



MPA Watch California Manual

*Citizen science initiative to monitor human
use of coastal natural resources*



MARCH 2015

Table of Contents

Contents

Table of Contents 2

 Introduction..... 3

 Purpose of the Manual..... 3

 Overview of MPA Watch 3

 Background on Marine Protected Areas 4

Statewide MPA Watch Coordination 5

 Technical Coordination..... 5

 Current MPA Watch programs..... 5

 Advisory Committee..... 5

 Governance of the MPA Watch Network..... 6

Key Elements of an MPA Watch Program 6

 Designing Your Monitoring Program 7

 Volunteer Training 12

 Data Collection, Management, & Reporting..... 13

MPA Watch Statewide Methodology 15

 MPA Watch Survey Protocol 15

 How to Conduct a Survey 15

 MPA Watch Complementary Survey Protocols..... 18

 Statewide MPA Watch Data Sheet 21

 Statewide MPA Watch Data Definitions 22

 Required and Recommended Practices 27

 Data Entry..... 29

 Volunteer Training 29

 Volunteer Supplies/Equipment 29

 Volunteer Training on Illegal Activities 29

 Volunteer Field Manual..... 30

 Training PowerPoint 30

 Transect/Map Design..... 30

 Volunteer Recruitment & Retention 31

Acknowledgements 32

Appendices..... 33

Introduction

Over 10 organizations in California are mobilizing hundreds of volunteers to contribute valuable data to help to understand human uses of coastal natural resources in marine protected areas (MPAs). These MPA Watch programs are a citizen science initiative that trains and supports volunteers in the collection of relevant, scientifically rigorous, and broadly accessible data. By involving local communities in this important work, MPA Watch programs inspire and empower stewardship, and educate citizens about California's ocean ecosystems. Creating an MPA Watch program of your own will help the success of marine protected areas and help conserve California's coastal resources.



listed below, also contributed to development of this manual. This document contains all the information necessary to build a program that recruits, trains, and manages volunteers in the collection of data in and around marine protected areas, in order to contribute data that keeps with the standards adopted by the broader MPA Watch network. We hope that this MPA Watch California Manual is helpful as you create your volunteer citizen science program to help monitor marine protected areas.

Purpose of the Manual

MPA Watch programs have been rapidly replicating throughout California since 2010. In past years, new programs borrowed materials from existing programs and adapted them for their region and local program. Since statewide MPA Watch coordination started in 2013, individual MPA Watch programs have banded together to unify survey methodology and other programmatic aspects. As a result, this master MPA Watch California Manual has been created as a guide for groups interested in starting up a new MPA Watch program, programs interested in refreshing their existing citizen science monitoring programs to align with statewide MPA Watch protocol, and for others interested to know what details are included in an MPA Watch monitoring program. This manual has been developed by the original two MPA Watch programs, The Otter Project and Heal the Bay, with technical support from California Ocean Science Trust, which leads the design and implementation of MPA monitoring for California. All existing MPA Watch programs,

Overview of MPA Watch

With the implementation of the [Marine Life Protection Act \(MLPA\)](#) and the required new network of MPAs, also came the task of monitoring if these areas are successfully meeting their goals. Organizations invested in the health of the California coastline began monitoring and collecting data in and around these areas. The MPA Watch program has been designed with the help of social and biological science experts throughout the state of California with the intention of collecting data on human activity and resource use. This data is meant to inform the management, enforcement, and science of California's marine protected areas (MPAs) and allow us to see how human uses are changing as a result of MPA implementation.

MPA Watch Statewide Program Goals:

1. To help determine how effective MPAs are at meeting their goal of enhancing recreational activities by tracking changes and trends of human use over time.
2. To provide contextual information on human use for interpretation of biological monitoring data.
3. To inform MPA enforcement and management decisions regarding human activity inside MPAs.

4. To train MPA Watch volunteers as stewards and effective public educators regarding MPAs.

Potential users of MPA Watch data include academia, natural resource management agencies, and local communities. A key focus for the program is to inform California's management of MPAs.



In addition to data-oriented goals, MPA Watch programs aim to involve local communities in learning about marine and coastal resources, and to inspire and empower ocean stewardship. We always welcome new volunteers to experience California's beautiful coastline while collecting data that will help protect our precious resources.

Background on Marine Protected Areas

Marine protected areas (MPAs) are marine or estuarine waters set aside primarily to protect marine life and associated habitat. The network of MPAs along the coastline of California was required by the Marine Life Protection Act of 1999 (Appendix J-vi.). MPAs exist at all levels of government, from National to local. For the purposes of this manual "MPA" will refer to the state-level protected areas. MPAs have varying levels of protections and allowed uses, from "no-take" zones to those that allow some take of marine life. Just as parks on land are designed to protect special lands and wildlife from over-development and hunting, these underwater parks are designed to preserve complete marine ecosystems for future generations to observe and enjoy.

While each MPA has its own unique set of permitted and prohibited uses, most MPAs fit into three

types:

1. State Marine Reserve (SMR) – Marine life completely protected in these no-take areas.
2. State Marine Park (SMP) – May allow some recreational take, but does NOT allow commercial take.
3. State Marine Conservation Area (SMCA) – May limit recreational and/or commercial take.

California's coast and ocean are among our most treasured resources. The productivity, wildness and beauty found here are central to California's identity, heritage and economy.

MPAs conserve biological diversity and protect a variety of marine habitats, communities and ecosystems for their intrinsic value, while allowing for human use of marine re-

sources. By protecting sensitive ocean and coastal habitats, marine life flourishes and, in turn, creates a healthier system overall.



Statewide MPA Watch Coordination

Technical Coordination

While MPA Watch programs all take a similar approach to measuring human use of ocean resources, there are also some differences across programs as a result of program size, total area covered, variation in regional characteristics or specific questions that are of interest to individual programs. MPA Watch programs collaborated with the Ocean Science Trust to enhance and expand the relevance and utility of the data collected by exploring differences, and where possible, aligning methods and protocols. Best practices, guidelines, and protocols for current and future locally-organized MPA Watch programs were developed to support MPA assessments and adaptive management; inform enforcement, compliance, and education efforts; and build social capital through engagement of local communities in statewide MPA Watch efforts. In addition, the resulting statewide database of human use activity can inform a variety of academic studies and other data needs unrelated to MPAs.

Current MPA Watch programs

Organizations currently training MPA Watch volunteers (2015):

- California Academy of Sciences (Marin County)
- Farallones Marine Sanctuary Association (San Mateo and Mendocino Counties)
- Heal the Bay (Los Angeles County)
- Lighthawk, air-based only (Southern CA)
- Los Angeles Waterkeeper, boat-based only (Los Angeles County)
- Orange County Coastkeeper (Orange County)
- The Otter Project (San Mateo, Santa Cruz, Monterey, & San Luis Obispo Counties)

- Point Reyes National Seashore (Marin County)
- San Diego Coastkeeper (San Diego County)
- Santa Barbara Channelkeeper, boat and land based (Santa Barbara County)
- The Bay Foundation, air-based only (Southern CA)
- West Marin Environmental Action Committee (Marin County)
- WiLDCOAST (San Diego County)

Advisory Committee

MPA Watch programs believe that it is important to secure, and effectively implement, expert input to demonstrate that MPA Watch products are accurate, reliable, and unbiased, and to ensure that processes are put in place to link these products to potential users. To this end, MPA Watch California has an Advisory Committee of individuals that collaborate with MPA Watch program partners to provide objective and expert support on ongoing scientific, technical and management needs.

