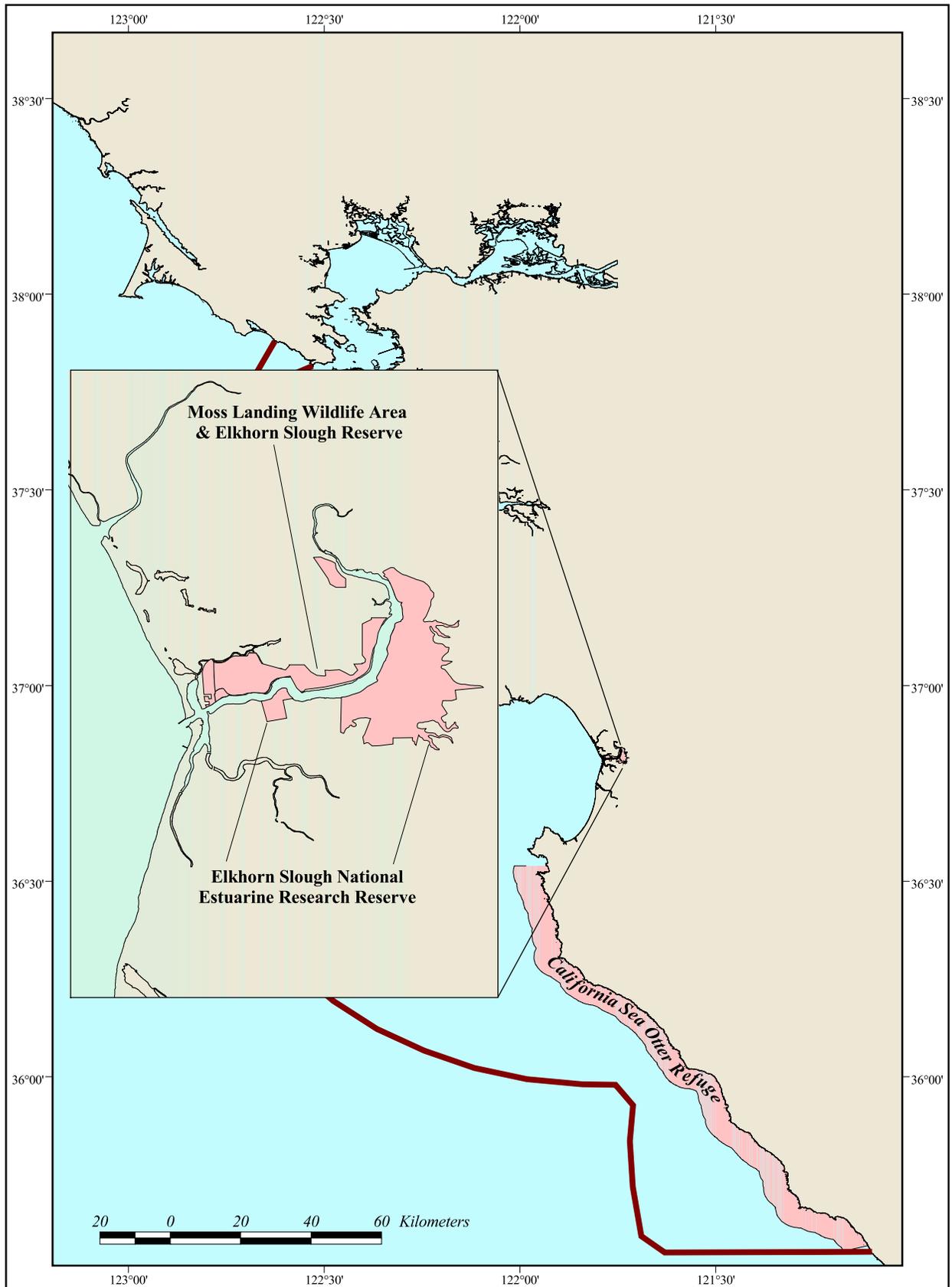
- Monterey Bay National Marine Sanctuary
- Restricted Overflight

References

Moss Landing Wildlife Areas Management Plan. State of California, Department of Fish and Game.

Page, G.W., J.S. Warriner, J.C. Warriner, and L.E. Stenzel. 1997. Nesting Success of Snowy Plover on Monterey Bay in 1997. Point Reyes Bird Observatory Preliminary Report. 10 pp.

FIGURE 12. Location of Wildlife Enhancement and Protection Zones



Existing Zones

Type of Zone: Wildlife Enhancement and Protection

Legislated Title of Site: National Estuarine Research Reserve

Location of Site

See Figure 12 for exact location

Monterey County

- 1) Elkhorn Slough National Estuarine Research Reserve

Year Established

1979

Established By

Coastal Zone Management Act (CZMA), U.S. Congress

Agencies Responsible

U.S. Department of Commerce, NOAA, Office of Ocean and Coastal Resources and National Estuarine Research Reserve System (OCRM-NERRS)
California Department of Fish and Game

Purpose

The mission of the National Estuarine Research Reserve (NERR) program is: The establishment, through Federal-state cooperation, of a national system of estuarine research reserves representative of the various regions and estuarine types in the United States. NERRs are established to provide long-term research, education, and interpretation. The goals of the NERR System are to:

- 1) Ensure a stable environment for research through long-term protection of NERR resources.
- 2) Address coastal management issues identified as significant through coordinated estuarine research within the System.
- 3) Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation.
- 4) Promote Federal, State, public, and private use of one or more reserves within the System when such entities conduct estuarine research.
- 5) Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

Regulations

General Regulations (CZMA 315)

- 1) Estuarine Research Guidelines. The Secretary [of Commerce] shall develop guidelines for the conduct of research within the System that shall include:
 - i) a mechanism for identifying, and establishing priorities among, the coastal management issues that should be addressed through coordinated research within the System;
 - ii) the establishment of common research principles and objectives to guide the development of research programs within the System;
 - iii) the identification of uniform research methodologies which will ensure comparability of data, the broadest application of research results, and the maximum use of the System for research purposes;

