

Examining the Conservation Level of Marine Management Areas within the Monterey Bay National Marine Sanctuary: How Protected is the Sanctuary?

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Cover image displaying marine spatial management boundaries in the Monterey Bay Area created by Jason Adelaars. Basemap credits: GEBCO, NOAA, CHS, OSU, UNH, CSUMB, National Geographic, DeLorme, NAVTEQ, and ESRI.

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Abstract

The growing number of marine managed areas in state and federal waters of the US has created within selected stakeholder groups the impression that “*everywhere is protected.*” That impression has fueled debates on the east and west coasts as to whether any additional management is required, though important questions remain unanswered as to whether everywhere is indeed protected. To directly investigate the accuracy of the widely-held impression, we created a scoring system based on selected attributes of managed areas within the Monterey Bay National Marine Sanctuary (central California) to quantify the level of protection provided by each management area individually, as well as cumulatively in locations where multiple managed areas overlap. We found that despite having a large number of managed areas the relative level of conservation within the Sanctuary is low. Furthermore, we found a noticeable difference in the level of conservation between state and federal waters, with near-shore state waters generally having higher conservation than off-shore federal waters. These results provide important context as the Sanctuary and its many collaborating state and federal agencies move forward with spatial approaches to management.

Key Words

Monterey Bay National Marine Sanctuary, marine management areas, marine protected areas, marine conservation, marine resource management, regulations

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Introduction

The multitude of overlapping spatial management regimes (ranging from no-take marine reserves to bottom trawl exclusion areas to personal watercraft use zones) currently in place in state and federal waters off central California has created the impression among selected stakeholder groups that “*everywhere is protected.*” That impression is used as an argument for restricting the implementation of new or revised management regimes. However, the combination of managed areas does not necessarily result in more protection, even where multiple agencies hold jurisdiction over the same area. Studies of spatial management in the Gulf of Maine (Recchia et al. 2001) and the Southern California Bight (Crowder et al. 2006) have shown gaps and conflicts in conservation efforts within areas marked by extensive management. Recchia et al. (2001) evaluated marine spatial management in the Gulf of Maine to determine the level of protection for each conservation area, while Crowder et al. (2006) examined regulatory mismatches in southern California. Both studies concluded that although spatial management areas were abundant, the conservation level was low; supporting the viewpoint that more management does not always result in more protection.

These studies demonstrate the need to evaluate regions where coastal marine spatial planning (CMSP) is implemented, in order to better understand the conservation effects, or lack thereof, of an abundance of spatially explicit regulations. One such area is the Monterey Bay National Marine Sanctuary (the Sanctuary), which exists within a mélange of overlapping management areas (both state and federal).

The Sanctuary, managed by the National Oceanic and Atmospheric Administration (NOAA), is a 15,783 square kilometer area of federally-protected waters off the coast of central California. The Sanctuary was established in 1992 for the purposes of “*protecting and managing the conservation, ecological, recreational, research, educational, historical, and esthetic resources of the area*” (NOAA 1992). Because many of the agencies managing separate resources within the Sanctuary’s boundary have dissimilar goals there is little incentive for interagency collaboration, creating the potential for gaps in overall resource protection (Ekstorm et al. 2009). In this study we evaluated the general conservation level in the Sanctuary by quantifying the potential cumulative protection provided by fifty-one management areas currently in place.

Conservation in the marine realm has been defined as the preservation of the ocean’s biodiversity (Norse and Crowder 2005) and respective ecosystem functions (Duffy and Stachowicz 2006). Therefore, in the following analysis the term *conservation level/score* refers to the degree to which the design attributes and legal measures of management areas can potentially preserve biodiversity and ecosystem functions. We developed ranking criteria to first determine conservation score, and then compared the relative conservation level of all individual spatial management areas in the Sanctuary. We then evaluated the collective effects of overlapping management areas on the regional conservation level in contrast to individual management areas. Our study seeks to provide context for on-going marine spatial planning in the Sanctuary.

Methods

A total of fifty-one discrete management areas were identified within the boundaries of the Sanctuary (Table 1) (ONMS 2011). The majority of the management areas identified were marine protected areas (MPAs) designated as a result of the California Marine Life Protection Act (MLPA). These areas were established within state waters to regulate or prohibit ‘take’ of marine organisms, in an effort to alleviate anthropogenic pressure on subtidal biological communities (MLPA 2004). In addition, there were seven areas of special biological significance (ASBS), which are coastal areas established by the State Water Resources Control Board (SWRCB) to prohibit discharge into the marine environment (SWRCB 2011). A total of nine regulated fishing areas, including federal essential fish habitat (EFH), and rockfish conservation areas (RCAs), were identified. These areas restrict either recreational or commercial fishing based on the type of gear used to catch fish (Pacific Coast Groundfish Fishery 2011). The boundaries of the RCAs shift annually, so a new area may be protected from one year to the next. The remaining management areas identified include Sanctuary designated overflight restriction zones, as well as the California Sea Otter Game Refuge, the subtidal area of Julia Pfeiffer Burns State Park, Point Lobos State Reserve (SR), a special closure area, and the Elkhorn Slough National Estuarine Research Reserve (NERR). Figure 1 depicts the spatial extent of each management area and the presiding managing agencies.

Table 1. Marine management areas(Area of Special Biological Significance (ASBS), State Marine Conservation Area (SMCA), State Marine Reserve (SMR), Essential fish habitat (EFH), National Estuarine Research Reserve (NERR), State Reserve (SR), Rockfish Conservation Area (RCA), and State Parke (SP)) in the Sanctuary and the respective management agencies: State Water Resources Control Board (SWRCB), California Department of Fish and Game (CDFG), and National Marine Fisheries Service (NMFS), Monterey Bay National Marine Sanctuary (MBNMS).

Marine Management Area	Management Agency	Marine Management Area	Management Agency
Año Nuevo Point & Island ASBS	SWRCB	Lovers Point SMR	CDFG
Año Nuevo SMCA	CDFG	Montara SMR	CDFG
Asilomar SMR	CDFG	Monterey Bay National Marine Sanctuary	MBNMS
Big Creek SMCA	CDFG	Moro Cojo Slough SMR	CDFG
Big Creek SMR	CDFG	Natural Bridges SMR	CDFG
CA Sea Otter Game Refuge	CDFG	Non-Trawl RCA	NMFS
Cambria SMCA	CDFG	Overflight Restriction (Moss Landing)	MBNMS
Carmel Bay ASBS	SWRCB	Overflight Restriction (North Bay)	MBNMS
Carmel Bay SMCA	CDFG	Overflight Restriction (South Site)	MBNMS
Carmel Pinnacles SMR	CDFG	Pacific Grove Marine Gardens SMCA	CDFG
Edward F. Ricketts SMCA	CDFG	PG Marine Gardens & Hopkins Refuge ASBS	SWRCB
EFH 1 (Davidson Seamount)	NMFS	Piedras Blancas SMCA	CDFG
EFH 2 (Big Sur Coast/Port San Luis)	NMFS	Piedras Blancas SMR	CDFG
EFH 2 (Half Moon Bay)	NMFS	Pillar Point SMCA	CDFG
EFH 2 (Monterey Bay/Canyon)	NMFS	Point Lobos Ecological Reserve ASBS	SWRCB
EFH 2 (Point Sur Deep)	NMFS	Point Lobos SMCA	CDFG
Egg Rock to Devil's Slide Special Closure	CDFG	Point Lobos SMR	CDFG
Elkhorn Slough NERR	CDFG	Point Lobos SR	CDFG
Elkhorn Slough SMCA	CDFG	Point Sur SMCA	CDFG
Elkhorn Slough SMR	CDFG	Point Sur SMR	CDFG
Federal trawl closure at 700 fathoms	NMFS	Portuguese Ledge SMCA	CDFG
Greyhound Rock SMCA	CDFG	Recreational RCA	NMFS
James V. Fitzgerald Marine Reserve ASBS	SWRCB	Salmon Creek ASBS	SWRCB
Julia Pfeiffer Burns Underwater Park ASBS	SWRCB	Soquel Canyon SMCA	CDFG
Julia Pfeiffer SP (underwater area)	State Parks	State Waters trawl closures	CDFG
		Trawl RCA	NMFS

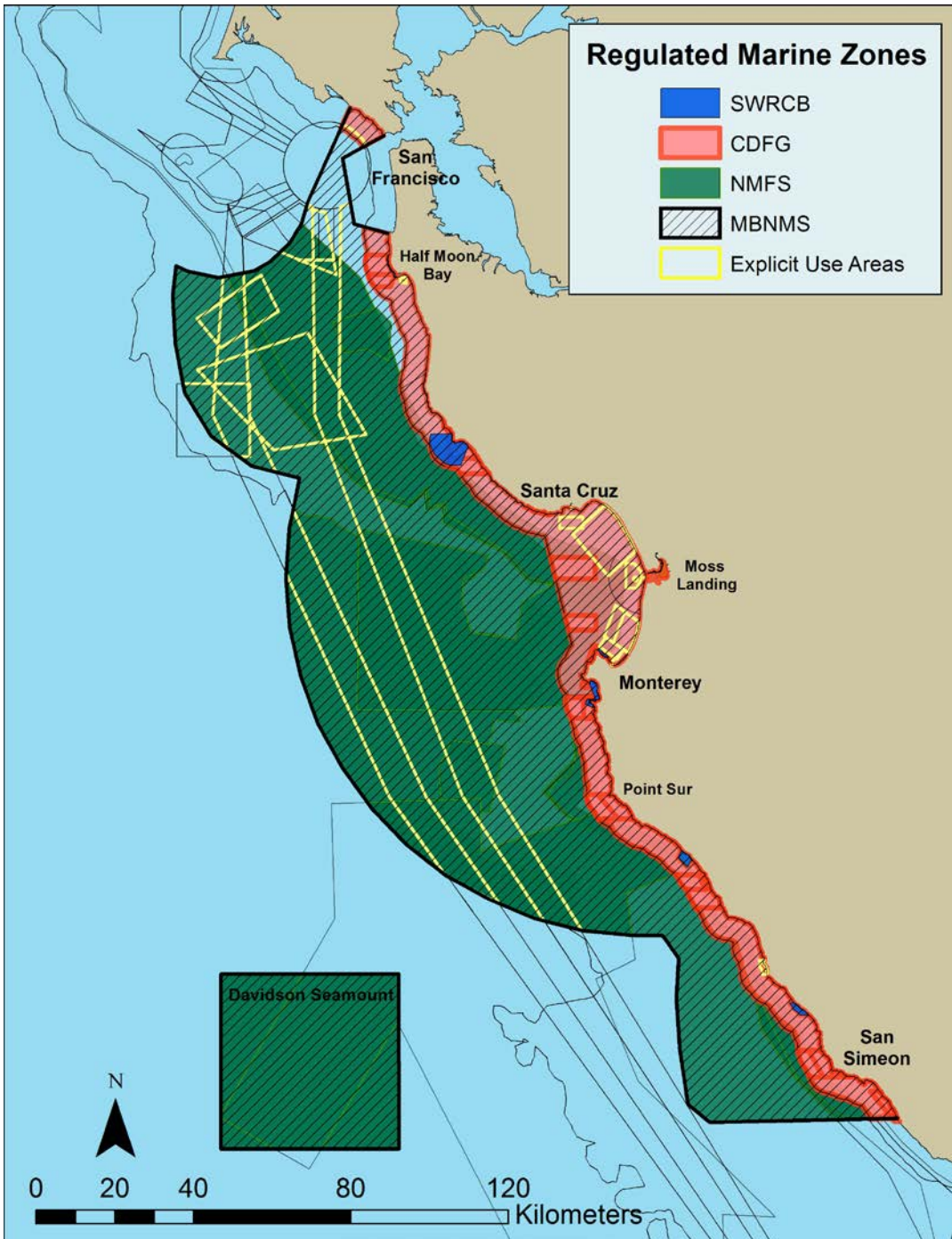


Figure 1. Extent of various marine management areas in the Sanctuary. Management areas are color-coded based on the governing agency (State Water Resources Control Board (SWRCB), California Department of Fish and Game (CDFG), National Marine Fisheries Service (NMFS), Monterey Bay National Marine Sanctuary (MBNMS)). Explicit use areas refer to zones designated for specific activities, such as shipping or military practice.