The Advisory Committee is working to:

1. Provide advice and review of requested scientific, technical and management questions pertaining to MPA Watch practices;
2. Identify opportunities for MPA Watch data to address scientific and management needs and link with other relevant initiatives;
3. Inform synthesis reports designed to present MPA Watch results to stakeholders;
4. Help raise awareness and facilitate communication of MPA Watch activities in their; and relevant disciplinary and institutional setting.

The Advisory Committee is composed of individuals from key user groups (e.g., social science, natural science, and resource managers) that represent the wide set of interests in MPA Watch products based on either disciplinary experience

or institutional setting. This group has differentiated roles that map onto the questions which MPA Watch data are intended to answer, as well as the management needs they might fulfill. The MPA Watch network appoints representatives who staff the Advisory Committee and serve as a liaison between these experts and the MPA Watch programs.

Members as of January 2015 include:

1. Becky Ota, CDFW (natural resource manager)
2. Bob Puccinelli, CDFW (enforcement officer)
3. Cheryl Chen, Point97 (social scientist)
4. Christina Donehower, State Parks (natural resource manager)
5. Jenn Caselle, UCSB (biological scientist)
6. Ryan Vaughn, independent (social scientist)
7. Steve Murray, retired Cal State Fullerton (biological scientist)

To learn more about the Advisory Committee members visit the MPA Watch website (www.mpawatch.org).

The Advisory Committee has provided insightful feedback on a number of issues to date such as appropriate tools and standards for data analysis, and is poised to play an influential role in MPA Watch efforts. MPA Watch representatives work to set the agenda for Advisory Committee meetings, which take place approximately every three to four months.



Governance of the MPA Watch Network

Addressing issues such as communications, data analysis, QA/QC, branding and exploring partnerships is a daunting task for a single citizen science organization. While many agreements have been made regarding methods, QA/QC practices, and data management, among many other issues, there will be a need for continual adjustment and improvement over time. MPA Watch programs recognize these challenges and are working to put in place processes that can guide decision making in the future. Thus, one of the most important functions of a local MPA Watch program is participation in the wider statewide network. Solidifying this collaborative work, and sustaining the statewide network will require proactive communication and participation on the part of all programs, as well as leadership to ensure that the programs remain in alignment, and that they all have a voice in determining future adjustments and improvements to the MPA Watch approach.



Key Elements of an MPA Watch Program

While operating independently, California MPA Watch programs all collaborate on core elements and take a similar approach to measuring human use of ocean resources. All programs involve several key aspects such as carefully-designed survey sites and transect routes, volunteer classroom and field trainings, data collection and management, and standard quality assurance and quality control (QA/QC) practices. Inherent to any social science monitoring project is some level of error that affects the interpretation of the results. Researchers attempt to control for this error and enhance the confidence in their findings by introducing methods and protocols. Implementing technical strategies, such as QA/QC practices, can enhance the accuracy of monitoring outputs. Benefits gained must be weighed in the context other citizen science programmatic considerations such as the goals of the monitoring project and the availability of resources for implementation.

Key commitments of MPA Watch programs in California include:

1. Participation in the statewide MPA Watch Program
2. Data entry into the online database at mpawatch.org
3. Commitment to the goals outlined above
4. Commitment to follow the standards in this guide.

MPA Watch methods and protocols have been designed with these analytical and practical challenges in mind. The following sections address key issues for consideration when designing a strategy for collecting, recording and analyzing data. This knowledge comes from a range of sources, including literature in the social sciences, expert consultation including the MPA Watch Advisory Committee, application of these practices, and the resulting lessons learned by MPA Watch programs.

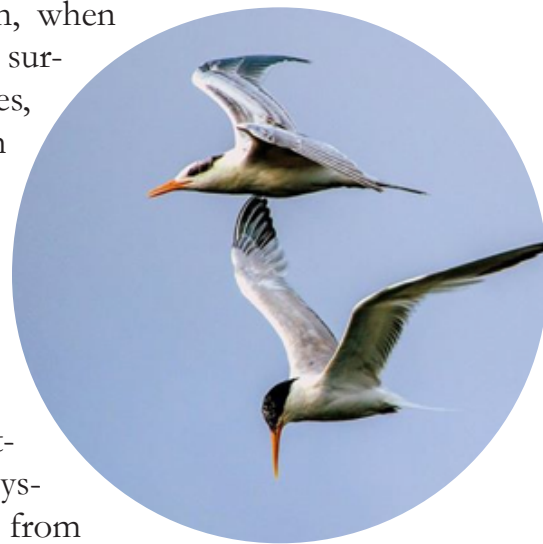
Designing Your Monitoring Program

MPA Watch program management takes place at the local level, administered by the local MPA Watch program. The considerations below offer guidance to programs in selection of transect routes, volunteer training, and program management. One of the first things a program should do is define their total coverage of the coast, understand where MPAs are, and make sure coordination is not overlapping with other MPA Watch programs. Defining sites, and transects within those sites, is a careful balance between practical and scientific considerations.

In addition, when

scouting survey routes, program managers will need to map and define methods of conducting surveys—such as from

a bluff, or walking along the beach. Program managers will also need to define transects with a specific start point and end point, and map them clearly in the local program's volunteer field guide so transect routes are easily findable, surveys can be completed accurately, and safety considerations such as tides are identified.



Where to Survey

A number of standard characteristics have been documented as important determinants in where people choose to go to the coast. These attributes can be used to understand the similarities and differences across potential survey sites. According to the social science literature, sites that

are similar in terms of the attributes listed in Table 1 will likely experience similar levels and types of human uses. It follows that the collection of data at one site can be extrapolated with the appropriate assumptions to estimate use at another site with similar characteristics.

This knowledge can help MPA Watch programs capitalize on effort by minimizing the collection of data at similar sites, with the acknowledgment that the activities and site attributes of interest may vary by program.

There are varying methods that can be used to identify the similarities and differences across survey sites. To date, existing MPA Watch survey sites have been evaluated for their similarities and differences using a method known as cluster analysis that attempts to group objects (site transects in this case) according to the similarity of the characteristics listed in Table 1 below.

Table 1. Key site attributes that influence coastal visitation patterns:

Attribute	Definition
Length	Length of site according to predefined values.
Width	Average width of the beach (back beach to the mean tide line).
Water Quality	Nearest Beach Report Card Grade on water quality.
Beach Type	Beach type (sandy/rocky).
Access	Type of access to beach.
Lot Parking	Presence or absence of lot parking.
Street Parking	Presence or absence of street parking.
Natural	Indicator of natural status. A natural beach is not groomed, and native vegetation is allowed to persist within the sandy area. Chosen from drop down.
Development	Indicator of development near the beach site. Development is indicated by the presence of residential or commercial construction visible from the shore.
Harbors/Marinas	Presence or absence of harbors and/or marinas in the site.
Jetties	Presence or absence of jetties in the site.
Camping	Presence or absence of camping availability at the site.
Boardwalk/Bike Path	Presence or absence of a beach boardwalk or bike path in the site.

Attribute	Definition
Lifeguard Stations	Presence or absence of lifeguard towers during the months of June - August.
Restrooms	Presence or absence of permanent bathrooms.
Surfing	Presence or absence of a well-known surfing destination in the site. If a report for a site is listed on surfline.com it is well known.
Diving	Presence or absence of a well-known diving location in the site.
Tide pooling	Presence or absence of well-known tide pooling location in the site.
Latitude/Longitude	Latitude and Longitude of the start and end points of the site, in decimal degrees.

Selecting Survey Sites & Transects

Once sites are identified, the path, or transect, on which volunteers will follow and record occurrences must be mapped. MPA Watch programs employ two basic approaches to defining these transects inside and outside MPAs.