- iv) the establishment of performance standards upon which the effectiveness of the research efforts and the value of reserves within the System in addressing the coastal management issues identified in subsection (1) may be measured; and
 - v) the consideration of additional sources of funds for estuarine research than the funds authorized under this Act, and strategies for encouraging the use of such funds within the System, with particular emphasis on mechanisms established under subsection (d). In developing the guidelines under this section, the Secretary shall consult with prominent members of the estuarine research community.
- 2) Promotion and Coordination of Estuarine Research. The Secretary [of Commerce] shall take such action as is necessary to promote and coordinate the use of the System for research purposes including:
- i) requiring that the NOAA, in conducting or supporting estuarine research, give priority consideration to research that uses the System; and
 - ii) consulting with other Federal and State agencies to promote use of one or more reserves within the System by such agencies when conducting estuarine research.
- 3) Evaluation of System Performance.
- i) The Secretary [of Commerce] shall periodically evaluate the operation and management of each national estuarine reserve, including education and interpretive activities, and the research being conducted within the reserve.
 - ii) If evaluation under paragraph (1) reveals that the operation and management of the reserve is deficient, or that the research being conducted within the reserve is not consistent with the research guidelines developed under subsection (c), the Secretary may suspend the eligibility of that reserve for financial assistance under subsection (e) until the deficiency or inconsistency is remedied.
 - iii) The secretary may withdraw the designation of an estuarine area as a national estuarine reserve if evaluation under paragraph (1) reveals that:
 - a) the basis for any one or more of the findings made under subsection (b)(2) regarding that the area no longer exists; or
 - b) a substantial portion of the research conducted within the area, over a period of years, has not been consistent with the research guidelines developed under subsection (c).

Site Specific Regulations

None (see Elkhorn Slough Ecological Reserve site regulations on page 60 of this report)

Evaluation of Effectiveness

Enforcement of Regulations

Section 312 of the CZMA requires NOAA to conduct continuing reviews of the overall management of each NERR site. These program evaluations are conducted by the Office of Ocean and Coastal Resource Management's (OCRM) Policy Coordination Division (PCD), with participation by program staff from the NERRS. Evaluations are generally conducted every 3 years, but may vary depending on the severity of management problems at any given site. Specific evaluation criteria established by NERRS and section 312 regulations include: the adequacy of the state's implementation of the Final Management Plan; staff roles; research plan; education and interpretation plan; public access; facility development plan; acquisition plan; resource protection plan; and inter-governmental Memorandums of Understanding with NOAA.

Achievement of Purpose

The Elkhorn Slough NERR is achieving its mandated purpose of providing long-term research, education, and interpretation through the following programs:

Education

Elkhorn Slough NERR's education program has cultivated tremendous interest and support among teachers, school children and other groups. Interpretive programs offered at the Reserve's visitor center are coordinated through the CDFG. The Reserve's visitor center is the hub for education programs, displays and special classes. Natural history presentations and tours are also offered by the Reserve.

Research

Research and monitoring activities at Elkhorn Slough NERR are guided by national plans and a local advisory committee to ensure the availability of scientific information to be used in making management decisions pertinent to the stewardship of the estuarine ecosystem. The Elkhorn Slough NERR maintains close working relationships with numerous universities and research institutions, but especially with Moss Landing Marine Laboratories, the Elkhorn Slough Foundation, the University of California at Santa Cruz, Hopkins Marine Station, and the Monterey Bay National Marine Sanctuary. Current research projects in Elkhorn Slough NERR include:

MONITORING: To monitor non-point source pollution, a long term local water quality sampling program has been developed and maintained since 1988 on a monthly sampling schedule of temperature, salinity, dissolved oxygen, turbidity, pH, and some nutrients (e.g. NO₃, NH₃-N, ortho PO₄-P). High resolution infrared aerial photographic records of the watershed have been gathered since 1980 and will be incorporated into a regional geographic information system.

PESTICIDES: High levels of pesticides measured in Slough shellfish by the California Mussel Watch Program has focused concern on the persistence and transport of pesticides in the watershed. A study is underway to determine how best to improve agricultural practices in the area to minimize erosion from the surrounding hills and sediment deposition in the wetlands (a major source of pesticides). Additional studies are being done to determine the levels and effects of pesticides on natural communities in the Slough.

EROSION: Erosion and loss of mudflats and marshland in the Slough is a major concern due to the increased tidal scouring caused by the construction of a direct line opening to the ocean in 1946. There is an ongoing study monitoring long term patterns of wetland erosion and possible mitigating factors.

RESTORATION: Restoration, enhancement, and monitoring of critical Slough habitats is accompanied by studies on the biology and ecology of important slough species and a close look at the ecological values of introduced species. Included here is the need to study the relationship between salt marsh restoration and ground water contaminant/salt water intrusion, as well as a close look at the wildlife value of transitional wetlands (areas where fresh water marsh is periodically inundated with salt water).

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Elkhorn Slough Ecological Reserve

References

Elkhorn Slough Foundation website. <http://www.elkhornslough.org/>

Elkhorn Slough NERR website. <http://inlet.geol.sc.edu/ELK/home.html>

Office of Ocean and Coastal Resource Management website. <http://www.nos.noaa.gov/ocrm/>

Existing Zones

Type of Zone: Wildlife Enhancement and Protection

Legislated Title of Site: Game Refuge

Location of Site

See Figure 12 for exact location

Monterey and San Luis Obispo Counties

- 1) California Sea Otter Game Refuge

Year Established

1959

Established By

Fish and Game Code 10840, State Legislature

Agencies Responsible

Fish and Game Commission

California Department of Fish and Game

Purpose

No legally mandated purpose accompanies the game refuge designation

Regulations

General Regulations

- 1) Except under a permit or specific authorization, it is unlawful:
 - i) To take or possess any bird or mammal, or part thereof, in any game refuge (Fish and Game Code 10500(a)).
 - ii) To use or possess in a game refuge, any firearm, or bow and arrow, or any trap or other contrivance designed to be, or capable of being, used to take birds or mammals, or to discharge any firearm or to release any arrow into any game refuge (Fish and Game Code 10500(b)).
- 2) Nothing in this code prohibits the possession of firearms or bows and arrows by persons when traveling through any game refuges when the firearms are taken apart or encased and unloaded and the bows are unstrung. When the traveling is done on a route other than a public highway or other public thoroughfare or right of way, notice shall be given to the department at least twenty-four (24) hours before such traveling. The notice shall give the name and address of the person intending to travel through the refuge, the name of the refuge, the approximate route, and the approximate time when such person intends to travel through the refuge (Fish and Game Code 10506).

Site Specific Regulations

- 1) It is unlawful to fly any aircraft, including any airplane or helicopter...less than 1,000 feet above water or land over the California Sea Otter Game Refuge...except for rescue operations, in case of any emergency, or for scientific or filmmaking purposes under a permit issued by the department after a review of potential biological impacts (Fish and Game Code 10501.5(a)).
- 2) In the California Sea Otter Game Refuge, the lawful occupant of privately owned land, or the employees of such occupants, may possess firearms and traps and may take on

such lands any non-protected bird or mammal, and no permit is required for such taking (Fish and Game Code 10659).