Conservation Potential Analysis

All management areas in this analysis are within the Sanctuary boundaries, below the mean high tide line, and have regulations that affect the use of marine resources within their boundaries. Similar to Recchia et al. (2001) we developed a total of nine criterion based on an in-depth literature review on ecosystem based management, threats to ecosystem health, and marine management area design. Our findings were compiled to create criterion to assess conservation level of individual marine management areas. The criterion fall under two main categories: design attributes of marine management areas (such as size, permanence, and adjacency) and restricted or prohibited uses (such as commercial fishing, recreational fishing, and kelp harvesting). Criteria are discussed below in order of their contribution to the level of protection afforded (Table 2).

Scoring Criteria

Regulation of Commercial Fishing

The extent to which a particular management area regulated commercial fishing was weighted the highest for calculating level of protection because of its extensive impacts on the marine environment. To date, modern commercial fishing has been proposed as the single greatest human impact to the oceans (Jackson et al. 2001; Crowder et al. 2006). In the last century, technological advances in fishing methods, coupled with rapid human population growth have resulted in widespread overexploitation or collapse of commercially fished species (Dayton et al. 2002). Specifically, large predatory fishes are of great commercial importance and many populations have declined by 90% since preindustrial times (Myers and Worm 2003). Commercial fishing has negatively impacted ecosystems, stemming from altered trophic levels and entire fish assemblages, degraded habitats, reduced biodiversity, and even the extinction of species (Auster and Langton 1999; Yoklavich et al. 2000; Jackson et al. 2001; Lindholm et al. 2001; Dayton et al. 2002; Levin et al. 2006).

Permanence of Protection

Protected species within marine conservation areas recover at different rates depending on life history, trophic level, and growth rate (Hutchings and Reynolds 2004). Therefore, some areas are established for the short term (such as one fishing season), while others are permanent. Marine conservation areas created permanently or longterm, offer a higher level of conservation because the resources within them have a longer time period to respond (Gleason 2006). Additionally, to understand the effect of marine spatial management areas, longer term or permanent protection is preferable because it is difficult to track short term changes (Hutchings and Reynolds 2004). The longer a marine reserve exists, the more feasible a direct comparison between protected and unprotected areas becomes. If regulations within a spatial management area are revoked, the benefits of conservation are reversed (Ballantine and Langlois 2008). Since permanent protection offers long-term conservation benefits, we weighted “*permanence*” as the second most important criteria for determining the level of protection of a marine management area.

Regulation of Recreational Fishing

We weighted the extent to which recreational fishing was regulated as the third most important criterion for determining level of protection of marine management areas. Although commercial

fishing has a large impact on fish stocks in the United States, the impact of recreational fishing cannot be overlooked. Many commercial fishery management plans are based on total catch limits, while recreational fisheries are managed through bag and size limits, which makes it difficult to track the total number of fishes caught (NOAA 2007; CDFG 2011). This can be detrimental to the management of exploited species in the United States because many recreational fisheries are large enough to extract a nontrivial amount of fish each year (Coleman et al. 2004; Ihde et al. 2010). Total catch from some recreational fisheries can be greater than commercial fisheries (Coleman et al. 2004). For example, recreational fishing accounted for 87% of total bocaccio (*Sebastes paucispinus*) landings along the Pacific coast in 2002 (Coleman et al. 2004). Allowing recreational fishing in marine protected areas can have negative effects on impacted fish stocks by removing top predators and therefore, altering food webs (Schroeder and Love 2002).

Size of Management Area

The size of a marine management area is important when considering the effectiveness of protecting marine ecosystems (Claudet et al. 2008). The size of a management area is directly related to the amount of biomass protected, and therefore larger reserves have the capacity to protect larger fish stocks and more species (Halpern 2003; Moffitt et al. 2011). Stocks within large reserves are more protected from the effects of fishing along the perimeter because larger reserves often have smaller perimeter to area ratios (Bartholomew et al. 2007). Our scoring system reflects these findings and predicates conservation area “size” as the fourth most important criterion when scoring conservation potential of a marine management area.

Extent of Non-Extractive Uses

Non-extractive uses of marine regions have less of an impact than extractive activities, such as fishing, but can also alter the ecosystem. For example, setting or dragging anchors can result in the decrease of structural complexity of seafloor habitats essential for the persistence of fish populations (Rogers and Miller 2006). Recreational boating, SCUBA diving, tide-pooling and snorkeling are popular marine activities that can alter the composition of algal communities in marine reserves by disturbing kelp and increasing suspended sediments (Brown and Taylor 1999; Schaeffer et al. 1999; Smith et al. 2008; Claudet et al. 2010; Thurstan et al. 2012). Non-extractive uses considered in this study include recreational boating, SCUBA diving, snorkeling and wildlife viewing. While these uses can promote overall conservation through appreciation and education, the physical disturbance can have negative impacts. Marine management areas that limit non-extractive uses offer a larger benefit to conservation than areas where non-extractive uses are allowed. We placed regulation of “non-extractive uses” as the fifth most important criteria when scoring the conservation potential of a marine management area.

Adjacency of Other Management Areas

Marine management areas that are adjacent to, or in close proximity of, each other increase the total area and level of protection of numerous species (Moffitt et al. 2011). Fish populations often have ranges beyond the spatial scale of politically feasible reserve sizes. One strategy to protect fish populations is to create networks of MPAs. These networks are created to protect stocks with planktonic larvae that drift large distances and also migratory species (Dunlop et al. 2009; Christie et al. 2010). Home range and larval dispersal are important considerations of marine spatial management design. Kinlan and Gaines (2003) found that the average distance

traveled between marine conservation areas was 10 km. Because networks of marine management areas and adjacency to other protected areas offer expanded protection, we consider that marine areas adjacent or in close proximity (<10km) to each other receive a higher conservation scores.

Regulation of Dredging

Harbors and ports often fill with sediment and must be dredged to maintain the appropriate water depth for ship travel. Dredging can also occur in the open ocean to obtain sand or other materials. Removal of this sediment in harbors or anywhere in the ocean is considered dredging and the act is highly regulated due to the potential negative impacts to habitat (EPA 1978). Dredging typically destroys benthic habitat such as seagrass, mounds, and depressions (Boyd et al. 2005; Erftemeijer and Lewis 2006). The activity also disturbs species, suspends sediments and can alter the benthic community for up to four years after the dredge activity (Nairn et al. 2004). Within the Sanctuary, the Santa Cruz, Moss Landing and Monterey harbors are all periodically dredged. Dredged material is then deposited offshore and the disposal site of the dredged material suffers similar impacts as the material blankets existing habitat, suspends sediment and introduces foreign material. Because of the potentially negative impact on habitats marine management areas that prohibit dredging received a higher conservation score.

Regulation of Oil and Gas

Oil and gas drilling in the marine environment can have rare but potentially widespread negative impacts. Although infrequent, oil spills can impact every aspect of the marine environment including immediate death and long-term disease of birds, marine mammals, fish, plants, and invertebrates (Piatt et al. 1990; Peterson et al. 2003). If oil and gas development is prohibited or restricted, a management area received a higher conservation score because the threats from negative impacts from oil and gas extraction are reduced.

Regulation of Intake and Discharge

The coastline of the Sanctuary is approximately 466 km long and there are numerous facilities that extract seawater from the Sanctuary, including aquaria, educational facilities, desalination, cities and power plants. Entrainment, impingement and exposure to warm water within intake systems negatively impacts marine populations during the intake process (Heimbuch et al. 2007). Discharge of effluent water into the Sanctuary impacts the natural state of marine ecosystems by warming coastal waters and introducing foreign material, even if treated to federal standards. The combined effects of sewage discharge and other anthropogenic disturbances can result in unexpected alteration of marine ecosystems (Grigg 1994). Because of the potential effects of intake and discharge of seawater from industrial uses, we consider that prohibition of these activities adds to the conservation level of management areas within the Sanctuary.

Scoring System

Specific numbers were assigned based on a 100 point scale. Scores were assigned to each of the criteria based on the conservation potential of the regulations or attributes within the marine management area. Complete prohibition of any activity received the highest possible score, while restriction of some activities received a lower score. The “*some prohibited*” category was created within each criteria due to the wide range in regulated activities. For example, a State Marine Conservation Area (SMCA) may restrict all fishing, except for recreational take of one species.

Because the “*some prohibitive*” category was different for each regulation within each management area, we decided to score “*some prohibited*” with less than half of the maximum points of the criteria.

Each marine management area was evaluated based on the nine scoring criteria. Points were assigned based on the scores which matched the individual laws and attributes of each management area (Table 2). The highest number of points was assigned to the areas with the highest conservation potential-- large, permanent areas that prohibit uses which compromise the protection of marine ecosystems. The lowest number of points was assigned to the areas with the lowest conservation potential—smaller, temporary areas that allow uses which compromise the conservation of marine ecosystems.

The following general rules were applied when scoring marine zones:

1. If an end date is not specified in the management areas regulations, the area was considered permanent.
2. If an activity is not explicitly prohibited in governing regulations, then it is not considered prohibited.
3. If a marine management area overlaps but is not encompassed within another area it is scored as ‘adjacent’.
4. For fishing, any restriction of gear type, species or season results in a score of “some” prohibited fishing.

Table 2. List of criteria and their respective scores.

Criteria	Points
Commercial Fishing	
All Prohibited	30
Some Prohibited	10
None Prohibited	0
Permanence	
Permanent	20
Not Permanent	0
Recreational Fishing	
All Prohibited	16
Some Prohibited	6
None Prohibited	0
Size	
> 100 km ²	10
10 km ² - 100 km ²	4
< 10 km ²	2
Non-Extractive Uses	
All Prohibited	8
Some Prohibited	4
None Prohibited	0
Adjacency	
Shares a Boundary	8
< 10 km of another zone	4
> 10 km of another zone	0
Dredging	
Prohibited	3
Not Prohibited	0
Oil and Gas	
Prohibited	3
Not Prohibited	0
Intake and Discharge	
Prohibited	2
Not Prohibited	0

Explicit Use Area Analysis

There are certain areas within the Sanctuary that were created for the purpose of focusing specific human activities rather than to promote conservation. For the purpose of this study, such areas are called “*explicit use areas*.” These areas include military use, personal watercraft, shipping lanes, dredge dumping, cruise anchor locations, and jade collection (Table 3). Explicit use areas were included in this study because of their potential negative impact on the marine environment. This is especially true when considering overall conservation within the Sanctuary because many explicit use zones overlap with conservation management areas.

Table 3. Explicit use areas in the Sanctuary. The purpose of each area is also included for better understanding of potential impacts on the marine environment.