1. Full coverage: Some groups divide entire MPAs into walkable transects that cover the entire MPA. Transects within the MPA may be defined by changes from rocky to sandy, or other features of the landscape that affect activity types.
2. Partial coverage: Other groups select one or more transects that cover only part of a given MPA.

When selecting survey sites for transects, it is important to take into account how existing MPA Watch programs have based their decisions, such as public access for volunteers, appeal to volunteers, length of survey route, terrain, likelihood of significant activity (or inactivity), and importance to local scientific researchers.

Because full MPA coverage is sometimes not achievable, MPA Watch programs may choose a subset of the MPA to sample. This choice is the

first and most important choice you must make when designing a sampling program. Some programs have transects paired with ecological monitoring sites (such as those surveyed by PISCO and Reef Check) to support integration with biological data. Also important is the choice of control sites outside of the MPA, if your program hopes to make inferences about causal effects of the MPA designation and compare inside/outside results.

Control/Reference Sites:

In addition to sites within MPAs, most MPA Watch programs also monitor control or reference sites outside of MPAs, with the goal of comparing activities and trends inside and outside of MPAs. The site attribute information in Table 1 above can help to define control sites for broad recreational comparisons, but there are other variables that programs may wish to consider. By surveying outside MPAs, control sites allow for useful comparisons of trends and changes in human use over time inside MPAs versus outside MPAs.

Considerations for reference site selection include:

1. Matching coastal use features: features similar to local MPAs such as public ac-

cess, parking lots, surfing spots, other infrastructure, or tidepools.

2. Candidate MPA sites not under protection: beaches and areas that were considered for placement of an MPA, but were not selected. Many of these sites have similar features and human use like nearby MPAs.
3. Matching other ecological research sites: Some programs have transects paired with PISCO and Reef Check monitoring sites to support integration with biological data.
4. Looking for edge effects: Some programs have transects abutting MPAs, which look for possible effects such as activities being “pushed out” of MPAs.

For now there is no standard protocol for defining MPA Watch reference sites. MPA Watch groups will continue to discuss these and other reference site options. The current goal is to agree on a few well-defined options for use of reference sites. If groups using reference sites have a very specific rationale, and a well-implemented approach, this will allow us to evaluate the efficacy of different approaches over time, and potentially move toward consistent, unified guidelines.

Additional Site Considerations:

Regardless of whether a program decides to have full or partial survey coverage of an MPA, a number of practical considerations should guide the definition of transects. Volunteers in citizen science include participants of different ages, and a range of fitness levels and physical attributes. With this in mind it is important to consider the accessibility to a site, terrain, and the distance covered. As a general rule, most MPA Watch programs design transects that can be covered

by a volunteer in approximately an hour or less. Although spatial design of survey routes varies by program and geography, to standardize survey techniques and control effort along a variety of routes, volunteers are trained to walk at a steady, somewhat slow pace while completing their observational MPA Watch surveys.

Standardizing the survey with temporal parameters (in addition to standardized training efforts and monitoring protocol) is intended to balance some of the variations between observers, making results comparable across MPAs and control sites.



When to Survey

Just as it is important to consider what parts of the coast are sampled, it is also critical to consider the temporal coverage of sampling. The activities on a stretch of coast are likely to vary by season, day of the week, and time of day.

They will also be influenced by weather, tides, and other shifting conditions.

Although volunteers are given flexibility in scheduling their surveys, they are encouraged to make an effort to cover a variety of times, weather conditions, and days of the week. It is likely that volunteer availability and preferences will provide initial results that are biased towards a certain time of day, day of the week, or weather conditions. Tide levels can influence activity, and seasons will also have to be considered, although this is relatively easy to incorporate into the data set after the fact. Open & closed fishing and harvesting seasons can also dramatically cause certain activities to increase or decrease.

Bias toward days with pleasant weather can diminish the credibility of statements about use over periods where there is variability in attributes contributing to selection. This bias can partial-

ly be addressed by collecting relevant meta-data (such as weather and tide conditions during the time of the survey which can be considered at later stages of data analysis), but sampling across the full range of conditions is also necessary. The most efficient method for securing this outcome is known as simple random sampling, whereby volunteers survey on a subset of days and times that have been selected at random. Random sampling can be conducted year-round or for the time periods that are considered most important. For example, is the weekend/weekday distinction most important to a program, or is the proportion of use within a specific season, say summer, the most important window?

While it is not a complicated matter to select this random subset of sampling times, many programs prefer to avoid specifying the exact dates and times that volunteers conduct their surveys, as it can deter volunteers from volunteering their time and create more work for the program manager. As an alternative approach to assigned or random sampling, some programs are monitoring submitted surveys to identify what times are overrepresented and/or underrepresented and where. Program managers are using this knowledge to identify where survey effort could be redirected or supplemented by more targeted MPA Watch surveys. Programs may supplement gaps in locations, dates, and times through more intensive MPA Watch surveys completed by interns, with the interns identifying temporal and spatial needs and targeting completing surveys then and there. All programs are encouraged to explore what works and share with the statewide MPA Watch Program for solutions and challenges on this front.



How Often to Survey

The goal of the MPA snapshot counts is to allow for significant and robust statistical inference on human uses. An approach to sampling that fails to account for a stratified population, and that depends only on simple random selection will very likely be biased. In order to translate the MPA Watch snapshot counts into credible statements about human uses it is critical that a sufficient number of surveys are conducted across each stratified observational windows.

Identifying the relevant observational windows, and determining survey targets (i.e., how often surveys should be conducted at a site across times, days and seasons) requires information on the user population. This is clearly “a chicken or the egg” dilemma as MPA Watch programs will generally have limited information on the user population at their survey sites at the start of their sampling program. To mitigate this MPA Watch programs should make educated assumptions about the user population by working with a qualified expert to analyze data across an initial calibration period (e.g., first six months of data collection).

In setting survey targets, MPA Watch programs must also consider the level of confidence they want an observer to have in a reported statistic. In general, the more surveys that are conducted across observational windows at a site, the more confidence one can place in the statistics generated from those data. Further, surveying at sites with large populations (total overall users overall or within a specific user group such as non-consumptive) is more likely to produce information that a researcher would have confidence in compared to surveying at sites with small popula-

¹See *MPA Watch Sampling Design manual* for an in depth discussion of margin of error and confidence levels.

tions, *ceteris paribus*. At sites that may never yield information that is statistically significant it may be advisable to rededicate program resources away from these sites unless it is determined that anecdotal data is of value to end users like the Department of Fish and Wildlife.

As an example, consider setting survey targets at site X for weekdays and weekends over a one-year period. Assume that site X has a large number of visitors on the weekends with a small variance in counts from week to week, and a small number of visitors during the weekdays, with a large variance in the count from week to week. This would require a relatively larger weekday sample than weekend sample at site X to ensure confidence in any generated statistics. The larger relative variance on weekdays makes the true weekday average harder to measure, and thus requires more visits to support statistical confidence. Conducting this many at any one site may not be feasible, especially if (at a site like X) weekdays are of lesser importance to weekends for policy makers. The higher the desired confidence, the larger the required sample size to achieve significance. The standard measure of confidence is the 95% level. This can often be onerous. In such cases as the 95% significance level is unobtainable we suggest you reduce your margin of error and confidence level to levels no lower than 80% and 20%, respectively.¹

As a resource, MPA Watch programs have access to an interactive table that they can use in Microsoft Excel to generate a simple random sampling plan, allowing the program manager to define observational window and confidence level of interest (see above). Because this table will depend on an estimate of the population size at each site, and most groups will not have access to this information prior to starting the surveying, at a minimum you should be able to sample

a site four weekdays and two weekend days per month.