Evaluation of Effectiveness

Enforcement of Regulations

Regulations enforced by California Department of Fish and Game wardens. Enforcement intermittent and subject to availability of wardens.

Achievement of Purpose

Evaluation of this zone is difficult because it lacks a legally mandated purpose. No research to date has examined the effectiveness of the game refuge regulations to protect seabird or marine mammal populations from exploitation. It would be difficult to determine the effectiveness of the California Sea Otter Game Refuge regulations because most marine mammals and seabirds are also protected by the Marine Mammal Protection Act, the Endangered Species Act, and/or Migratory Bird Treaty Act.

Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Jade Collection
- Restricted Overflight
- Shark Attraction Prohibited
- Military
- Pt. Lobos Ecological Reserve
- Pt. Lobos State Reserve
- Big Creek Marine Resources Protection Act Ecological Reserve
- Carmel Bay Ecological Reserve
- Julia Pfeiffer Burns State Park/Underwater Park
- Carmel River SB, William Randolph Hearst Memorial SB, and San Simeon SB
- Carmel Bay ASBS, Point Lobos Ecological Reserve ASBS, Julia Pfeiffer Burns Underwater Park ASBS, and Ocean Area Surrounding the Mouth of Salmon Creek ASBS

References

McArdle, D. A. 1997a. California Marine Protected Areas. Publication No. T-039. California Sea Grant Publication, San Diego, CA. 268 pp.

Existing Zones

Type of Zone: Water Quality Protection

Legislated Title of Sites: Area of Special Biological Significance (ASBS)

Location of Sites

See Figure 13 for exact locations

San Mateo County

- 1) James V. Fitzgerald Marine Reserve ASBS
- 2) Año Nuevo Point and Island ASBS

Monterey County

- 1) Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS
- 2) Carmel Bay ASBS
- 3) Point Lobos Ecological Reserve ASBS
- 4) Julia Pfeiffer Burns Underwater Park ASBS
- 5) Ocean Area Surrounding the Mouth of Salmon Creek ASBS

Year Established

1974

Established By

Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California, State Water Resources Control Board
Water Quality Control Plan for Ocean Waters of California, State Water Resources Control Board

Agencies Responsible

State Water Resources Control Board (SWRCB)
Regional Water Quality Control Board (RWQCB)
California Department of Fish and Game

Purpose

To protect the specified area from undesirable changes in natural water quality. The ASBS designation is based on the presence of certain species or biological communities that because of their value or fragility deserve special protection consisting of preservation and maintenance of natural water quality conditions to the extent practicable (Water Resources Control Board and California Regional Water Quality Control Board Administrative Procedures, September 24, 1970, Section XI and Miscellaneous Rev. 7-9/1/72).

Regulations

General Regulations*

- 1) The discharge of elevated temperature wastes in a manner that would alter water quality conditions from those occurring naturally is prohibited.
- 2) The discharge of discrete, point-source sewage or industrial process wastes in a manner that would alter water quality conditions from those occurring naturally is prohibited.

* The regulations accompanying the ASBS designation are not applicable to vessel wastes, dredging control, or the disposal of dredge spoil.

- 3) The discharge of waste from non-point sources, including but not limited to storm water for waste from non-point sources, Regional Boards will give high priority to areas tributary to ASBSs.

Site Specific Regulations

None

Evaluation of Effectiveness

Enforcement of Regulations

During the ASBS designation process, point-source discharges were phased out in all ASBS sites in the MBNMS except for Carmel Bay ASBS. New point-source discharges into ASBSs are strictly prohibited. Along the coast between Monterey and San Francisco, perspective point-source dischargers are required by the SWRCB to show, through techniques such as mathematical modeling, that there will be no deleterious effects of the new discharge on the water quality of nearby ASBSs. The Carmel Bay discharge was allowed to continue pursuant to the following conditions: the effects of this discharge on water quality must be monitored (by the state mussel watch program) and the discharger must submit periodic reports to the RWQCB (Ray Dunham, SWRCB, pers. comm.).

Due to funding constraints, the monitoring of ASBSs for non-point source pollution is a low priority for the RWQCB. The RWQCB is currently attempting to develop new programs to monitor areas for non-point source pollution (Karen Wooster, RWQCB, pers. comm.).

Achievement of Purpose

No research to date has monitored the water quality in ASBSs to determine the effectiveness of the ASBS regulations to protect these sites from undesirable changes in natural water quality.