Explicit Use Areas	Management Agency	Purpose
Cruise Anchorage	MBNMS	Anchoring of cruise ships
Jade Collection Area	MBNMS	Collection of jade
MBNMS ML SF-12	MBNMS	Disposal of dredge materials
MBNMS Monterey Dredge	MBNMS	Disposal of dredge materials
MBNMS MPW 1	MBNMS	Operation of motorized personal watercraft
MBNMS MPW 2	MBNMS	Operation of motorized personal watercraft
MBNMS MPW 3	MBNMS	Operation of motorized personal watercraft
MBNMS MPW 4	MBNMS	Operation of motorized personal watercraft
MBNMS SC Dredge	MBNMS	Disposal of dredge materials
Military Dumping	US Military	Disposal of military waste
Military Zone (SubArea 1)	US Military	Military practice
Military Zone (SubArea 2)	US Military	Military practice
Military Zone (SubArea 3)	US Military	Military practice
Military Zone (SubArea 4)	US Military	Military practice
Naval Operating Area (SC)	US Military	Military practice
Ord Military Zone (Outer)	US Military	Military practice
Ord Military Zone (Shore)	US Military	Military practice
Shipping Lanes	US Coast Guard	Shipping
Spoil Ground	US Military	Disposal of military waste

Because the explicit use areas were designed for human activities, the criteria used to evaluate them were adapted from the conservation analysis scoring criteria. The scoring criteria for explicit use areas include size, permanence, and adjacency. Similar to the conservation analysis, scoring criteria are listed in order of importance.

Size of Management Area

We ranked size as the most important criteria for determining the extent of human impacts on conservation because larger areas will have a larger negative effect than a smaller explicit use area. For example, a large dumping area will alter a larger area of seafloor than a smaller one.

Permanence of Management Area

Permanence is also an important criterion in determining the impacts of explicit use areas. Areas that are permanent promote prolonged, long term disturbances to the marine environment with little possibility of the ecosystem recovering from the impact.

Adjacency of Other Management Areas

If an explicit use area is adjacent to, or in close proximity of, a conservation area it will have a higher probability of impacting conservation level of surrounding marine conservation areas.

Scoring System

While the impact of explicit use areas is important and warrant inclusion in this study, their presence should not completely negate all positive impacts of conservation areas. Because of this, the maximum points of each criteria were assigned based on a 30 point scale. Explicit use areas were evaluated based on the three scoring criteria. Points were assigned on a negative scale to reflect their negative impacts on the environment (Table 4). Large, permanent explicit use areas that shared a boundary with another area were assigned the lowest scores. With respect to these three criteria, large areas are assumed to have a larger spatial footprint and were assigned the lowest points. Permanent areas have the potential for long-term impacts and were assigned the second lowest total possible criteria points.

Table 4. Scoring system used to evaluate the impact of explicit use areas. Criteria are in order of importance.

Criteria	Points
<hr/>	
Size	
<hr/>	
> 100 km ²	-15
10 km ² - 100 km ²	-7
< 10 km ²	-3
Permanence	
<hr/>	
Permanent	-10
Not Permanent	0
Adjacency	
<hr/>	
Shares a Boundary	-5
< 10 km of another zone	-3
> 10 km of another zone	0

Overlap Analysis

Because overlapping marine management areas can help or hinder level of protection, it is important to look at the conservation level of all areas that overlap one another within the Sanctuary. Many of the marine management areas analyzed here overlap each other and the conservation potential can increase where regulations overlap. For example, a state marine reserve (SMR) may overlap with an ASBS. The conservation scores of these two areas have an additive effect because their regulations complement each other. To account for this we conducted an overlap analysis to visualize the cumulative effects of overlapping spatially explicit

regulations, using similar methods to the conservation potential analysis of individual management areas.

To calculate the adjusted conservation score for overlapping management areas, the individual area scores were added. In contrast, areas designated for conservation may be negatively impacted if they are adjacent to, or in close proximity of, explicit use areas. While explicit use areas are created to limit the extent of human uses in the Sanctuary, these areas also concentrate the activities and their impacts. For example, a Personal Watercraft Area allows use of jet skis, which limits the activity in other areas of the Sanctuary, but concentrates negative impacts to marine birds and mammals such as noise pollution and boat strikes. To calculate the adjusted conservation scores for areas overlapping explicit use areas, the explicit use score was subtracted from the original conservation score (Figure 2).

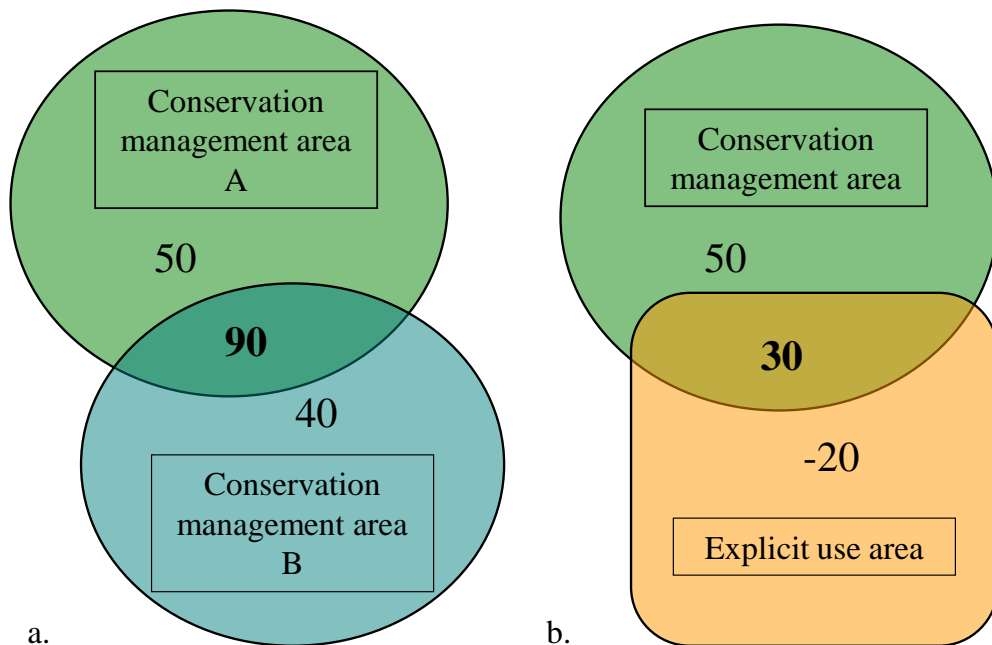


Figure 2. Methods used to calculate conservation scores in regions where spatially explicit management overlaps. Figure 2a illustrates the increase in conservation level where two conservation areas overlap. Figure 2b shows the decrease in conservation level within the area where a conservation area and an explicit use area overlap

Results

Conservation Analysis

Based on our criteria, the evaluation of management areas within the Sanctuary produced conservation levels consistent with the management objectives of each area (Appendix 1 and 2). Overall, the scores ranged from high (82) to low (20), with a mean of approximately 53 (Table 6). High scoring areas (≥ 82) consisted of the larger SMR that prohibit all commercial and recreational fishing. The medium-high range of scores (81 – 72) consisted mostly of the smaller SMR, Point Lobos SR, Elkhorn Slough NERR, and the special closure area. Although these areas offer a relatively high level of protection, they are much smaller (mean 2.05 km^2) than the larger marine reserves (mean 27.4 km^2) in the high conservation level category. The medium score range of marine management areas (71 – 52) was entirely made up of SMCA. These management areas are commonly the less protected counterpart to the SMR, wherein they allow some forms of recreational and commercial fishing. The medium-low ranked marine management areas (51 – 32) consisted of the remaining SMCA, all ASBS, areas of overflight restriction, the underwater area of Julia Pfeiffer Burns State Park, California state waters, and the Sanctuary itself. These areas have a broad range of sizes; however offer little as far as comprehensive legal protection, particularly from fishing. The low scored areas (≤ 31) included predominantly non-permanent regulated fishing areas that allow some types of commercial or recreational fishing. Spatially, the areas of higher conservation scores tend to be closer to the coastline while lower scored areas are predominantly found beyond California state waters (Figures 3-6).

Table 5. Conservation scores of marine management areas. Conservation level was determined by each area's final score.

Marine Management Area	Score	Rank	Marine Management Area	Score	Rank
Big Creek SMR	82	High (≥82)	Pacific Grove Marine Gardens SMCA	50	Medium - Low (51 - 32)
Montara SMR	82		Carmel Bay SMCA	50	
Piedras Blancas SMR	82		Edward F. Ricketts SMCA	50	
Point Lobos SMR	82		Monterey Bay National Marine Sanctuary	50	
Point Sur SMR	82		James V. Fitzgerald Marine Reserve ASBS	48	
Asilomar SMR	80	Medium - High (81 - 72)	State Waters trawl closures	48	
Carmel Pinnacles SMR	80		EFH 2 (Big Sur Coast/Port San Luis)	48	
Elkhorn Slough NERR	80		EFH 2 (Monterey Bay/Canyon)	48	
Elkhorn Slough SMR	80		Julia Pfeiffer SP (underwater area)	47	
Lovers Point SMR	80		EFH 2 (Half Moon Bay)	44	
Point Lobos SR	80	Medium (71 - 52)	CA Sea Otter Game Refuge	42	
Egg Rock to Devil's Slide Special Closure	76		Overflight Restriction (Moss Landing)	42	
Moro Cojo Slough SMR	76		Overflight Restriction (North Bay)	42	
Natural Bridges SMR	76		Overflight Restriction (South Site)	42	
Elkhorn Slough SMCA	70		EFH 1 (Davidson Seamount)	40	
Cambria SMCA	66	Medium (71 - 52)	EFH 2 (Point Sur Deep)	40	
Ano Nuevo SMCA	62		PG Marine Gardens & Hopkins Refuge ASBS	35	
Big Creek SMCA	52		Ano Nuevo Point & Island ASBS	34	
Greyhound Rock SMCA	52		Carmel Bay ASBS	32	
Piedras Blancas SMCA	52		Julia Pfeiffer Burns Underwater Park ASBS	32	
Pillar Point SMCA	52		Point Lobos Ecological Reserve ASBS	32	
Point Lobos SMCA	52		Salmon Creek ASBS	32	
Point Sur SMCA	52		Federal trawl closure at 700 fathoms	28	
Portuguese Ledge SMCA	52		Non-Trawl RCA	28	
Soquel Canyon SMCA	52		Trawl RCA	28	
		Recreational RCA	24		