Volunteers also commit to completing surveys regularly, but specific time and survey commitments vary from program to program (commitments range from two to eight surveys a month, typically).



Volunteer Training

All programs provide periodic volunteer trainings to train new volunteers and bring in additional data, to compensate for volunteers who decide to not continue past their initial commitment, and to ensure each monitoring site is surveyed continuously throughout the year. MPA Watch programs are encouraged to require all volunteers to attend a classroom and field training session before beginning to survey any monitoring sites. Program managers and instructors provide resources, go over protocols and procedures, and make sure the volunteer understands MPA Watch, as well as how to conduct a survey and enter data. Volunteers then accompany managers on their first survey to ensure maximum volunteer confidence before data is collected. Many programs also recruit and train university-level interns to complete more surveys and create a more robust monitoring program.

Data Collection, Management, & Reporting

Data Collection

The predominant approach to gathering data is to have MPA Watch volunteers to walk steadily along a predefined transect with clearly defined starting and ending points. When conducting a survey, MPA Watch volunteers count every person they see. Each person counted gets a tally in only one category (see the Quick ID Field Guide in the appendix or the table on Page 19 for a list of categories). The one exception is in the case of boats where each boat gets only one tally regardless of the number of people aboard.

A majority of programs conduct boating and aerial surveys on the shoreline or a bluff-top trail, though a few programs also collect data by air and boat (see page 18 for more information). As volunteers walk along a transect, they record people or boats and their specific activities at the moment they pass them. In other words, people and activities occurring in front of or behind the surveyor are not counted. This helps to prevent double counting as people and boats are often not stationary. Volunteers walk at a relatively even speed, though this is not always possible as there may be some areas that have a high number of users making the recording of observations more time intensive. Maintaining as constant pace as possible allows for a more even distribution of observations across space and time.

In some cases limited public access can prevent MPA Watch volunteers from walking along the shoreline or bluff-top. In these cases, volunteers stop at pre-defined vista points and scan the coast to document activities occurring across the defined area of observation. For all vista point observations, volunteers take the smallest amount of time needed to count all ac-

tivities.

When a person is observed, the activity they are engaged in at that moment is recorded. No judgment is made about what the person may have been doing, or intends to do. This avoids biasing the data. However, some data categories are observed as they begin or end such as someone just entering the water to dive, snorkel, kite-surf, or gearing up for these activities (see MPA Watch Core Definitions Table for further clarification). In those cases, the activity is counted if the person is actively getting ready to engage in the activity or coming out of the water. In other words, gearing up counts as part of the activity, but sitting on the beach next to the gear does not.

Activities are only recorded if the person or boat is inside the study area, or “countable” area. The countable area is defined by a shoreward boundary and seaward boundary, as well as the start- and end-points of the transect. The shoreward boundary is defined as the first occurrence of infrastructure or bluff/vegetation. Defining the seaward boundary is less straightforward. The seaward boundary is not uniform in distance

across all MPAs (e.g., in some cases the MPA boundary is one mile offshore and in other cases it is three miles offshore) and there are fewer distinguishable markers like restrooms or lifeguard towers that can help orient the observer. The only outlier is rod/reel fishing, where the fisherperson is outside the countable area and their line is inside the countable area. Depending on the geography of your survey sites, this is an exception that needs to be taken into account for volunteer training and logging data.

Development of clear and consistent guidelines for establishing a seaward boundary for the countable area is a work in progress for the statewide MPA Watch network. Programs are de-



termining how to best train volunteers to visualize this boundary and tally data accordingly. Furthermore, some environmental conditions (e.g., marine layer, ocean swell) make it challenging to accurately record observations at certain times. For now the seaward boundary is defined based on what works best for a given site and volunteer training, among other factors. Regardless of the approach taken, it is critical that each program documents its decisions so that the countable area for each site is known and used consistently. In consultation with experts, MPA Watch programs are evaluating options to ground-truth offshore observations.

MPA Watch Data Portal

All MPA Watch groups share the use of an online MPA Watch Data Portal developed by GreenInfo Network, and accessible at www.mpawatch.org. The MPA Watch Data Portal reduces the costs associated with data management, enhances quality control, widens and improves access to MPA Watch data, and allows volunteers to see the results of their work in a broader context. MPA Watch programs collectively share responsibility for stewarding this technological resource.

MPA Watch volunteers have the option to deliver their completed survey to the program manager for data entry, or log-in to the online MPA Watch data portal and input their data themselves if they have been properly trained. When a volunteer submits data to the portal, a message is then sent to the program manager to review and approve the submission. Programs must secure the original hand-written survey from the volunteer to perform QA/QC. The original paper survey can be submitted to program managers through the data portal by uploading a photo of their survey and including it as part of the submission, or

sending it to the program manager via email, fax, or postal mail.

Data Analysis & Reporting



MPA Watch programs currently develop their own reports, targeting key constituents. However, programs acknowledge that the credibility and utility of MPA Watch data hinge in large part on a common understanding about appropriate ways of analyzing, synthesizing, and communicating results, and that building capacity and a shared vision for regular analysis and standardized reporting of data is a crucial task in the near-term.

MPA Watch programs are working with the Advisory Committee to identify what the data can tell us, and, just as important, what it can't tell us. The analysis and reporting of MPA Watch data can take many forms, depending on the audience. The current focus is to advance a web-map viewer and supporting reporting features on the MPA Watch website to allow for data to be analyzed for multiple factors in real-time.

There are also opportunities for MPA Watch data to be integrated with existing human use and biological assessments (e.g., MPA Baseline consumptive and non-consumptive use, NOAA Coastal Use Atlas, PISCO and Reef Check) to simultaneously advance area-based monitoring and management and further establish MPA Watch as a rigorous scientific approach to monitoring within the fabric of existing human use data collection methods. Collaborative efforts are underway to develop additional capacity for MPA Watch integrated assessments to be conducted and shared with persons involved with MPA enforcement, management, and the social and biological sciences.

MPA Watch Statewide Methodology

Methodology for conducting a survey ensures that any well-trained volunteer will conduct observations and gather data in the same manner. Existing MPA Watch programs have agreed upon standardized protocols that promote consistency across the state.

MPA Watch Survey Protocol

The following protocol is designed for MPA Watch citizen science volunteers as the audience. It details the steps required to complete a survey including preparation & materials required, alignment on the coast, how to count activities and when, ending a survey route, and entering data into the Statewide website.

How to Conduct a Survey

1. Have all required materials are on hand before conducting a survey. This includes:
 - MPA Watch field guide/maps (survey protocol and directions for conducting the survey)
 - Data Sheets (one for each survey)
 - Binoculars
 - Clipboard
 - Writing Utensil
 - Watch
 - Compass (can use on smart phone) or GPS
 - Digital camera (encouraged but optional)
2. Fill out the top portion of the data sheet, writing in some of the metadata (Name, Date, Transect ID/Site).
3. Walk to the designated start point.
4. Write in the existing metadata (Start Time, Weather, Tide, etc.)
5. To begin the survey accurately, use a compass or GPS unit to orient yourself in the correct direction of the MPA boundary or transect boundary (see program field guide for site specific orientation directions).
6. Start walking the specified route your survey protocol describes, usually along the mean high tide line, observing and recording all people and boats on the beach or in the water. Do not count people on bluffs, trails, roads, or parking lots. The first occurrence of infrastructure or bluff onshore constitutes the shoreward boundary. The only activities you can count on trails or bluffs are active shore-based hook and line fishing, where the fishing line is touching the waters of the MPA or control site. In some cases limited access prevents volunteers from moving steadily along a transect route. Instead, they must visit pre-defined vista points and scan the coast to document activities occurring across a wide area. For all vista points, the time spent observing at each vista point should be the smallest amount of time needed to count all activities across the defined transect.
7. As you walk, record any activity in the appropriate categories when you pass the people doing that activity. For example, if you see someone surfing 50 feet ahead of you, do not count that activity until you pass the person who is surfing. People's activities may change from the time you first see them until the time you pass them, so to maintain scientific consistency, you should only record the activity you see them doing when you pass them. Count every single person you see, except in the case of boats (a boat gets one tally regardless of the number of people aboard). Each person or boat counted gets a tally in only one category. Also, do-

mestic animals are tallied separately from their owner. For example, if a man is walking his leashed dog down the beach, this counts as one “Beach Recreation” and one “Domestic Animal”.