Overlapping Sites

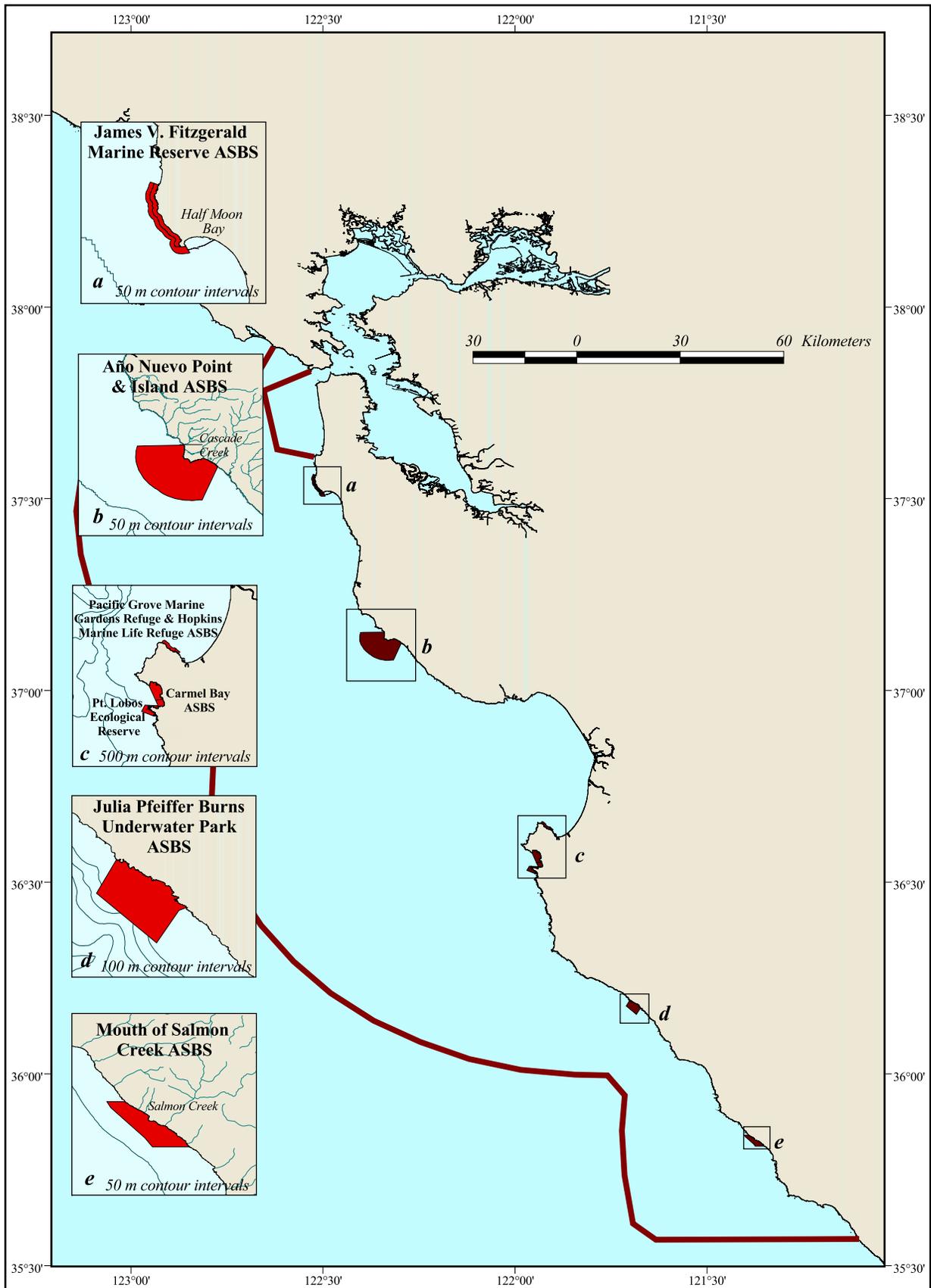
- Monterey Bay National Marine Sanctuary
- Restricted Overflight
- Shark Attraction Prohibited
- Military
- Hopkins Marine Life Refuge
- Pt. Lobos Ecological Reserve
- Pt. Lobos State Reserve
- James V. Fitzgerald Marine Reserve
- Año Nuevo State Reserve
- Carmel Bay Ecological Reserve
- Pacific Grove Marine Gardens Fish Refuge
- Pacific Grove Marine Reserve
- Julia Pfeiffer Burns State Park/Underwater Park
- Montara SB and Carmel River SB
- California Sea Otter Game Refuge

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University of California Davis, Information Center for the Environment, The Guide to California Programs for Biodiversity Conservation, State Water Resources Control Board webpage. http://ice.ucdavis.edu/guide_to_california_programs_for_biodiversity_conservation/swrcb/swrcb.htm

FIGURE 13. Location of Water Quality Protection Zones



Potential Future Zones

Type of Zone: Limited Take

Legislated Title of Site: City Park and Recreation Area

Location of Site

See Figure 14 for exact location

Monterey County

- 1) Ed Ricketts Park*

Year Proposed

1998

Proposed By

Monterey City Council

Agencies Responsible

City of Monterey Recreation and Community Services Department
City of Monterey Police Department

Purpose

Ed Ricketts Park was established to serve as an underwater park and recreational facility (Monterey City Code Sec. 23-30).

Regulations

General Regulations

- 1) Regulations in all Recreation Areas. It shall be unlawful for any person to:
 - a) Engage in commercial activity of any kind, except under lease, concession or permit from the City (Monterey City Code Sec. 23-3(h)).
 - b) Allow or permit any person under the age of six under their custody, jurisdiction or control, to enter or remain without providing adequate supervision (Monterey City Code Sec. 23-3(i)).
 - c) Leave, drop, place, or deposit any trash; expect in receptacles provided for trash. Glass containers are not allowed on beaches under the control of the City (Monterey City Code Sec. 23-3(k)).
 - d) Willfully or negligently pick, dig up, cut, mutilate, destroy, injure, disturb, move, molest, burn or carry away any tree or plant or portion thereof, whether alive or dead (Monterey City Code Sec. 23-3(l)).
 - e) Conduct or participate in an assembly or public demonstration without a permit issued jointly by the Chief of Police and the Recreation & Community Services Director pursuant to Sections 32-4 and 32-5 of this Code (Monterey City Code Sec. 23-3(m)).
 - f) Remain at an assembly or public demonstration after having been requested to leave by a peace officer (Monterey City Code Sec. 23-3(n)).

* The legal status of the Ed Ricketts Park regulations is currently being decided in court. The City of Monterey asserts that it has jurisdiction over both physical and biological resources contained within the park boundaries. Some members of the local community, specifically kelp harvesters, disagree and have taken the City to court. These individuals assert that the California Department of Fish and Game has jurisdiction over the biological resources within the parks boundaries, not the City of Monterey. The State of California appears to support the kelp harvesters in this matter.

- 2) Alcoholic Beverages Prohibited: Exceptions. It shall be unlawful for any person to consume or have in their possession an open container of any alcoholic beverage in any park or recreation area, except as follows:
 - a) Alcoholic beverages are permitted on all public beaches during the hours of 6:00 a.m. to 10:00 p.m., and are prohibited after 10:00 p.m. and before 6:00 a.m. except by valid written permit issued by the Director. The term "public beach" is defined as any beach area used for recreational purposes which is owned, operated or controlled by the City, State, or State or local agency, or any unimproved beach area privately owned but used by the public for recreational purposes with or without permission of the property owner (Monterey City Code Sec. 23-4(b)).

Site Specific Regulations

- 1) It shall be unlawful to spearfish within the park (Monterey City Code Sec. 23-32(a)).
- 2) Recreational fishing by hook and line is permitted subject to California Department of Fish and Game rules and regulations (Monterey City Code Sec. 23-32(b)).
- 3) Commercial fishing by net is permitted in the area as long as kelp beds are not disturbed (Monterey City Code Sec. 23-32(c)).
- 4) Kelp harvesting is allowed by persons acquiring a permit from the City and who possess a valid kelp harvesting permit from the California Department of Fish and Game. Kelp permit regulations will be established by Resolution, and the City Council may, by Resolution, restrict or prohibit the harvesting of kelp within all or portions of the park to facilitate scientific studies, to protect against overharvesting of kelp, or to otherwise protect this natural resource. It shall be unlawful to harvest kelp in violation of this section or any Resolution establishing a zone of prohibition (Monterey City Code Sec. 23-32(d)).
- 5) Collection or harvesting of marine life within the park is permitted only with written permission from the City based on a recommendation from an oversight committee of the City which shall be established by Resolution and which will consist of members from the scientific community, the conservation community, the California Department of Fish and Game, the diving community, the business community, the commercial fishing industry, the kelp harvesting industry, and a City representative, whom shall be appointed by the City (Monterey City Code Sec. 23-32(e)).