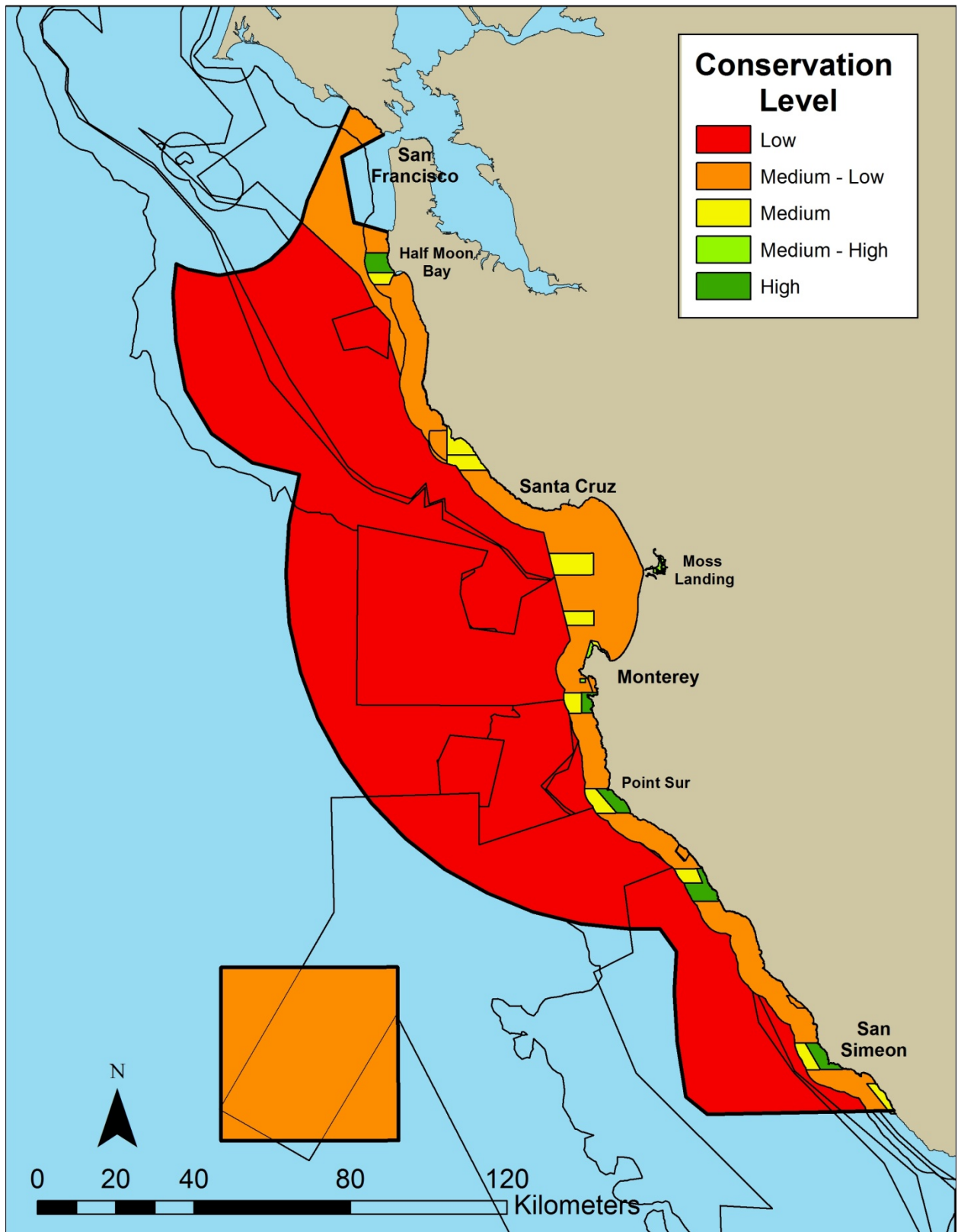


Figure 3. Overview map of the level of conservation within management areas in the Sanctuary.

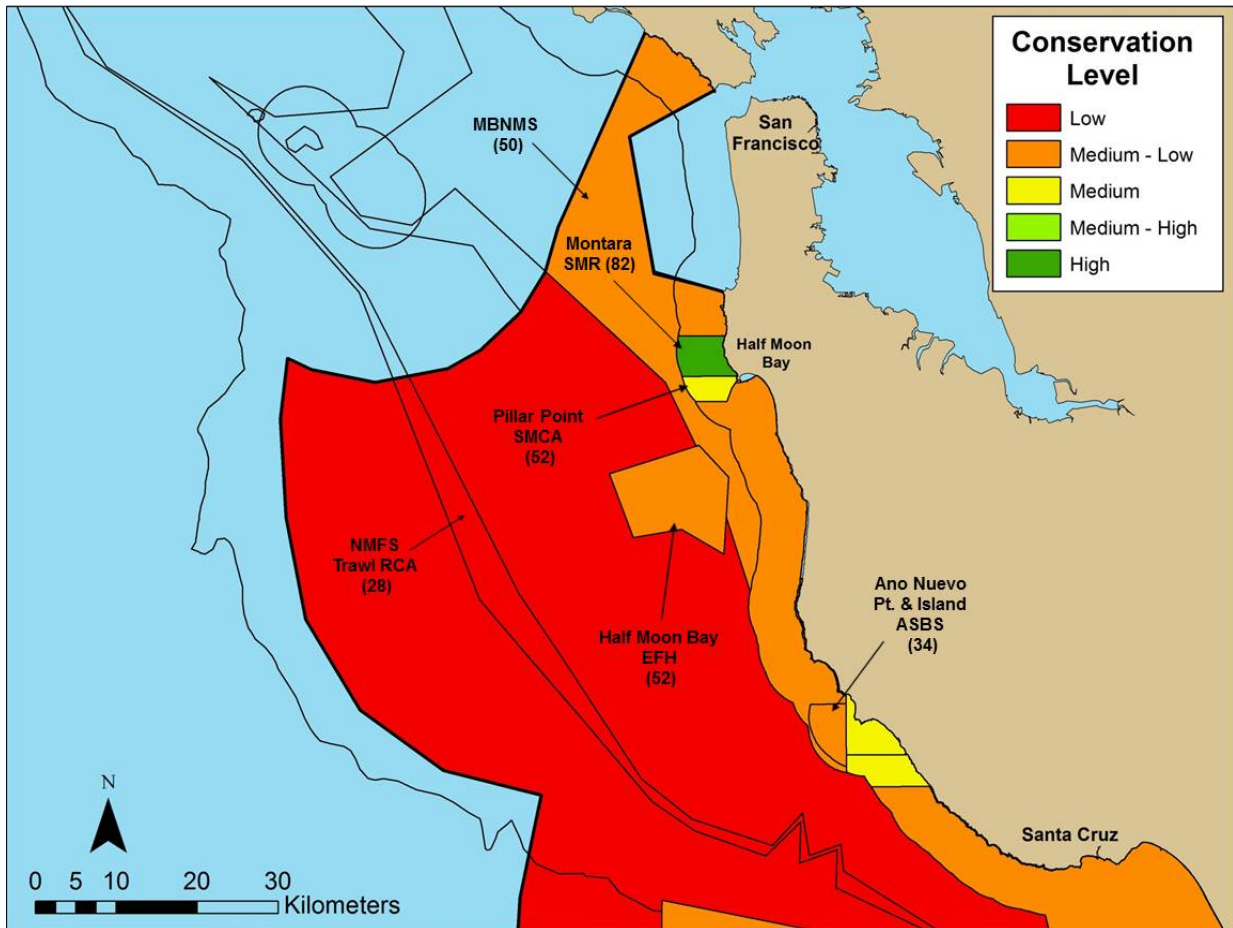


Figure 4. Map of conservation levels in the north region of the Sanctuary. Conservation scores are written in parentheses after the name of the management area examples shown on the map.

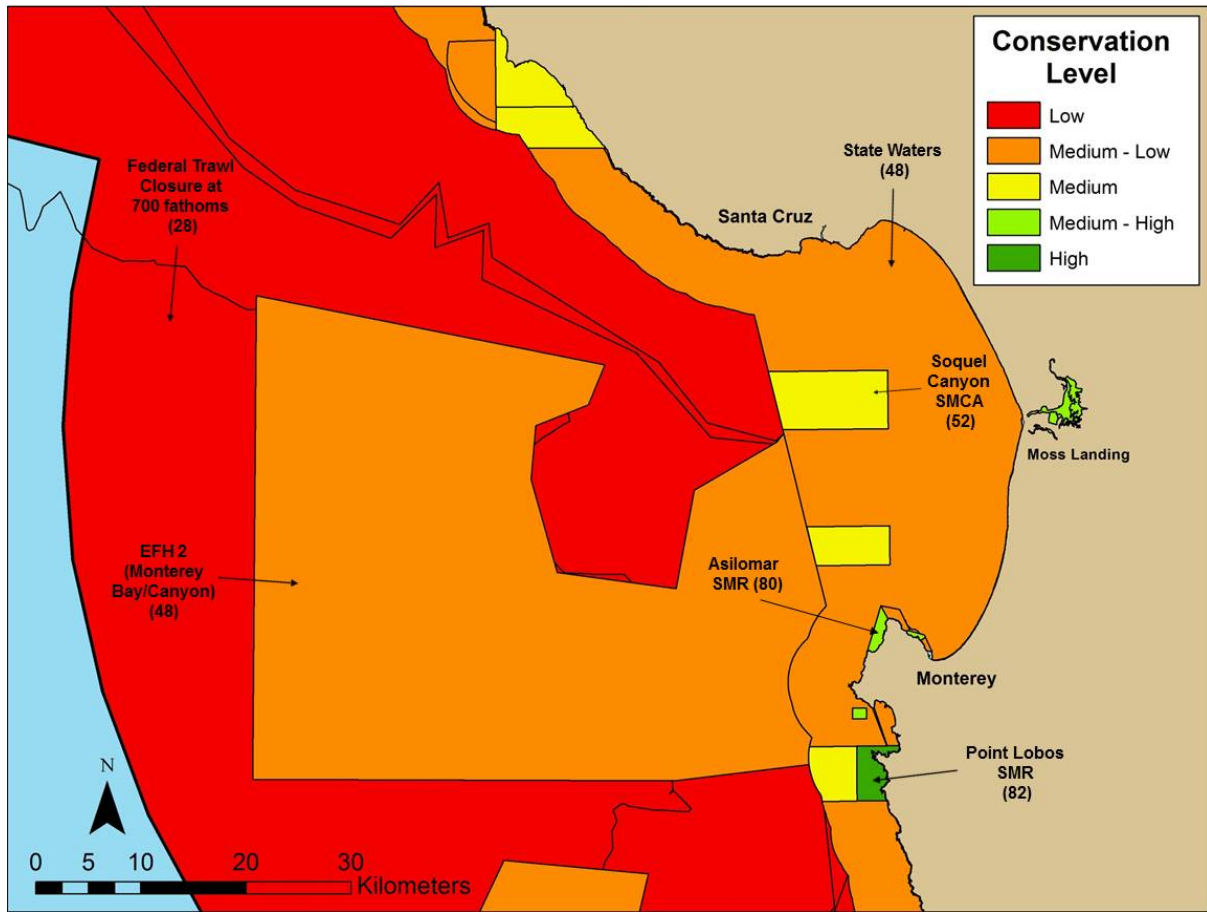


Figure 5. Map of conservation levels in the central region of the Sanctuary. Conservation scores are written in parentheses after the name of the management area examples shown on the map.