8. Do not count any activity that is happening behind you. Only count activity that is happening between you and the stop point as you pass them. However, for example, if a person is running along the beach in the same direction you are walking and he passes you from behind, you should count that activity as running when he passes you (as long as you have not counted him earlier in the survey). Try not to double-count people if their activity changes.
9. All activities should be counted as you pass them and as they are happening. The only activities you can count if the person is not actively doing those activities in the water are surfing and SCUBA diving. If a person is in a wetsuit and is walking with his surfboard along the beach (and he has no other beach recreational items with him), it can be assumed that his only activity is or was surfing. The same can be assumed for a person walking along the beach in a wetsuit and SCUBA gear. However, if a person is next to a surfboard lying on the sand and he or she is in clothes or a bathing suit (NOT a wetsuit), you should count that activity as “beach recreation” because we cannot assume that his/her only activity is or was surfing.
10. Wildlife watching should only be counted if the activity is taking place on the beach or in the water- not on bluffs or trails. Wildlife watching is indicated by the use of binoculars or overt pointing and gesturing towards wildlife (such as whales, sea lions, etc.)
11. When recording consumptive boat fishing activities, make sure to properly mark if a person is inactive or active in the appropriate section of the data sheet. Active fishing is indicated by lines in the water, traps or nets set or pulled up from the water, and divers with fishing gear entering or exiting the water. Inactive fishing is when fishing gear is visible or present on board, but not baited, in the water, or being used. It is allowed for a person to transit through an MPA with fishing gear to areas where fishing is permitted as long as the gear is not baited or ready to be used to fish. Therefore, for example, we need to differentiate between a kayaker with a rod/reel on board who is legally transiting through an MPA, and a kayaker with a rod/reel that is actively fishing inside the MPA.
12. When you arrive at the end point, stand facing the ocean and use your compass or GPS to orient yourself in the accurate direction for the end of the survey. Imagine a line that extends out to the ocean as the border of the survey segment, and use this to accurately record only the activities within the survey area on your data sheet.
13. Write the end time at the top of the data sheet.
14. Total the tally marks in each individual box and circle the numbers when you finish your survey.
15. Begin your next survey on the next data sheet. You may survey the same area more than once a day, even immediately after your previous survey.
16. If you have been trained and approved for data entry, please log in to www.mpa-watch.org/portal to enter your data, and attach a photo or PDF of your data sheet to the survey online.
17. If you have not been trained and approved for online data entry, send your

data sheet to the local MPA Watch program administrator via an email attachment, fax, mail, or in person.

Reminders:

1. Each survey should take no longer than one hour (one direction).
2. Only mark the activity the person is actively engaging in.
3. Some surveys may have no activity – fill out data sheet with zeros and write “no activity”. These surveys are equally as important as ones that have plenty of activities recorded.
4. Fill out a separate data sheet for EACH transect surveyed.
5. **SAFETY FIRST!**
 - Do not compromise your safety to collect the data!
 - Be aware of people approaching you- be friendly, provide them with a general overview of what you are doing.
 - Do not approach people engaged in an activity- especially fishing, as you are taking observational surveys and do not want to influence behavior while conducting a survey, or put yourself in a controversial or dangerous situation.



MPA Watch Complementary Survey Protocols

While the majority of MPA Watch programs conduct surveys along the shoreline, there are a few programs that operate complimentary data collection programs by air and by water. These programs, which focus their data collection efforts on documenting ocean-going vessels, are able to cover more MPAs and reference sites in less time. They also provide the potential to validate land-based survey data when dates and times coincide. However, these programs are more resource intensive to operate, and as a result surveys are conducted at a lesser frequency than their shore-based counterparts. Currently aerial and boating programs are operating in the South Coast region, though existing or new MPA Watch programs may have an interest in exploring the adoption of these methods as well. Below is a description of the background and methods of the ongoing aerial and boating programs, and more information can be found in the appendices.

Aerial Surveys

Background

The Bay Foundation and LightHawk conduct aerial surveys of boating activities in state waters off of the mainland coast of Southern California, from Point Conception to the US-Mexico border. These surveys were initiated in 2008 by LightHawk and Santa Monica Baykeeper (now Los Angeles Waterkeeper), and contributed to the South Coast Marine Life Protection Act Initiative by providing stakeholders and decision makers

with a spatially explicit, fishery-independent dataset to help determine the locations for a network of MPAs. The aerial surveys continued after the implementation of the South Coast MPA network in 2012, and can now help to describe trends and responses in boating activities to the MPA network, namely from the fishing communities that have been restricted due to the MPA network.

Methodology

Aerial surveys collect spatially specific data regarding the distribution, type and activity of vessels operating in state waters. Small aircraft capable of high maneuverability and low speeds are used to fly directly over vessels while survey personnel record the location, vessel type, activity, and when possible, document with photographs. Depending on weather conditions, aircraft fly at an altitude of 500 to 1000ft (average elevation for pre-MPA equaled approximately 650 feet) and travel at 100 to 120 knots. Although high-wing aircraft are preferred because they allow more visibility below the aircraft, low-wing aircraft work well. The collection of data from small fixed-wing aircraft allow for a transect to be completed in approximately two to two and one half hours depending on number of vessels encountered.

The survey team consists of a pilot, spotter, GPS technician and photographer. Some of the planes are incapable of carrying a pilot plus three passengers; in this circumstance, the photographer role is adopted by the spotter. The spotter directs the pilots' flight path to intersect the vessels on the water, describes the type and activity of the vessel at time of contact and directs the GPS technician to enter a point and corresponding



Figure X. Survey team flying in a Piper Cherokee comprising; pilot (front left), spotter (front right), GPS technician (back right), Image collected courtesy of LightHawk.

information into the data capture system. When possible, the photographer captures a photograph of the vessel(s) to aid in post flight QA/QC, and for uploading observations to the project database. Due to the speed of the aircraft, rapid and accurate identification of vessels encountered on a transect is required. Therefore, the spotter, aided by binoculars or telephoto camera lens, must be familiar with the various boat types and boater activities in the south coast region.

This information is recorded by the GPS technician into one of the predefined categories (Commercial Fishing, Commercial Non-fishing or Recreational) in a GPS data dictionary (see appendices 2) along with observed vessel type and activity (underway, fishing or anchored/not fishing). Ideally, vessel positions are not logged until survey planes are directly overhead for highest spatial accuracy. In areas with high vessel density or restricted airspace, where logging vessels individually is infeasible, multiple boats may be logged to a single representative point and later extracted using GIS. After completion of the aerial survey, the GPS data are downloaded and exported into ArcGIS for analysis. Any photos taken of the vessels are linked to the

corresponding data points collected and used for post-flight QA/QC and training purposes. Once these data have been verified as accurate through QA/QC processes, the information is updated to the entire dataset from which maps and summary statistics are derived.