Evaluation of Effectiveness

Not Available

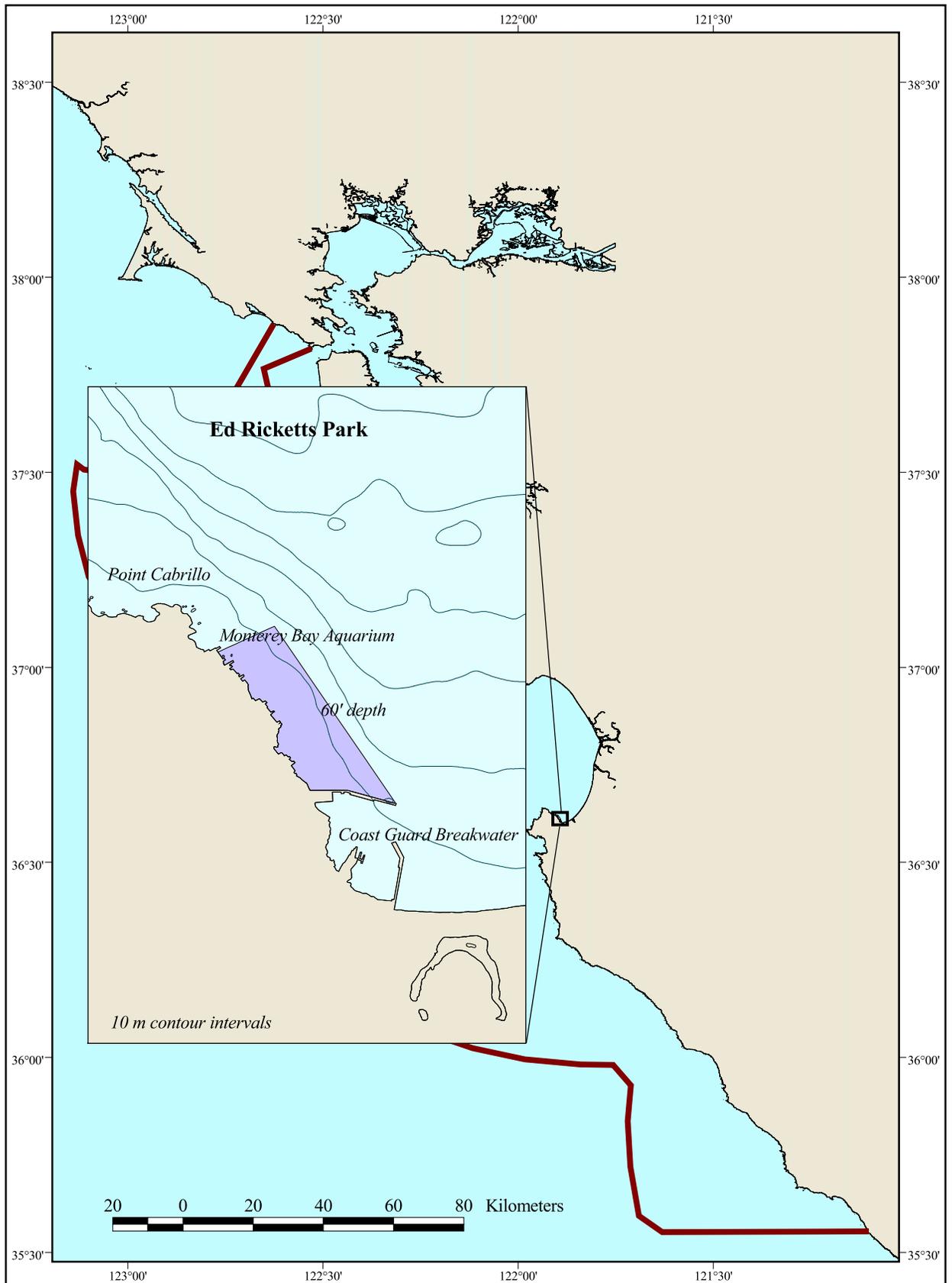
Overlapping Sites

- Monterey Bay National Marine Sanctuary
- Shark Attraction Prohibited

References

None

FIGURE 14. Location of Potential Future Zones



Appendices

Appendix I: Summary of the Marine Reserve Literature

Foreword

Many of the marine zones reviewed in this report fall under the title "marine reserve". The following is a brief summary of the marine reserve literature. This summary is not meant to be a comprehensive review of the available literature, but instead is designed to acquaint the reader with the current issues relevant to marine reserves. Though the general content of this summary is applicable to marine reserves in both temperate and tropical regions, this summary will focus on the current literature from temperate systems and it will use examples from the marine zones in this report whenever possible. Many comprehensive reviews of the marine reserve literature have been published over the past three decades (e.g., Bjorkland 1974; Davis 1981; Randall 1982; Rigney 1990; Roberts and Polunin 1991, 1993c; Rowley 1992, 1994; Dugan and Davis 1993a; Jones et al. 1993). These reviews should be consulted for an in-depth discussion of the issue summarized here.

A number of reviews of California marine reserves are being synthesized currently. The Resource Agency of California has assembled an interagency working group that is in the process of evaluating the California system of marine managed areas (State Interagency Marine Managed Areas Workgroup 1999). A draft of this group's report is available on the agency's website (see below for website address). In response to the state's review and to two bills passed by the State Legislature in August 1998*, the Pacific Ocean Conservation Network (POCN) organized a scientific advisory panel to analyze the potential of marine reserves to improve fisheries and marine conservation, with an emphasis on the Pacific Coast of the United States. The paper that resulted from this panel's discussions was published in 1999 in the journal *Fisheries* (Murray et al. 1999). The Environmental Defense Fund, a member of the POCN, has also completed its own review of the potential of no-take marine reserves to rebuild the Pacific coast groundfish fishery (see Fujita et al. 1997). This paper was submitted to the Pacific Fisheries Management Council's Alternative Groundfish Management Committee in 1997. Finally, the National Marine Fisheries Service (NMFS) sponsored the *Marine Harvest Refugia for West Coast Rockfish Workshop* in September 1997. The objectives of this workshop were to: 1) assess the current and future needs, benefits, and implementation of harvest refugia to protect and manage rockfish populations; and 2) develop recommendations for establishing and monitoring rockfish refugia on the west coast. A summary of the findings of this workshop are currently available on the NOAA/NMFS Pacific Fisheries Environmental Laboratory website (see below for website address). The proceedings of the workshop, including papers on plenary presentations, conclusions and recommendations from the working groups, and related abstracts, have been published as a NOAA Technical Memorandum (see Yoklavich 1998) and can be downloaded from the website. These reviews should be consulted for an in-depth discussion of issues relevant to marine reserves in California.