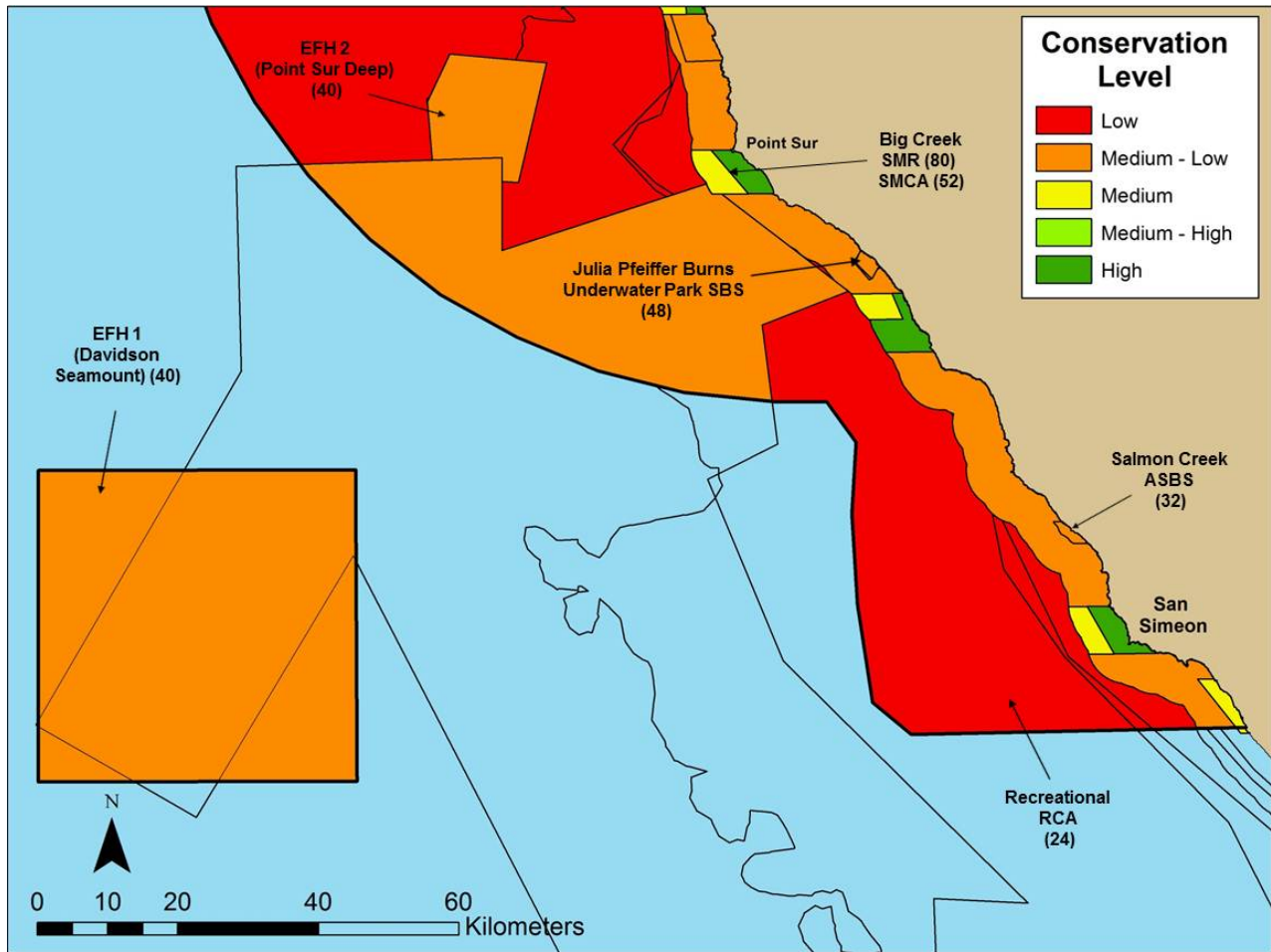


Figure 6. Map of conservation levels in the south region of the Sanctuary. Conservation scores are written in parentheses after the name of the management area examples shown on the map.

Explicit Use Area Analysis

The values calculated for each explicit use area ranged from the minimum value of -30 to a maximum of -13, with a mean of approximately -22 (Table 7). The lowest scoring values (-30), were associated with the largest of the explicit use areas, such as the shipping lanes and larger military use areas. The intermediate scoring areas (-22 to -18) consisted of several smaller military practice areas, motorized personal water craft areas (MPW), and several dredge disposal sites. The remaining low scoring areas (≥ -16) were a small MPW area, cruise anchoring points, a small dredge disposal site near Monterey harbor, and the Jade Collection area.

Table 6. Scores of explicit use areas which detract from conservation levels across the Sanctuary.

Explicit Use Area	Score
Shipping Lanes	-30
Military Dumping	-30
Military Zone (SubArea 1)	-30
Military Zone (SubArea 2)	-30
Military Zone (SubArea 3)	-30
Naval Operating Area (SC)	-30
MBNMS MPW 2	-22
MBNMS MPW 4	-22
Military Zone (SubArea 4)	-22
MBNMS MPW 3	-20
Ord Military Zone (Outer)	-20
Ord Military Zone (Shore)	-20
MBNMS SC Dredge	-18
MBNMS ML SF-12	-18
Spoil Ground	-18
MBNMS MPW 1	-16
MBNMS Monterey Dredge	-16
Cruise Anchorage	-16
Jade Collection Area	-13

Overlap Analysis

By incorporating the scores of the explicit use areas and overlapping conservation areas, the conservation scores were calculated to reflect a more realistic depiction of conservation level throughout the Sanctuary (Figures 7-10). We found that marine management areas do not overlap completely in most cases, resulting in a patchwork of varying conservation scores within one area. This is an important finding because it shows the reality of conservation potential throughout the Sanctuary (in general, most areas immediately offshore are less protected than those outside of the California 3-nautical mile limit). This change in conservation potential is likely caused by the overlap of the Recreational RCA, which features a boundary starting at 30 to 40 fathoms extending seaward, and the trawl closure within California state waters. Most areas seaward of the California 3-nautical mile limit have low to medium-low conservation levels. This area has a suite of fishing regulations, however the non-permanent status of the RCA boundaries, as well as the presence of large explicit use areas, makes this area of the Sanctuary vulnerable to human uses. Overall, more than half of the Sanctuary was scored as having a medium-low conservation level (57%). Another 35% of the Sanctuary was ranked as having a low level of conservation, while 6% was found to have a medium level of conservation. Less than 1% of the Sanctuary is categorized as having high or medium high levels of conservation (Table 8).

Table 7. The coverage of conservation levels throughout the Sanctuary after considering overlap of spatially explicit management.

Rank	Area (km²)	Percent of Sanctuary Area
High	12.02	0.08
Medium - High	146.82	0.93
Medium	1032.23	6.54
Medium - Low	9,035.18	57.25
Low	5,556.99	35.21

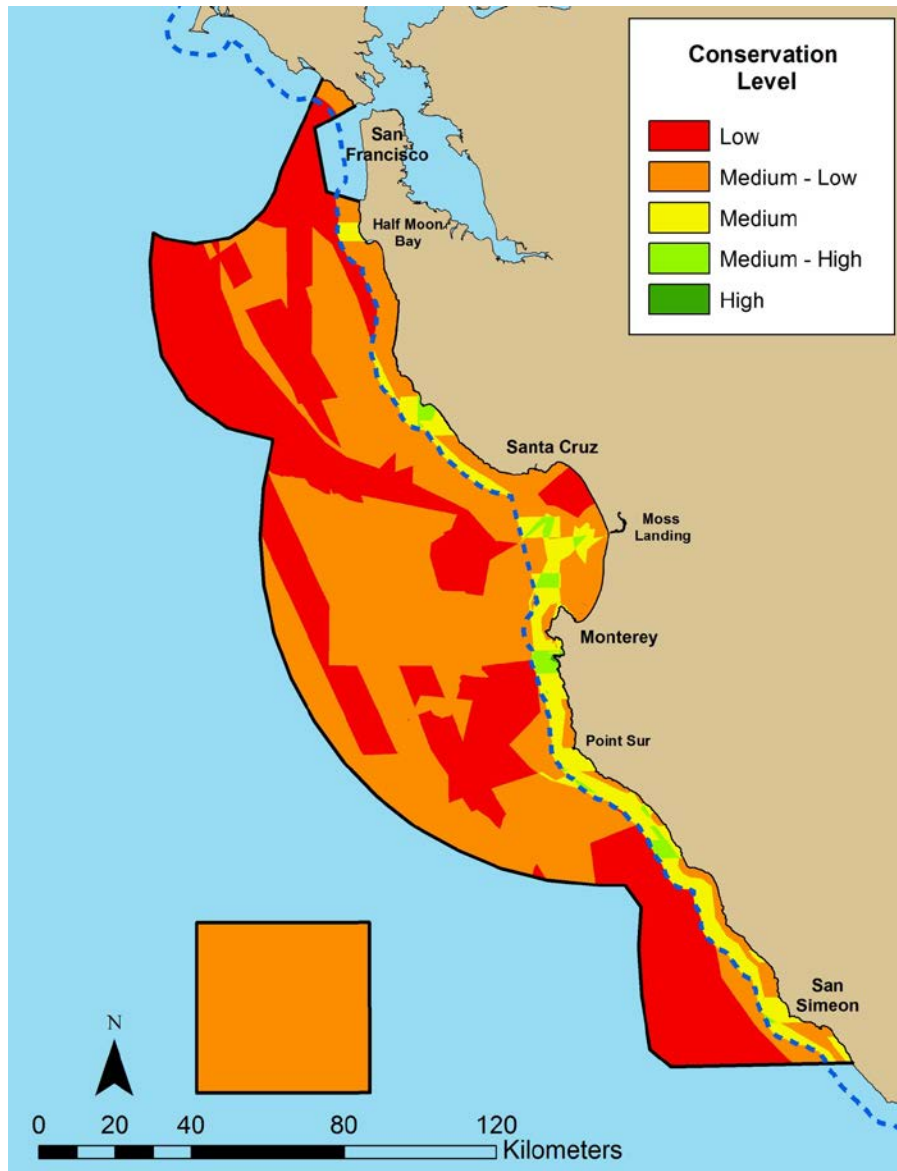


Figure 7. Overview map of the level of conservation in the Sanctuary after considering the overlap of spatially explicit management. The dashed line denotes the boundary of California state waters.

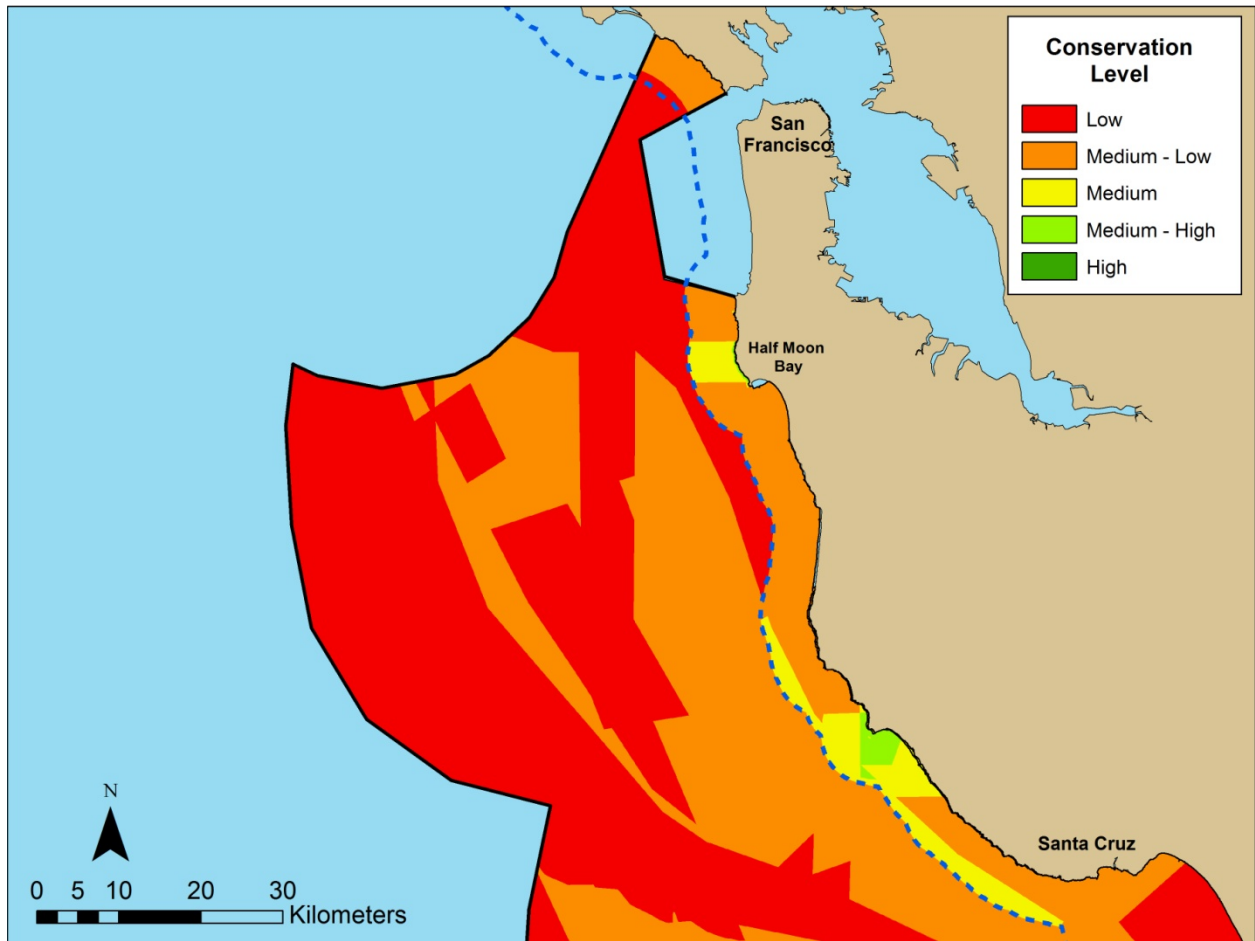


Figure 8. Map of conservation levels in the north region of the Sanctuary after considering the overlap of spatially explicit management. The dashed line denotes the boundary of California state waters.