Data Analysis and Reporting

Currently, data are recorded in a database unique to The Bay Foundation, and these data are used to analyze trends in fishing activities and compliance with MPA regulations in the South Coast. There are ongoing discussions on integrating these data products into the MPA Watch website.

Boating Surveys

Background

Boat-based surveys are currently conducted in the South Coast region by LA Waterkeeper, and have been since the South Coast MPA network of MPAs were established January 1, 2012. At this time, Santa Barbara Channelkeeper also conducts boat-based surveys. These surveys focus on capturing all boating activity and all fishing from shore activities in defined transects inside and outside of MPAs.

Survey Crew Positions and Equipment:

- Boat Operator
- Data Scribe – Data Sheet and Writing Instrument
- Distance Finder Operator – Distance Finder
- Spotter - Binoculars
- Photographer - Camera
- GPS Unit Operator – Handheld GPS
- Ipad Data Scribe – Ipad or Tablet

Methodology

Transects are run at a speed of approximately 10 knots and roughly a half-mile from shore, and observations are made at a safe, unobtrusive distance from an observed vessel, moving to position the observed vessel on a heading directly North, South, East, or West from your vessel.



Figure Y. Part of the survey team comprising: data scribe (far left), GPS operator (middle left), spotter and distance finder operator (middle right), and photographer (far right)

For each vessel or onshore fishers the following are documented in the data tally sheet:

- The time of sighting is noted
- Your vessel's GPS position is noted
- The compass heading direction of the observed vessel from your vessel is noted
- The distance of the observed vessel from your vessel is noted
- *MPA coverage area is to three miles off shore if visibility allows. It is suggested that

if a violation is suspected, spending time and gas to get a closer look at vessel type, activity, and to possibly collect more accurate data be done on a case-by-case basis.

- The observed vessel type is noted, commercial or recreational, as are any onshore fishers
- The activity on the observed vessel is noted, as are activities of any onshore fishers
- The quantity of observed vessels or onshore fishers is noted
- Two Photos are taken of the observed vessel or fishers and that is noted
- *These photos are taken for categorizing and clarifying activity and vessel type. Identifying characteristics should be obscured before any public posting.
- Any additional comments, including violations observed and reported, as well as other observations are noted

Data Analysis and Reporting

Currently, data are recorded in a database unique to LA Waterkeeper and represented in Google Earth and GIS mapping products to demonstrate the extent and location of observed boating and fishing activities. There is ongoing work to integrate these observations into the MPA Watch information management system and the webmapper.

Statewide MPA Watch Data Sheet

MPA Watch Core Tally Sheet

Name(s):		Date: ____/____/____	Transect ID:
Start Time:	End Time:	Clouds: clear (0%) / partly cloudy (1-50%) / cloudy (>50% cover)	Precipitation: yes / no
Air Temperature: cold / cool / mild / warm / hot		Wind: calm / breezy / windy	Tide Level: low / med / high
Visibility: perfect / limited / shore only		Beach Status: open / posted / closed / unknown	

On-Shore Activities	Rocky	Sandy
Recreation (walking, resting, playing, etc. NOT tidepooling)		
Wildlife Watching		
Domestic animals on-leash		
Domestic animals off-leash		
Driving on the Beach		
Tide-pooling (not collecting)		
Hand collection of biota		
Shore-based hook and line fishing		
Shore-based trap fishing		
Shore-based net fishing		
Shore-based spear fishing		

Off-Shore Activities (Non-Boating)	
Offshore Recreation (e.g., swimming, bodysurfing)	
Board Sports (e.g., boogie boarding, surfing)	
Stand-Up Paddle Boarding (alternatively tally in paddle operated boat below)	
Non-Consumptive SCUBA and snorkeling	
Spear Fishing (free diving or SCUBA)	
Other Consumptive Diving (e.g., nets, poles, traps)	

Boating	Recreational		Commercial		Unknown	
	Inactive	Active	Inactive	Active	Inactive	Active
Boat Fishing - Traps						
Boat Fishing - Line						
Boat Fishing - Nets						
Boat Fishing - Dive						
Boat Fishing - Spear						
Boat Kelp Harvesting						
Unknown Fishing Boat						
Paddle Operated Boat (can separately tally stand-up paddle boarding above under board sports)						
Dive Boat (stationary - flagup)						
Whale Watching Boat						
Work Boat (e.g., life-guard, DFW, research, coast guard)						
Commercial Passenger Fishing Vessel (5+ people)						
Other Boating (e.g., powerboat, sail boat, jet ski)						

Comments
<p>Did you observe: <input type="checkbox"/> scientific research; <input type="checkbox"/> education; <input type="checkbox"/> beach closure; <input type="checkbox"/> large gatherings (e.g., beach cleanup); <input type="checkbox"/> enforcement activity</p> <p>Describe below and provide counts of individuals involved where possible, and whether it took place on rocky or sandy or sandy substrate.</p> <p>Did you report a violation: <input type="checkbox"/> yes <input type="checkbox"/> no If yes, how many violations did you report _____</p> <p>Who did you report the violation to (mark all that apply): <input type="checkbox"/> DFW <input type="checkbox"/> State Parks <input type="checkbox"/> other entity (e.g., lifeguard, harbor patrol)</p> <p>Which method did you use to report your violation (mark all that apply): <input type="checkbox"/> phone call <input type="checkbox"/> text <input type="checkbox"/> mobile app <input type="checkbox"/> website <input type="checkbox"/> email <input type="checkbox"/> in person</p>

Statewide MPA Watch Data Definitions

Effective coordination requires that MPA Watch programs use consistent categories to collect data, and consistent definitions of those categories. In order to standardize MPA Watch throughout the state of California, MPA Watch programs have agreed to the following definitions of activities. Some definitions are self-explanatory and some are very specific (i.e.: wildlife watching requires possession of a spotting scope or binoculars, NOT a camera). Almost all activities need to be witnessed objectively, and in real time, with the exception of on-shore fishing, surfing, and diving. Volunteers should be trained appropriately in spotting these activities.

Metadata	Definition	Note
Name(s)	First and last name	
Date	Month / Day / Year	
Transect ID	Name of transect	
Start Time	Time data collection begins	This could be different from the time you make your first observation.
End Time:	Time data collection ends	This could be different from the time you make your last observation.
Clouds	Clear (0%) / partly cloudy (1-50%) / cloudy (>50%cover)	
Precipitation	Yes / no	If there is the presence of precipitation anytime during the survey indicate “yes.”
Air Temperature	Cold / cool / mild / warm / hot	Automated temperature data from Weather Underground are linked to surveys submitted in the data portal.
Wind	Calm / breezy / windy	Automated wind data from Weather Underground are linked to surveys submitted in the data portal.
Tide Level	Low / med / high	Automated temperature data from Weather Underground are linked to surveys submitted in the data portal.
Visibility	Perfect / limited / shore only	
Beach Status	Open / posted / closed / unknown	

On-Shore Activities	Definition	Note
Rocky	If an activity occurs on a rocky shoreline.	Apply, where applicable, to ALL on-shore activities.
Sandy	If an activity occurs on a sandy shoreline.	Apply, where applicable, to ALL on-shore activities.
Recreation	Walking, hiking, running, resting, playing, sitting, camping, art, etc. Essentially anyone on the shore who does not fall into another category.	Does not include tide-pooling.
Wildlife Watching	Possession of binoculars or a spotting scope. NOT a camera. OR overt interaction with wildlife (e.g. pointing)	
Domestic animals on-leash	Dogs, horses	Count animals as individuals, and count people separately as recreation. Animals are assumed to be dogs. Note animals that are not dogs in the comments section.
Domestic animals off-leash	Mostly dogs	Count animals as individuals, and count people separately as recreation. Note animals that are not dogs in the comments section.
Driving on the Beach	Motorized vehicles, actively driving, or parked.	
Tide-pooling	Actively observing tide-pools -- standing on tide-pool areas is not enough.	Does not include collection of biota.
Hand collection of biota	Extraction into a bucket or other vessel of sand-crabs, kelp, or other tide-pool species.	
Shore-based hook and line fishing	Actively fishing with line in, casting, etc.	Including when fisherperson is outside of countable area, but fishing line is inside the countable area.
Shore-based trap fishing	Actively fishing with traps in, retrieving, etc.	
Shore-based net fishing	Actively fishing with net in, throwing, retrieving, etc.	
Shore-based spear fishing	Standing on-shore with a spear.	This includes poke-poling.