Websites:

Resource Agency of California. <http://ceres.ca.gov/cra>

Pacific Ocean Conservation Network, Scientific Advisory Panel on Marine Reserves.
<http://www.biology.ucsc.edu/MarReservSAP>

* Bill AB 1241 – the Marine Life Management Act - was signed by Governor Wilson. However, Bill AB 2404 – the Sea Life Conservation Act - was not signed by the Governor.

National Marine Fisheries Service, Pacific Fisheries Environmental Laboratory, Marine Harvest Refugia For West Coast Rockfish: A Workshop.

http://www.pfeg.noaa.gov/events/workshops/refugia/refugia_index.html

Introduction

A marine reserve (= marine protected area), as defined by the Fourth World Wilderness Congress and later adopted by the World Conservation Union (IUCN), is "any area of intertidal or subtidal terrain, together with its overlying water and associated flora and fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment (McArdle 1998a)". Sites which fit this definition have been given a variety of names that are derived from terrestrial protected areas, such as "sanctuaries", "parks", and "preserves". The majority of existing marine reserves were established primarily to preserve habitats and communities for conservation and research (Dugan and Davis 1993a; Roberts and Polunin 1993c; Gubbay 1995). Additionally, some marine reserves have been established primarily for fisheries enhancement (Davis 1989; Plan Development Team 1990; Armstrong et al 1993; Tegner 1993). These areas are given names, such as "fishery reserves", and "harvest refugia", that reflect their purpose, which is to help sustain or enhance harvested populations.

For the last three decades, marine reserves have been a tool for the management of coastal marine habitats (Jones et al. 1993; Gubbay 1995). Recently marine reserves have received great attention from conservationists, fisheries and resource managers, and ecologists primarily because of their potential to improve two of the major problems in marine ecosystems: 1) fisheries overexploitation (Davis 1989; Dugan and Davis 1993a; Carr and Reed 1993); and 2) habitat and ecosystem degradation (Roberts and Polunin 1991, 1993c).

Fisheries Overexploitation

Currently, two-thirds of the world's marine fishery populations are fully exploited, overexploited, or depleted (Botsford et al. 1997; Roberts 1997b). Specifically, on the Pacific coast of the United States many groundfish and invertebrate stocks are in jeopardy due to intense fishing pressure (Davis 1989). One striking example of groundfish stock declines on the west coast is Pacific rockfish. Some rockfish stocks, such as Pacific ocean perch (*Sebastes alutus*), bocaccio (*S. paucispinis*), and canary rockfish (*S. pinniger*) have experienced precipitous declines over the past three decades and are currently below 10% of their unfished biomass (Pacific Fisheries Management Council 1995; Ralston 1999). Several nearshore invertebrate fisheries have shown similar declines during the last four decades (Davis 1989). For example, since the 1960's the abalone (*Haliotis* spp.) fishery has been reduced from a five species state-wide commercial and recreational fishery to a one species (*H. rufescens*) recreational fishery open only north of San Francisco (Dugan and Davis 1993a; Tegner 1993). These two examples demonstrate that current fisheries management strategies have not been sufficiently effective for some species and that improved fisheries management techniques are needed to prevent depletion of at least some exploited fish stocks.

Certain types of marine reserves (e.g., fishery reserves or harvest refugia) are being strongly recommended as a fisheries management strategy that may help sustain or even enhance exploited fish and invertebrate populations (Dugan and Davis 1993a; Roberts et al. 1995; Fujita et al. 1997). There are many possible fisheries benefits of marine reserves. For example, the density of large, reproductively mature fish and invertebrates tends to increase in no-take reserves (Roberts and Polunin 1991; Bohnsack 1996a, 1996b; for examples from the MBNMS see Pollard 1992; Paddock 1996, 1998) and these individuals may act as sources of larvae to replenish both reserve populations and adjacent exploited populations (Carr and Reed 1993, Quinn et al. 1993, Roberts 1997a). A build-up of biomass in reserves also can cause a spill-over of individuals into adjacent fishing grounds due to the emigration of juveniles and adults (Dugan and Davis 1993a; McClanahan and Kaunda-Arara 1996; Russ and Alcala 1996a). In addition to supplying individuals to exploited populations, no-take reserves protect a portion of the fishery stock from

negative changes in population structure caused by selective fishing mortality, such as altered genetic composition, sex ratios, and size structure (Roberts and Polunin 1991; Roberts et al. 1995; Bohnsack 1998). As important as all the above perceived benefits, no-take reserves may serve as insurance against uncertainty. In other words, reserves can act as buffers against stock collapse caused by unanticipated events, such as environmental change, management errors, high additional fishing mortality through bycatch, and catastrophic events (Lauck et al. 1998; Carr and Raimondi 1999; Murray et al. 1999).

Prohibiting harvest does not ensure that all species will recover to pre-harvest levels within the reserve and begin to replenish adjacent exploited populations. A number of researchers have found no difference in the abundance and sizes of some target species between reserve and exploited areas (Buxton and Smale 1989; Russ and Alcala 1989; Cole et al. 1990). These results were attributed to a variety of reasons, including animal behavior and movement patterns. Target species may move outside the reserve to forage or spawn where they may be harvested. No-take reserves are highly unlikely to benefit highly migratory species such as tuna and salmon.

Habitat and Ecosystem Degradation

Over the last couple of decades marine habitats and ecosystems have experienced accelerated rates of degradation (Suchanek 1994; Vitousek et al. 1997). Marine habitat and ecosystem degradation has a variety of causes. The development of waterfront property and other land-based activities adversely affect marine ecosystems through the loss or modification of coastal habitats (Dahl et al. 1991) and through the discharge of sediments, nutrients, and pollutants into the ocean (Samoilys 1988; Agardy 1997; Vitousek et al. 1997). Coastal recreation activities can also have negative impacts on shoreline communities. There is increasing evidence that tidepooling, swimming, snorkeling, and SCUBA diving can adversely affect coastal ecosystems (Ghazanshahi et al. 1983; Hawkins and Robert 1992; for examples from the MBNMS see Beauchamp and Gowing 1982; Schaeffer and Foster 1998). For example, Schaeffer and Foster (1998) demonstrated that recreational SCUBA divers caused a variety of disturbances to kelp forests, including contacting the substrate, handling of animals, and detachment of algal blades.