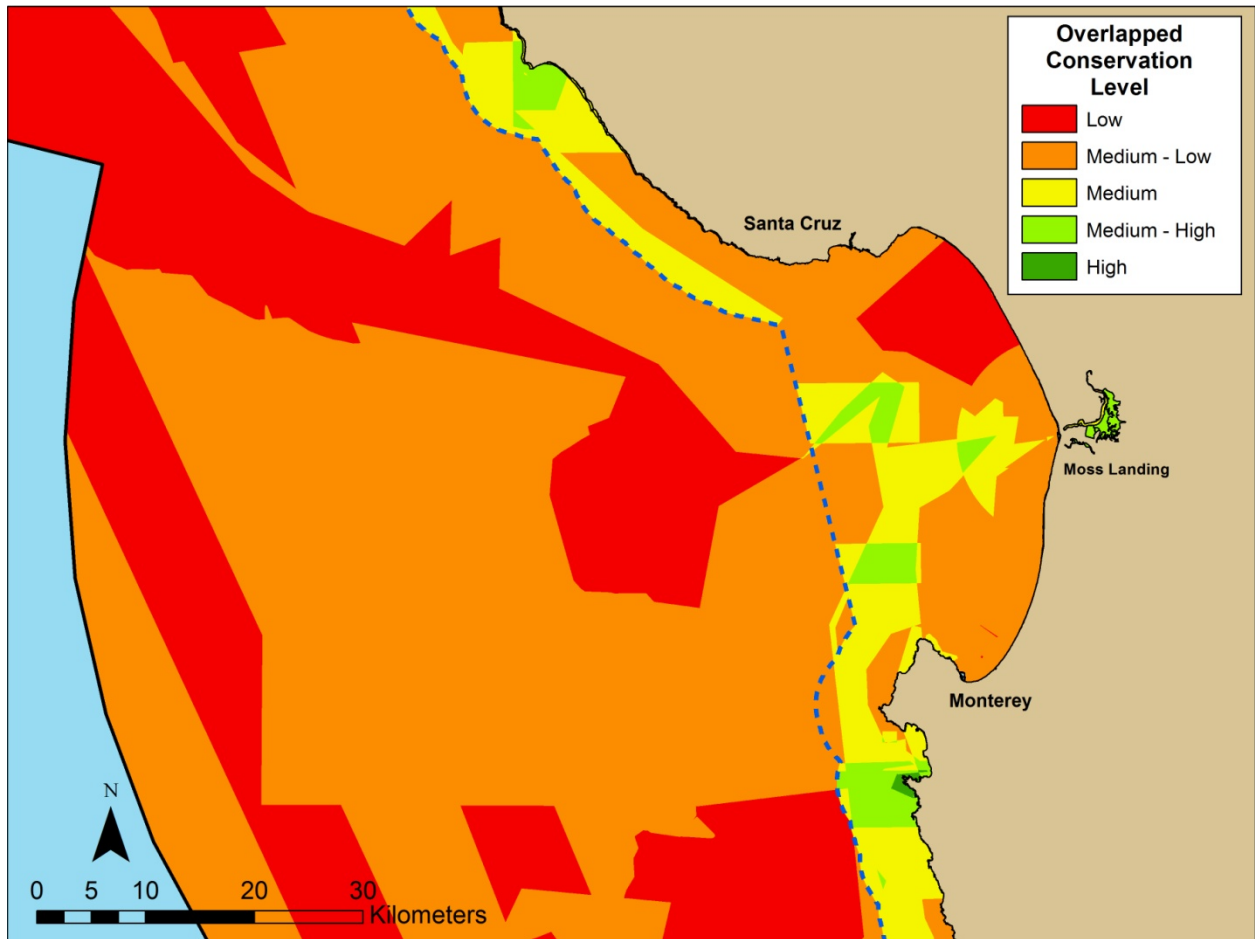


Figure 9. Map of conservation levels in the central region of the Sanctuary after considering the overlap of spatially explicit management. The dashed line denotes the boundary of California state waters.

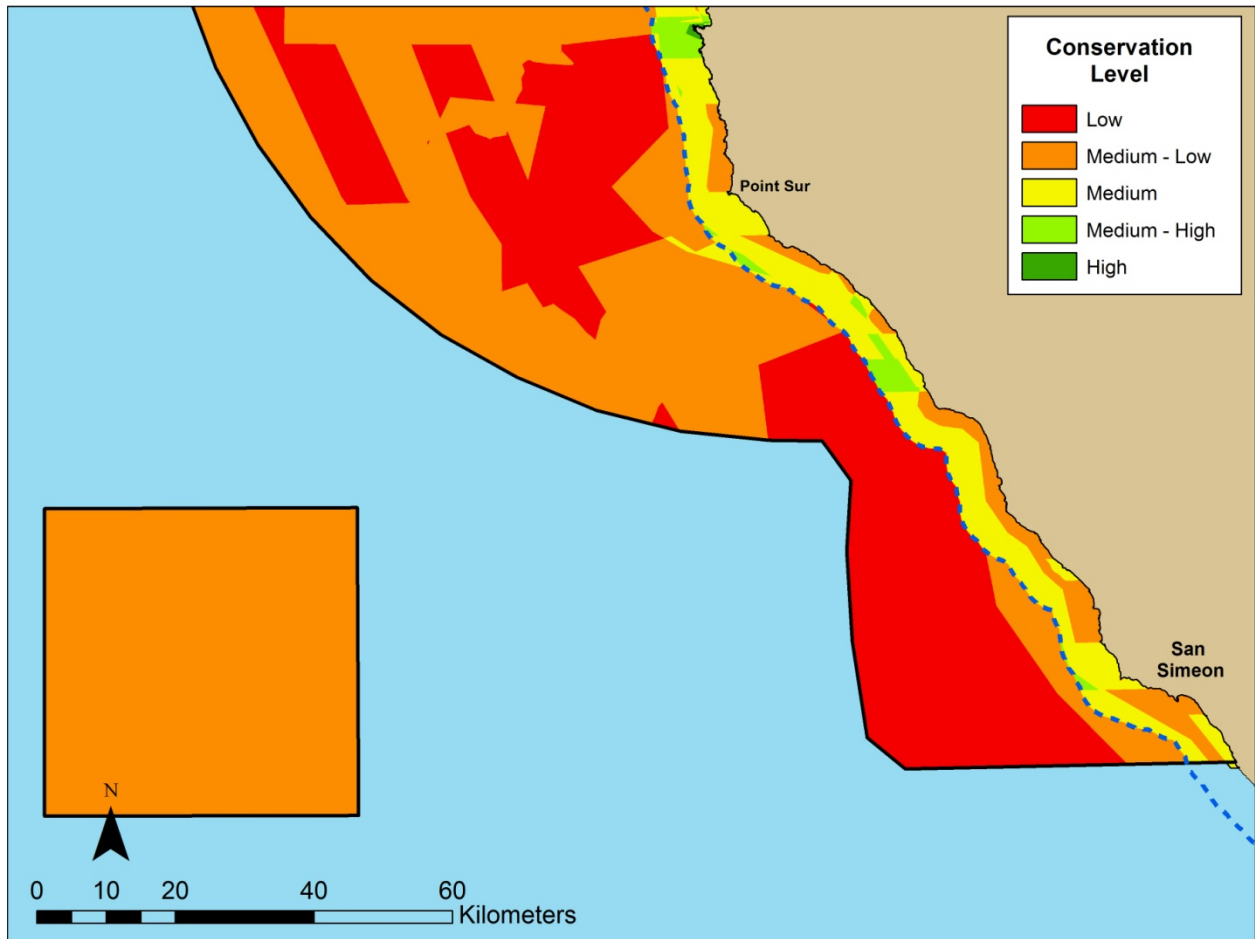


Figure 10. Map of conservation levels in the south region of the Sanctuary after considering the overlap of spatially explicit management. The dashed line denotes the boundary of California state waters.

One area of the Sanctuary received higher conservation scores as a result of the overlap analysis. The area surrounding Point Lobos, approximately 10 km southwest of Monterey had the highest overall conservation score after the overlap analysis (Figure 11). This area is overlapped with several marine management areas: a large SMR, California state waters trawl closure, EFH, Point Lobos SR, Point Lobos Ecological Reserve ASBS, and a low-overflight restriction zone. While all of these marine management areas increased the conservation scores of each other due to their proximity, only a small area of overlap is subject to regulations established by multiple agencies.

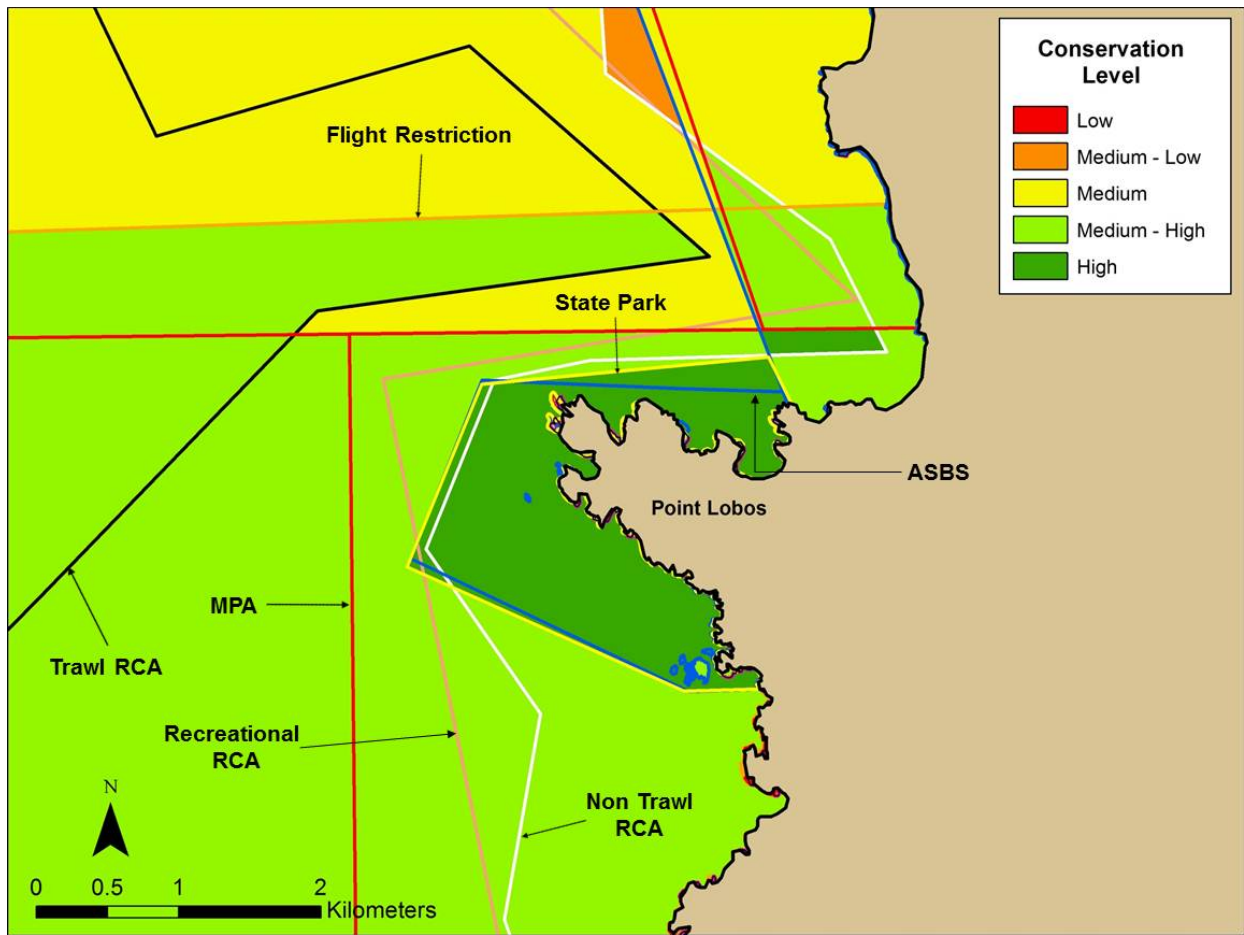


Figure 11. Map of the marine management areas surrounding Point Lobos and the increase in conservation level due to the overlap of management areas.