Off-Shore Activities (Non-Boating)	Definition	Note
Offshore Recreation	Swimming, wading, bodysurfing, etc. Essentially anyone in the water who does not fall into another category.	
Board Sports	Surfing/ Boogie Boarding, Kite Surfing/ Wind Surfing.	Does not include stand-up paddle boarding which is in paddle operated boats or separately tallied as its own off-shore non-boating activity.
Non-Consumptive SCUBA and snorkeling	Gearing up, entering or exiting the water.	This includes research, which can be noted in the comments field.
Do not count divers gearing up outside of the count area (e.g., the parking lot).		
Spear Fishing	Free diving or SCUBA gearing up, or coming out of the water.	
Other Consumptive Diving	Lobster, scallops, goodie bags. Observed take in bags as they come out of the water.	

Boating	Definition	Note
Recreational		Apply, where applicable, to all boat fishing categories (i.e., traps, line, nets, dive, spear).
Commercial		Apply, where applicable, to all boat fishing categories (i.e., traps, line, nets, dive, spear).
Unknown		Apply, where applicable, to all boat fishing categories (i.e., traps, line, nets, dive, spear).
Inactive		Apply, where applicable, to all boat fishing categories (i.e., traps, line, nets, dive, spear) and boat kelp harvesting.
Active		Apply, where applicable, to all boat fishing categories (i.e., traps, line, nets, dive, spear) and boat kelp harvesting.
Boat Fishing - Traps	Traps are visible on the boat.	

Boating	Definition	Note
Boat Fishing - Line	Rods and lines are visible on the boat.	
Boat Fishing - Nets	Nets are visible on the boat.	
Boat Fishing - Dive	Dive gear is visible on the boat.	
Boat Fishing - Spear	Spears are visible on the boat.	
Boat Kelp Harvesting	Harvesting gear is visible on the boat.	Assumed to be commercial.
Unknown Fishing Boat	Must be visual evidence that the boat is a fishing boat, but be unable to discern a gear type and if it is recreational or commercial in nature.	
Paddle Operated Boat	On the water, launching, or pulling out of kayaks, paddleboards, dinghies, canoes, etc.	Can separately tally stand-up paddle boarding above under board sports if you create its own separate row.
Dive Boat	Stationary – flag up	
Whale Watching Boat	Self-explanatory	
Work Boat	Lifeguard boats, enforcement, research, military, coast guard, etc.	This may also include local knowledge of vessels.
Commercial Passenger Fishing Vessel	5+ people visible on board	This may also include local knowledge of vessels.
Other	Any powerboat, jet ski, or sailboat, which is not obviously a work-boat.	

Comments	Definition	Note
Scientific research	Presence or absence of scientific research	Describe in comment field the nature of the activity and number of individuals involved where possible, and whether it took place on rocky or sandy or sandy substrate.
Education	Presence or absence of educational groups.	Describe in comment field the nature of the activity and number of individuals involved where possible, and whether it took place on rocky or sandy or sandy substrate.
Beach closure	Presence or absence of beach closure because of water pollution or some other issue like sensitive habitat.	Describe in comment field the nature of the activity, and whether it took place on rocky or sandy or sandy substrate.
Large gatherings	Presence or absence of large gatherings for a volleyball tournament, Junior Lifeguards, etc.	Describe in comment field the nature of the activity and number of individuals involved where possible, and whether it took place on rocky or sandy or sandy substrate.
Enforcement activity	Presence or absence of enforcement activity.	Describe in comment field the nature of the activity and number of individuals involved where possible, and whether it took place on rocky or sandy or sandy substrate.
Did you report a violation?	Yes, no	If yes, indicate number of violations reported.
Who did you report the violation to	DFW, State Parks, other entity (e.g., lifeguard, harbor patrol)	Mark all that apply.
Method for reporting violation	Phone call, text, mobile app, website, email, in-person	Mark all that apply.

Required and Recommended Practices

The reliability and credibility of MPA Watch data and analyses depend in part on the processes and protocols in place to ensure that all aspects of the program—especially those agreed upon by all members of the statewide network—are implemented correctly. Citizen science efforts stand to gain from adopting quality assurance and quality control (QA/QC) protocols that demonstrate to potential users the quality and reliability of the resulting data and analyses. However, these practices often need to be balanced with other considerations. For example, expert oversight of volunteers might improve the accuracy of observations, but would detract from the efficiency of the program and overall volunteer experience.

MPA Watch required and recommended practices (see Table 1) extend across most elements of the program, from training volunteers to producing and sharing results. All programs are required to do at a minimum some strategies, while other

measures are recommended as good practice, when feasible. In determining what protocols are required vs. recommended, specific thought was given to the operational and organizational consequences of implementation. For example, required prior expertise may limit the pool of potential volunteers while in-person oversight may require significant investment of resources.

MPA Watch programs have agreed on required and recommended practices. To arrive at these decisions individual programs engaged in a series of discussions comparing current practices and considering the feasibility and desirability of particular requirements, given the range of programs currently operation. The Advisory Committee reviewed the results of these discussions and provided additional recommendations. Results of this process is reflected in Table 1. Those practices and others are discussed further below. The table is a living document, to be updated as programs evolve and learn from experience.

Table 3. A list of practices that, for citizen science in general, can contribute to increased accuracy and reliability of data and analyses. MPA Watch required (blue) and recommended (green) practices are indicated in the 3rd and 4th columns.

Strategy	Definition	Required	Recommended
Prior expertise	Particular knowledge or experience required in order for volunteers to participate	MPA Watch participants are not required to have any prior expertise as a prerequisite for participation.	There is no recommended prior expertise to participate in MPA Watch.
Training	Required formal instruction before participation in the activity	MPA Watch participants will be required to participate in a training session. The training session could be online, in the classroom, or in the field.	It is recommended that MPA Watch participants take part in either an online or classroom training, and field training.