Recreational and commercial fishing can have multiple negative impacts on marine ecosystems. Fishing practices, such as trawling and dredging disturb and alter seafloor habitats, which can modify the species composition and trophic structure of benthic communities (Dayton et al. 1995; Engel and Kvitek 1998). Many commercial fishing practices cause mortality of non-target species as bycatch or through ghost fishing by abandoned gear (Dayton et al. 1995; Roberts et al. 1995). In addition, fishing is selective and can remove a specific predator or consumer from an ecosystem potentially changing species interactions and perhaps the biodiversity of a community (Roberts and Polunin 1991; Dugan and Davis 1993a; Jones et al. 1993). These examples demonstrate that land-based development and both extractive and non-extractive uses of marine resources are having significant negative impacts on marine habitats and ecosystems.

Marine reserves that prohibit the discharge of pollutants (such as Areas of Special Biological Significance) and restrict potentially damaging extractive and recreational uses (such as Hopkins Marine Life Refuge and Pt. Lobos State Reserve) can be used to protect marine habitats and ecosystems. These reserves can be established to protect areas that are fairly pristine from future degradation. Conversely, reserves located in formerly perturbed areas can allow the recovery of habitats and ecosystems by eliminating damaging fishing practices, discharge of pollutants, or by limiting or prohibiting certain recreational activities.

Additional Benefits

The majority of the marine reserve literature focuses on the two benefits of marine reserves discussed above; enhancing overexploited fisheries and protecting habitats and

ecosystems from degradation. However, marine reserves offer many additional social and economic benefits.

Scientific Understanding

One additional benefit of marine reserves is an increase in scientific knowledge and understanding of marine ecosystems and their management (for example Big Creek MRPA Ecological Reserve). Protected areas can act as 'control' sites against which scientists can measure changes due to natural and human-induced disturbance (Jones et al. 1993; Agardy 1994; Lindeboom 1995). Comparisons between exploited and control sites can help scientists determine which population changes are due to human disturbances and which changes are due to natural variability (Rowley 1992; Bohnsack 1996a, 1998). Baseline data from reserve populations may supply better estimates of intrinsic population parameters, such as growth rates, sex ratios, and size structure, leading to more accurate fishery models and better fisheries management (Bohnsack 1996a). In addition, scientists will be able to study community level processes (e.g., species interactions) in a relatively undisturbed habitat (Bohnsack 1998).

Social and Economic Benefits

There are social and economic benefits that can be gained from establishing minimally disturbed marine areas. In fact, it has been shown in some cases that the social and economic benefits gained from establishing marine reserves can exceed the social and economic costs of losing extractive or other human uses of the area (Dixon and Sherman 1990a, 1990b; Dixon et al. 1993; Gubbay 1995). One potential economic benefit is an increase in local and regional ecotourism (Bloomstein 1985; Dixon and Sherman 1990b). For example, many tourists visit marine reserves because they are an ideal location for tidepooling, snorkeling, SCUBA diving, kayaking, and photography (Gubbay 1995; Murray et al. 1999). Reserves that allow limited recreational use, while maintaining ecosystem health (e.g., Pt Lobos State Reserve), tend to be popular destinations for tourists (Causey 1995; Gubbay and Welton 1995). One potential economic benefit of fishery reserves is improved yields in local recreational and commercial fisheries (Alcala 1988; White 1988). Social benefits of reserves include increased aesthetic quality of the coastal region and sites for scientific and environmental education (Novaczek 1995; Bohnsack 1998).

Marine Reserve Design and Management

Due to the many benefits that can be derived from marine reserves, many countries have established or are in the process of establishing marine reserves (Gubbay 1995; Jones et al. 1993). However, many of the world's existing marine reserves are not effective due to improper goals and poor site selection, design, enforcement, management, and evaluation (Gubbay 1995; McArdle 1997b, 1998a). California's system of marine reserves is a prime example of these problems. California has over 100 marine reserves which are usually poorly designed, with unclear or inappropriate goals, and inadequate management, enforcement, and evaluation (McArdle 1997a, 1997b, 1998a; Starr and Johnson 1998). Most existing marine reserves provide very limited protection from extractive uses, recreational uses, or negative changes in water quality and often the same area of coastline has multiple designations with conflicting regulations (McArdle 1997a). Many of the marine zones in the Monterey Bay National Marine Sanctuary have some, if not all, of these problems, which is evident from this report.

Recently, researchers and managers have acknowledged the need to improve marine reserve design and to unify reserve goals and management (Gubbay 1995; Starr and Johnson 1998; Murray et al. 1999; State Interagency Marine Managed Areas Workgroup 1999). The topic of proper reserve design and management has been the focus of numerous recent papers (Carr and Reed 1993; Dugan and Davis 1993a; Ballentine 1997a; Starr 1998; Murray et al. 1999). The general consensus of these papers is that the establishment of any marine reserve or system of marine reserves, regardless of geographic location, should follow a set of guidelines to maximize

success. These guidelines include: proper design, effective enforcement, evaluation of effectiveness, and adaptive management.

Design

Determining the optimal size and placement of a marine reserve will depend on the goals of the reserve. Therefore, the first step in reserve design should be to clearly identify the purpose, goals, and expectations of a reserve (Salm and Price 1995; Starr and Johnson 1998; Murray et al. 1999). Individual reserves within a network can have different individual goals, but in aggregate should form a system with clearly defined, network-wide goals and expectations (McArdle 1997b; Murray et al. 1999). Reserve design will be determined specifically by the species, communities, and habitats being protected. For example, if the goal of the reserve is to protect and sustain one or more species, then reserve size will be influenced by the mobility and density of the species targeted for protection (Rowley 1992; Dugan and Davis 1993a). Reserves must be at least as large as the average size of the target species' home range (Armstrong 1993; Starr and Johnson 1998) and should contain enough individuals to guarantee a high probability of population sustainability (Dugan and Davis 1993a). This will guard against edge effects, facilitate enforcement, and help sustain populations following local catastrophic events (Murray et al. 1999). Habitat type, distribution, and quality - both inside and outside of a reserve's boundary - should be considered when locating individual reserves (Davis 1989; Starr and Johnson 1998). Surrounding a reserve with habitat of appropriate type and quality is especially important when the goal of the reserve is to enhance fishing stocks adjacent to the reserve (Rowley 1992; Carr and Reed 1993; DeMartini 1993).