The area with the lowest conservation level is near the north western boundary of the Sanctuary (Figure 12). This area is overlapped by the Sanctuary and the Recreational RCA, which increase conservation level. However, this area also features several naval practice zones, and a military dumping zone. The explicit use scores of the naval practice zones and military dumping zone were subtracted from the conservation score of the Sanctuary and Recreational RCA, reducing the overall conservation scores and in turn conservation level within the area.

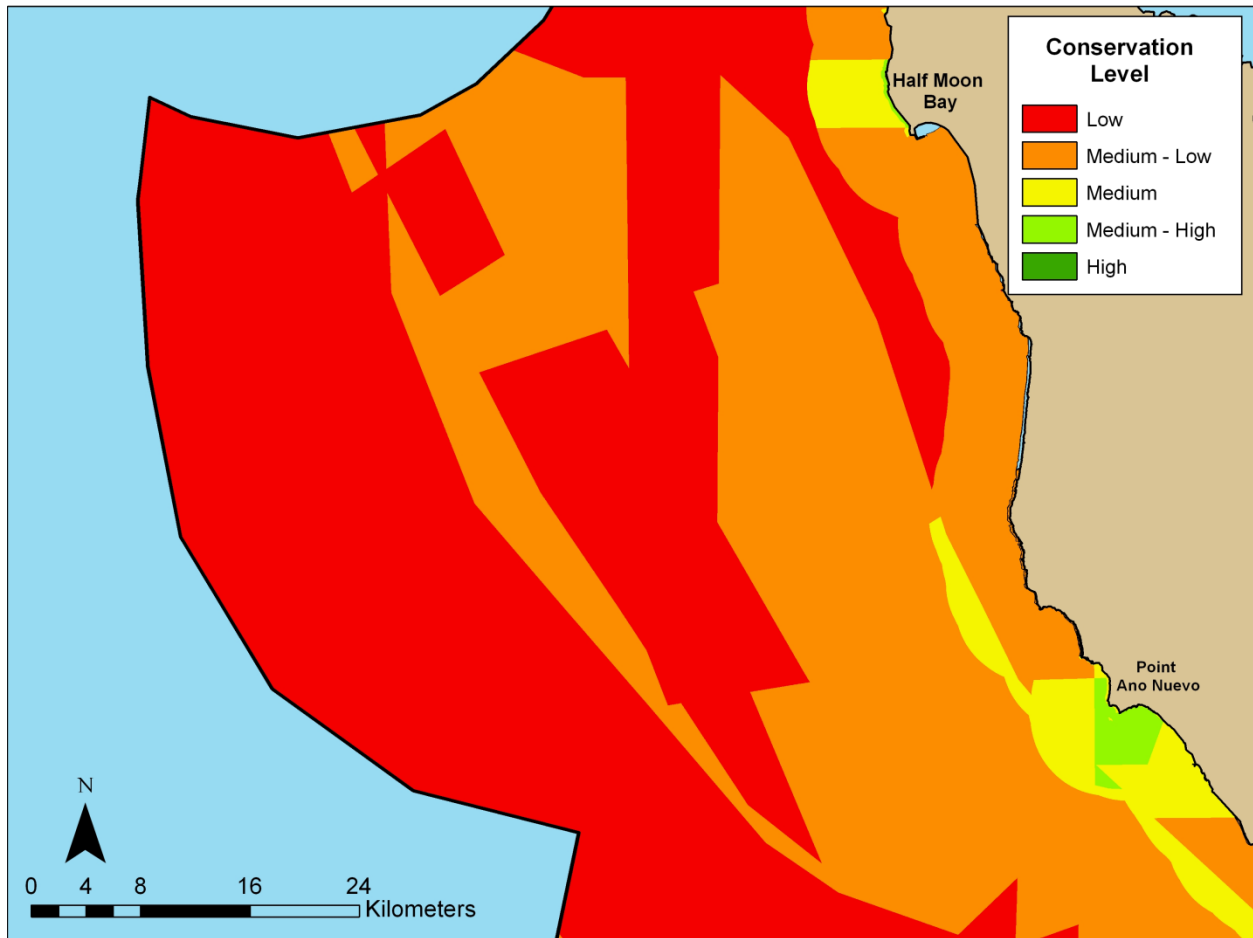


Figure 12. Map of the northwest region of the Sanctuary and the decrease in conservation levels due to overlap with explicit use areas.

Discussion

Our results indicate that despite the numerous and overlapping management areas present in the Sanctuary, the level of legal protection within the Sanctuary's boundary is low, with less than 1% of management areas within the Sanctuary receiving a conservation rank of high or medium-high. Nearshore state waters had higher conservation scores, primarily due to eleven non-extractive State Marine Reserves implemented as part of the MHPA process. Offshore, federal waters encompass larger management areas (such as Essential Fish Habitat closures) which offer little conservation potential because many were created to only manage single activities. While the goal of the Sanctuary is to "*protect and manage ecological resources*," our study indicates that a sizable portion of the Sanctuary's resources receive little legal protection.

The Sanctuary itself received a medium conservation score of 50 out of 100 independent of the other fifty management areas. This is largely because federal directives do not give the Sanctuary the authority to regulate either commercial or recreational fishing (NOAA 1992). Fishing has been identified as the primary anthropogenic factor contributing to the alteration of marine ecosystems worldwide (Jackson et al. 2001). Managing recreational, and most importantly, commercial fisheries not only preserves scarce resources but also prevents ecosystem degradation (Tegner and Dayton 1999; Cardinale et al. 2011; Srinivasan et al. 2012). Therefore, Montara, Point Lobos, Point Sur, Big Creek, and Piedras Blancas State Marine Reserves all received a high conservation score of 82 out of 100 because, in addition to other management attributes, recreational and commercial fishing are prohibited within their boundaries.

While the smaller State Marine Reserves scored high (80-82) several large management areas such as Essential Fish Habitat and Rockfish Conservation Areas scored comparatively low (24-40). This indicates that the effect of management area size is less influential on conservation potential when regulations are not comprehensive (Robb et al. 2011). To illustrate, the area of Essential Fish Habitat in the Sanctuary totals over 14,000 km², nearly 25% of the Sanctuary by area, but the overall conservation level within these areas was low. The low score was a consequence of the lack of regulations of extractive activities as well as their isolation, and therefore no additive conservation effects of adjacent spatial regulations. Similarly, the Rockfish Conservation Areas (trawl, non-trawl and recreational) are large in size but only regulate fishing by restricting a few specific types of fishing gear and are not permanent which decreases their contribution to conservation (Claudet et al. 2008). Our scoring system reflects research which has shown that partial restrictions on fishing activities in management areas do not have the same benefit to conservation as no-take reserves (Lester and Halpern 2008). Management areas in the Sanctuary that are larger are not more valuable for conservation if they do not provide an adequate level of protection for resources (Halpern 2003; Robb et al. 2011).

Three of the State Marine Conservation Areas (Edward F. Ricketts, Carmel Bay and Pacific Grove Marine Gardens) assessed as part of this study received the same score as the Sanctuary-- however for very different reasons. These three State Marine Conservation Areas are small, all less than 10km², and their regulations allow some extractive activities. So while the Sanctuary received a higher score for its large size, the State Marine Conservation Areas scores were higher due to some regulation of recreational and commercial fishing. Stricter management regulations that protect marine resources provide a larger benefit to conservation than a larger area that does not offer complete resource protection (Robb et al. 2011).

This study was an assessment of the conservation level of management areas within the Sanctuary based on the established regulations, where the analysis was based solely on the text of those regulations and other physical attributes of MPA design. The purpose of this study was twofold: 1. Identify all marine management areas within the boundary of the Sanctuary and 2. Evaluate their independent and cumulative contribution to conservation based on a ranking system. We recognize that other social and economic factors, such as the level of enforcement within a given management area, or the magnitude and frequency of impactful activities, will greatly affect the actual level of conservation within the Sanctuary beyond just the legal regulations. However, this study did not seek to evaluate these social or economic factors because the data are often subjective, dynamic and therefore difficult to measure. This study also did not include land-based impacts such as pollution. Factors such as non-point source pollution from land-based sources highlight gaps in data because the impacts on the marine environment have not been well studied throughout the Sanctuary. Including information on land based regulations and pollutants could improve an overview analysis of management within the Sanctuary. Because of the challenges of assessing the effect of multiple human stressors few studies have attempted to map numerous anthropogenic impacts. One study focusing on 25 human impacts has been conducted on a broader scale for the entire California current (Halpern et al. 2009). However, this study differed from ours in that Halpern et al. (2009) evaluated impacts on multiple habitats on a pixel-by-pixel bases rather than evaluating established management areas. Both analytical approaches have their advantages and for this study, we aim to provide information about existing management regimes by evaluating state and federal waters using marine management boundaries.

Ultimately, we hope that this study serves as a point of departure for a larger discussion about the relative level of protection in US waters in general, and in Sanctuaries in particular. Given the multiple management areas and agencies involved within the Monterey Bay National Marine Sanctuary (MBNMS), successful management will require the type of inter-agency cooperation espoused by recent Federal coastal and marine spatial planning efforts. To this end, rather than being viewed as a condemnation of the MBNMS, we believe that the challenges identified in this study bring into clear relief the vital role that the MBNMS can carry out in the region. The MBNMS, with its consensus-based approach to management, is perfectly situated to orchestrate the multi-agency cooperation that successful management will require. Its unique facilitative role (Lindholm and Pavia 2010) will be central to any effort to implement marine spatial planning efforts in the area and the productive interaction between Sanctuaries and other agencies could serve as a model for moving forward with similar efforts nation-wide.

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Appendix 1. Management areas and their individuals scores for each of the nine criteria. The 51 management areas are listed in order of total score, from highest to lowest.