The above design criteria applies to the design of both individual, isolated reserves and a regional system of reserves. Establishing individual reserves is currently the most common approach in reserve establishment (McArdle 1997b, 1998a). However, isolated reserves are probably not as effective as a network of interconnected reserves because a network can be designed to link a variety of environmental conditions and ecological processes (Ballantine 1991; Jones et al. 1993; Roberts 1997a). Marine populations often depend on larval recruitment from distant populations for replenishment, therefore reserves within a network should be connected through larval dispersal (via ocean currents) to insure the maintenance of both reserve and exploited local populations (Roberts and Polunin 1991; Rowley 1992; Roberts 1997a). Creating a network of reserves also serves as a form of risk management against isolated stochastic events that destroy a population or habitat within one of the system's reserves (Lauck et al. 1998). Within a network, individual reserve size and placement should take into account spawning and nursery habitat location and oceanographic features, such as the location of eddies or areas of upwelling, which may be important for larval dispersal or recruitment (Rowley 1992; Carr and Reed 1993; Dugan and Davis 1993a).

Enforcement

Determining reserve regulations and how these regulations will be effectively enforced is a key feature in establishing an effective marine reserve system (Causey 1995). The potential for reserves to serve as effective resource management tools can only be realized if social and economic concerns are taken into account during the reserve designation process (Salm and Price 1995; Wells and White 1995). Regulations restricting commercial or recreational activities are often resisted by resource users (see the Motorized Personal Watercraft Zone for an example). Often the positive social and economic benefits of marine reserves are not effectively explained by the groups supporting reserve formation nor are these benefits fully understood by the users who are opposing reserve establishment (Agardy 1994; Gubbay 1995). Distinguishing the real from the perceived costs and weighing short- vs. long-term costs and benefits, are issues that must be addressed during the regulation establishment process (Dugan and Davis 1993a; Murray et al. 1999).

Reserve success depends on compliance once regulations are established. However, regulation enforcement is often weak or non-existent leading to "paper parks" which allow continued resource degradation (Causey 1995; McArdle 1998a). Weak enforcement often results

when reserves are created without the allocation of funds to support proper enforcement and management (Gubbay 1995; McArdle 1998a). For example, most of the marine reserves in California are not established with appropriations for management (McArdle 1998a). The California Department of Fish and Game (CDFG) is responsible for the enforcement of all regulations pertaining to living marine resources, however, the CDFG has limited resources to that end. As a result, most reserves do not have effective site enforcement (McArdle 1997b, 1998a). These economic barriers to proper enforcement may be diminished, in some instances, by assessing visitor fees (Dixon et al. 1993; Pt. Lobos State Reserve is an example).

Fostering participation and support from local communities and visitors is important for successful management and enforcement of regulations (Cava and Power 1989; Causey 1995; Wells and White 1995). To promote voluntary compliance, regulations must be clearly stated and easily accessible to reserve visitors (Kaza 1995). Starting a volunteer naturalist program, such as the docent programs in James V. Fitzgerald Marine Reserve and Año Nuevo and Pt. Lobos State Reserves, can help to increase local support for marine reserves (Clark et al. 1989; Wells and White 1995). A system by which local residents, conservation groups, and volunteers can report poaching and other violations, such as the CDFG CalTIP hotline, is another way to involve the local community in reserve management and regulation enforcement (Causey 1995; Wells and White 1995).

Evaluation

Proper evaluation of a reserve's effectiveness is vital to the creation of a successful system of marine reserves. Carr and Raimondi (1999) argue that inadequately or inaccurately evaluated reserves can jeopardize both the health of the resources being protected and the future of a reserve program. For example, an inaccurate evaluation of a poorly designed harvest refuge could show that the refuge is having positive impacts on a fish stock. This false information could lead to an increase in fishing pressure on adjacent fishing grounds or a relaxation of current fishing regulations, thus potentially jeopardizing the size or sustainability of the fish stock and the fishing industry. Conversely, an inadequate evaluation of a properly designed reserve could fail to demonstrate the reserve's effectiveness. This inability to demonstrate a reserve's effectiveness could jeopardize the future of that reserve and possibly the future of a regional reserve program. Thus, to achieve the desired goals of a reserve or reserve network, the reserves must be properly and rigorously evaluated (Carr and Raimondi 1999, Murray et al. 1999). In addition, it's likely that some marine reserves will not effectively achieve their goals, even when they are well designed. Marine reserves are only one of many resource management strategies, therefore, identification of situations in which marine reserve are an ineffective management tool will allow managers to implement other, hopefully more effective, strategies.

Rigorous scientific evaluation of reserve effectiveness can be challenging. High spatial and temporal variability can greatly reduce a study's ability to detect an effect (Roberts and Polunin 1993c; Jones et al. 1993; Parma et al. 1998). This problem emphasizes the need for scientists and fisheries managers to develop stronger analytical and empirical approaches for evaluation of reserve success (Murray et al. 1999). In addition, the evaluation of fishery reserves is very difficult due to our inability to accurately predict larval transport and subsequent recruitment (Robert and Polunin 1991, 1993c; Dugan and Davis 1993a). This problem emphasizes the need for integrated research programs involving fisheries biologists, larval ecologists, and oceanographers (Rowley 1992; Carr and Raimondi 1999).

Adaptive Management

The last step in reserve implementation, and a fairly new idea in the marine reserve literature, is the need for adaptive management (Agardy 1994; Carr and Raimondi 1999; Murray et al. 1999). Adaptive management requires a feedback loop between scientist and managers so that reserve design and management can be modified as new scientific information becomes available (Parma et al. 1998). Reserves that are shown to be ineffective may need different boundaries, new regulations, better enforcement, or a completely different location (Murray et al. 1999). Failing to fix ineffective marine reserves is a waste of money that could be better spent

on maintaining effective reserves, establishing new reserves, or instating other management practices (Carr and Raimondi, 1998).

Conclusions

Declining trends in the health of the world's fishery populations and marine ecosystems despite existing fishery management and conservation practices, underscores the need for new management approaches. Marine reserves have received much recent attention, and have been identified as having the potential to be powerful resource management tools. Marine reserves offer opportunities to improve the status of exploited populations, benefit fisheries management, protect habitats and ecosystems, and increase understanding of marine ecosystems. However, for marine reserves to reach these potential objectives, they must be properly designed and managed.

Identifying the goals of a reserve should be the critical first step in reserve establishment. Determining the optimal size, location, and management strategy of the reserve will follow based on these goals. For networks of marine reserves, each reserve may have unique goals, but the network must have a unifying goal that will determine the overall design and management of the system. Effective management of marine reserves includes: fostering participation and support from local residents, allocating funds to support regulation enforcement, rigorously evaluating a reserve's effectiveness, and employing adaptive management. Proper evaluation and adaptive management are especially important because marine reserves may not be effective management tools in all situations. Therefore, marine reserves should be used as a management tool to supplement rather than replace existing management strategies.

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