	Final Score	Permanence	Size Category (Km ²)	Commercial Prohibited?	Recreational Fishing Prohibited?	Intake/ Discharge/ Dredging Prohibited?	Oil and Gas Prohibited?	Non-Extractive Protected Areas?	Adjacency to Other Protected Areas?		
Big Creek SMR	82	20	4	4	30	16	0	0	0	4	8
Montara SMR	82	20	4	4	30	16	0	0	0	4	8
Piedras Blancas SMR	82	20	4	4	30	16	0	0	0	4	8
Point Lobos SMR	82	20	4	4	30	16	0	0	0	4	8
Point Sur SMR	82	20	4	4	30	16	0	0	0	4	8
Asilomar SMR	80	20	2	2	30	16	0	0	0	4	8
Carmel Pinnacles SMR	80	20	2	2	30	16	0	0	0	4	8
Elkhorn Slough NERR	80	20	2	2	30	16	0	0	0	4	8
Elkhorn Slough SMR	80	20	2	2	30	16	0	0	0	4	8
Lovers Point SMR	80	20	2	2	30	16	0	0	0	4	8
Point Lobos SR	80	20	2	2	30	16	0	0	0	4	8
Egg Rock to Devil's Slide Special Closure	76	20	2	2	30	16	0	0	0	4	4
Moro Cojo Slough SMR	76	20	2	2	30	16	0	0	0	4	4
Natural Bridges SMR	76	20	2	2	30	16	0	0	0	4	4
Elkhorn Slough SMCA	70	20	2	2	30	6	0	0	0	4	8
Cambria SMCA	66	20	4	4	30	0	0	0	0	4	8
Ano Nuevo SMCA	62	20	4	4	10	16	0	0	0	4	8
Big Creek SMCA	52	20	4	4	10	6	0	0	0	4	8
Greyhound Rock SMCA	52	20	4	4	10	6	0	0	0	4	8
Piedras Blancas SMCA	52	20	4	4	10	6	0	0	0	4	8
Pillar Point SMCA	52	20	4	4	10	6	0	0	0	4	8
Point Lobos SMCA	52	20	4	4	10	6	0	0	0	4	8
Point Sur SMCA	52	20	4	4	10	6	0	0	0	4	8
Portuguese Ledge SMCA	52	20	4	4	10	6	0	0	0	4	8
Soquel Canyon SMCA	52	20	4	4	10	6	0	0	0	4	8
Carmel Bay SMCA	50	20	2	2	10	6	0	0	0	4	8
Edward F. Ricketts SMCA	50	20	2	2	10	6	0	0	0	4	8
Monterey Bay National Marine Sanctuary	50	20	10	10	0	0	3	2	3	4	8
Pacific Grove Marine Gardens SMCA	50	20	2	2	10	6	0	0	0	4	8

EFH 2 (Big Sur Coast/Port San Luis)	48	20	10	10	0	0	0	0	0	8
EFH 2 (Monterey Bay/Canyon)	48	20	10	10	0	0	0	0	0	8
James V. Fitzgerald Marine Reserve ASBS	48	20	2	10	6	0	2	0	0	8
State Waters trawl closures	48	20	10	10	0	0	0	0	0	8
Julia Pfeiffer Burns SP (underwater area)	47	20	2	10	0	3	0	0	4	8
EFH 2 (Half Moon Bay)	44	20	10	10	0	0	0	0	0	4
CA Sea Otter Game Refuge	42	20	10	0	0	0	0	0	4	8
Overflight Restriction (Moss Landing)	42	20	10	0	0	0	0	0	4	8
Overflight Restriction (North Bay)	42	20	10	0	0	0	0	0	4	8
Overflight Restriction (South Site)	42	20	10	0	0	0	0	0	4	8
EFH 1 (Davidson Seamount)	40	20	10	10	0	0	0	0	0	0
EFH 2 (Point Sur Deep)	40	20	10	10	0	0	0	0	0	0
Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS	35	20	2	0	0	3	2	0	0	8
Ano Nuevo Point & Island ASBS	34	20	4	0	0	0	2	0	0	8
Carmel Bay ASBS	32	20	2	0	0	0	2	0	0	8
Julia Pfeiffer Burns Underwater Park ASBS	32	20	2	0	0	0	2	0	0	8
Point Lobos Ecological Reserve ASBS	32	20	2	0	0	0	2	0	0	8
Salmon Creek ASBS	32	20	2	0	0	0	2	0	0	8
Federal trawl closure at 700 fathoms	28	0	10	10	0	0	0	0	0	8
Non-Trawl RCA	28	0	10	10	0	0	0	0	0	8
Trawl RCA	28	0	10	10	0	0	0	0	0	8
Recreational RCA	24	0	10	0	6	0	0	0	0	8

Appendix 2. Management areas and their regulations pertaining to each of the nine criteria. The 51 management areas are listed in order of total score, from highest to lowest.

<i>Final Score</i>	<i>Permanent</i>	<i>Size Category (Km²)</i>	<i>Commercial Fishing Prohibited?</i>	<i>Recreational Fishing Prohibited?</i>	<i>Intake/ Dredging Prohibited?</i>	<i>Oil and Gas Prohibited?</i>	<i>Non-Extractive Uses Prohibited?</i>	<i>Adjacency to Other Protected Areas?</i>		
Big Creek SMR	82	Yes	10-100	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Montara SMR	82	Yes	10-100	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Piedras Blancas SMR	82	Yes	10-100	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Point Lobos SMR	82	Yes	10-100	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals. Restrictions on boating and diving.	Shares boundary
Point Sur SMR	82	Yes	10-100	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Asilomar SMR	80	Yes	0-9.99	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary

Carmel Pinnacles SMR	80	Yes	0-9.99	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Elkhorn Slough National Estuarine Research Reserve	80	Yes	0-9.99	All commercial fishing prohibited.	All recreational fishing prohibited.	No	No	No	Some. Pets, camping, biking, riding, boating, and fishing are prohibited.	Shares boundary
Elkhorn Slough SMR	80	Yes	0-9.99	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Lovers Point SMR	80	Yes	0-9.99	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Point Lobos SR	80	Yes	0-9.99	All. Commercial fishing prohibited.	All. Recreational fishing prohibited.	No	No	No	Some. No pets. Diving is limited. No introduction of new species or feeding animals.	Shares boundary
Egg Rock to Devil's Slide special closure	76	Yes	0-9.99	All. Only government employees allowed to enter.	All. Only government employees allowed to enter.	No	No	No	Some. Only government employees allowed access.	Within 10km
Moro Cojo Slough SMR	76	Yes	0-9.99	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Within 10km
Natural Bridges SMR	76	Yes	0-9.99	All. Take of all living marine resources is prohibited.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Within 10km
Elkhorn Slough SMCA	70	Yes	0-9.99	All. Take of all living marine resources is prohibited.	Some. Take of finfish by hook-and-line and clams allowed.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary

Cambria SMCA	66	Yes	10-100	All. Take of all living marine resources is prohibited.	None. All recreational take is allowed.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Ano Nuevo SMCA	62	Yes	10-100	Some. Commercial giant kelp harvest by hand allowed.	All. Take of all living marine resources is prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Big Creek SMCA	52	Yes	10-100	Some. Take of all living marine resources is prohibited except the commercial take of salmon, albacore and spot prawn.	Some. Recreational take of salmon and albacore allowed.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Greyhound Rock SMCA	52	Yes	10-100	Some. Only the following species may be taken commercially. giant kelp (by hand harvest only), salmon, and squid.	Some. The following species may be taken recreationally. giant kelp (by hand harvest only), squid, salmon, and, by hook-and-line from shore only, other finfish.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Pillar Point SMCA	52	Yes	10-100	Some. The commercial take of pelagic finfish* with troll fishing gear or seine, Dungeness crab by trap and market squid by round haul net.	Some. Recreational take of pelagic finfish by trolling, Dungeness crab by trap and squid by hand-held dip net allowed.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Point Lobos SMCA	52	Yes	10-100	Some. Allows commercial take of salmon, albacore and spot prawn.	Some. Allows recreational take of salmon and albacore.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Point Sur SMCA	52	Yes	10-100	Some. All take prohibited except for salmon and albacore.	Some. all take is prohibited except for salmon and albacore	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary

Portuguese Ledge SMCA	52	Yes	10-100	Some. Take of all marine aquatic plants, invertebrates and finfish prohibited, except pelagic finfish.	Some. No take of marine aquatic plants or invertebrates. Hook & line for pelagic finfish is allowed.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Soquel Canyon SMCA	52	Yes	10-100	Some. Take of pelagic finfish allowed.	Some. take of pelagic finfish allowed	No	No	No	Some. No introduction of new species or feeding animals.	
Carmel Bay SMCA	50	Yes	0-9.99	Some. Bull kelp and giant kelp allowed.	Some. Take of finfish by hook & line prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Edward Ricketts SMCA	50	Yes	0-9.99	Some. Bull kelp and giant kelp allowed.	Some. Take of finfish by hook & line prohibited.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
Monterey Bay National Marine Sanctuary	50	Yes	>100	None	None	Yes	Yes	Yes	Some. Aircraft, watercraft and species introductions are regulated.	Shares boundary
Pacific Grove Marine Gardens SMCA	50	Yes	0-9.99	Some. Allows commercial take of giant and bull kelp by hand.	Some. Allows recreational take of finfish.	No	No	No	Some. No introduction of new species or feeding animals.	Shares boundary
EFH 2 (Big Sur Coast/ Port San Luis)	48	Yes	>100	Some. Prohibited, except for demersal purse seiners.	None	No	No	No	None	Shares boundary
EFH 2 (Monterey Bay/Canyon)	48	Yes	>100	Some. Prohibited, except for demersal purse seiners.	None	No	No	No	None	Shares boundary
James M Fitzgerald Marine Reserve ASBS	48	Yes	0-9.99	Some. Take of mollusks, crustaceans and other invertebrates prohibited.	Some. Finfish may be taken by hook and line or spearfishing.	No	Yes	No	None	Shares boundary

State Waters trawl closures	48	Yes	>100	Some. Use of bottom trawl gear is prohibited in state waters and all of Monterey Bay.	None.	No	No	No	None	Shares boundary
Julia Pfeiffer Burns State Park (underwater park)	47	Yes	0-9.99	Some. Some invertebrate species may be taken commercially.	Some. Some invertebrate species may be taken recreationally. No take of marine plants.	Yes	No	No	Some. Scuba, hang-gliding or parachuting restricted.	Shares boundary
EFH 2 (Half Moon Bay)	44	Yes	>100	Some. Prohibited, except for demersal purse seiners.	None	No	No	No	None	Within 10km
CA Sea Otter Game Refuge	42	Yes	>100	None	None	No	No	No	Some. Overflight lower than 1000ft restricted.	Shares boundary
Overflight Restriction (Moss Landing)	42	Yes	>100	None	None	No	No	No	Some. Overflight lower than 1000ft restricted.	Shares boundary
Overflight Restriction (North Bay)	42	Yes	>100	None	None	No	No	No	Some. Overflight lower than 1000ft restricted.	Shares boundary
Overflight Restriction (South Sanctuary)	42	Yes	>100	None	None	No	No	No	Some. Overflight lower than 1000ft restricted.	Shares boundary
EFH 1 (Davidsons Seamount)	40	Yes	>100	Some. Commercial vessels fishing with bottom-contact gear or other gear deployed deeper than 500 fathoms are prohibited.	None	No	No	No	None	Farther than 10km
EFH 2 (Point Sur Deep)	40	Yes	>100	Some. Prohibited, except for demersal purse seiners.	None	No	No	No	None	Farther than 10km
Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life Refuge ASBS	35	Yes	0-9.99	None	None	Yes	Yes	No	None	Shares boundary

Ano Nuevo Point and Island ASBS	34	Yes	10-100	None	None	No	Yes	No	None	Shares boundary
Carmel Bay ASBS	32	Yes	0-9.99	None	None	No	Yes	No	None	Shares boundary
Julia Pfeiffer Burns Underwater Park ASBS	32	Yes	0-9.99	None	None	No	Yes	No	None	Shares boundary
Point Lobos Ecological Reserve ASBS	32	Yes	0-9.99	None	None	No	Yes	No	None	Shares boundary
Salmon Creek ASBS	32	Yes	0-9.99	None	None	No	Yes	No	None	Shares boundary
Federal trawl closure at 700 fathoms	28	No	>100	Some. Bottom trawl prohibited between 700 fathoms (1280 meters) and 1094 fathoms (3500 meters).	None	No	No	No	None	Shares boundary
Non Trawl RCA	28	No	>100	Some. All gear prohibited, except for bottom-trawl gear.	None	No	No	No	None	Shares boundary
Trawl RCA	28	No	>100	Some. Bottom trawl gear prohibited.	None	No	No	No	None	Shares boundary
Recreational RCA	24	No	>100	None	All. Restricts recreational fishing to 40 fathoms south of Pillar Point and 30 fathoms above it.	No	No	No	None	Shares boundary