Strategy	Definition	Required	Recommended
Science Advising	Recognized experts provide guidance on the project design and implementation		
Ranking System	Volunteers advance through a hierarchy of roles, as they demonstrate improvement in skills and knowledge	MPA Watch programs are not required to implement a ranking system.	There is no recommended ranking system to be implemented by MPA Watch programs.
In-Person Oversight	Professionals accompany volunteers in the field to keep an eye on data collection	MPA Watch programs are not required to implement in-person oversight practices.	It is recommended that where feasible, there are periodic in-person check-ins in the field.
Re-training	Instruction or testing for volunteers to refresh or gain skills	MPA Watch programs are required to retrain their volunteers when major protocol changes are made at the statewide level.	It is recommended that MPA Watch programs re-train their volunteers (via refresher courses in the classroom, online or in the field) periodically to limit protocol drift.
Technological aids	Technology that standardizes practices and/or reduces error	MPA Watch programs are required to upload their data in the information management system.	It is recommended that volunteers use binoculars and compasses to support data collection.
Data Entry	A professional validates data once they have been collected	MPA Watch program managers or identified volunteers will review and approve data logged into the IMS.	It is recommended that MPA Watch programs work with science advisors and identified qualified personnel to establish IMS outliers.
Cross-comparison	Compare program data with data generated by professionals	MPA Watch programs are not required to cross-compare their data.	It is recommended that MPA Watch programs cross-compare their data when feasible techniques are available and identified as credible and cost-effective by the Advisory Committee.

Strategy	Definition	Required	Recommended
Data Sharing and Publication	Transparency and accessibility of data, and technical review of data or results	MPA Watch programs are not required to have their data reviewed. When reporting results to managers and the public, programs will indicate whether their analyses have been reviewed and in what form.	It is recommended that MPA Watch programs have their analytical questions and framework reviewed by qualified experts, including the Advisory Committee.

Data Entry

Some MPA Watch programs allow volunteers to enter data into the database, and others only allow trained volunteers or interns, or program managers to enter this data. A professional validates data once it has been entered into the database and cross-references the entry with the original data sheet. MPA Watch managers or identified volunteers will review and approve data logged into the IMS. It is recommended that MPA Watch programs work with the Advisory Committee and identified qualified personnel to establish thresholds for IMS outliers (these are determined by individual programs because each site has unique characteristics). For instructions on entering survey data into the IMS, please see the Volunteer Field Manual in the Appendix.

Volunteer Training

Currently, there are few requirements as to how volunteers should be trained. Table 1 shows several aspects of volunteer training, what is currently required, what is recommended, and thoughts for the future of MPA Watch training.

Volunteer Supplies/Equipment

MPA Watch programs are open to the community and general public, although many programs have age restrictions. Because most monitoring

sites require moderate hiking, volunteers must be able to spend at least one hour outdoors in unpredictable weather. Volunteers need to have access to public transportation or provide their own reliable transportation to get to and from survey sites. Volunteers are asked to use basic technology (i.e.: binoculars, GPS or compass, and digital cameras) and web tools to share and access materials and information. Volunteers are instructed on proper use of field technology and web tools in the MPA Watch volunteer training to ensure they are able to complete surveys, much of which is detailed in the Volunteer Field Manual.

Volunteer training on illegal activities

When a volunteer observes an illegal activity, they are discouraged from confronting the person due to both safety and influencing the data. Volunteers are giving their time to collect objective and accurate data; not to enforce regulations. A volunteer may decide to do nothing about an illegal activity. However, they can call the potential violation in to CalTIP, and individual MPA Watch programs can provide resources or local phone numbers in order to report violations.

To support programs in developing their own practices regarding violations, general guidelines, developed from discussions with enforcement officials at the CA Department of Fish and Wild-

life are provided below.

When you witness possible poaching or illegal activities in an MPA:

1. Do NOT confront the person
2. Position yourself in a safe place, or just continue with your survey (incognito-style)
3. Call 911 if a dangerous or emergency situation exists
4. The California Department of Fish and Wildlife (DFW) is the agency charged with management and enforcement of MPA regulations. It's up to you if you want to report poaching or polluting. If you feel comfortable, call 1-888-DFG-CalTIP (1-888-334-2258). CalTIP (Californians Turn In Poachers and Polluters) is a confidential witness program that encourages the public to provide Fish and Wildlife with factual information leading to the arrest of poachers and polluters.
5. Be prepared to give the fullest possible account of the incident including the name, address, age and description of the suspect, vehicle description, direction of travel, license number, type of violation and when and where it occurred.
6. For more information, go to: <http://www.dfg.ca.gov/enforcement/caltip.aspx>

Volunteers are also encouraged to take notes on any consumptive behaviors observed (e.g., a survey would include what was being collected and where [and potentially have a photo] if they observed "hand collection of biota").

Volunteer Field Manual

The Volunteer Field Manual is designed to be a

resource for new MPA Watch programs to customize for volunteers being trained with MPA Watch. This manual (Appendix) contains materials such as activity identifications, volunteer responsibilities, equipment checklists, monitoring protocol, maps of the MPA Watch program's specific transects, and more.

This is a neutral version of the manual, approved by all current organizations statewide. It includes the basic standardized requirements for volunteers, policies, and procedures. Each organization will need to input their location-specific maps, personalized forms, and procedures into their manual by spotting the highlighted areas and changing them to their specific organization's information.



Training PowerPoint

The Volunteer Training PowerPoint Presentation (Appendix) serves as a resource for MPA Watch programs when training their volunteers. It contains information on the Marine Life Protection Act, the science behind MPAs, where MPAs are in California, local MPA regulations, the goals of MPA Watch, the need for and purpose of human use data, the MPA Watch program protocol, identifying beach and ocean activities, and geographic training on local MPA Watch survey routes. Each organization will need to input their location-specific maps and volunteer requirements into the PowerPoint.

Transect/Map Design

In addition to selecting survey sites within MPAs, programs are also encouraged to design, using tools provided in the IMS, transect routes with detailed instruction for each route. Instructions are intended to provide every volunteer with a clear and concise, step-by-step protocol for each transect. These protocols should be easily avail-

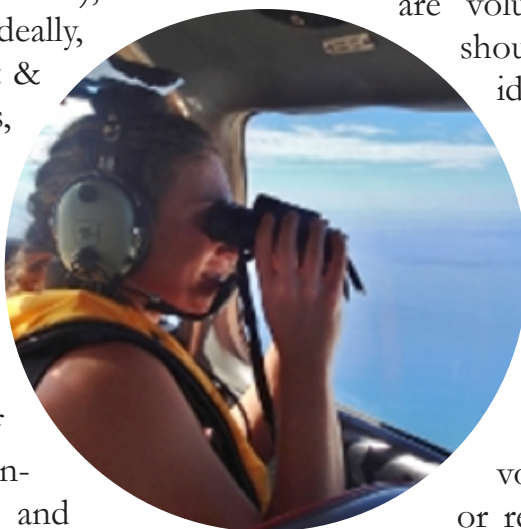
able for volunteers to refer to. Elements needed to incorporate into every transect protocol include:

1. Name, location (GPS markers), and map of survey site (Ideally, maps include start point & end point or vista points, and detail the route a volunteer will be walking/driving/using public transportation).
2. Description of the boundaries & background information of the MPA or site (this includes when to survey and when not to survey if specific conditions are necessary to survey or the area is potentially dangerous at certain times).
3. Parking or public transportation options, beach access, and bathroom locations
4. Detail about the survey site (i.e., is it an MPA? What are the prohibited/permitted uses?)
5. The starting point of the survey
6. Field notes (i.e. length of walk, safety advice, proper attire & equipment, etc.)
7. Detailed instructions of how to walk/drive-and-scan the survey
8. Reminders of procedures throughout the survey (i.e. use of compass or GPS, survey techniques, or potential obstacles/hazards).
9. Any other important information the volunteer would need to properly conduct the survey
10. The end point of the survey

Please see an example of a Survey Route in the Appendix.

Volunteer Recruitment & Retention

The key to any successful MPA Watch program are volunteers. Recruitment strategies should be evaluated regularly, to identify potential improvements in recruitment and retention. Each organization will have a different strategy for recruitment, based upon regional considerations, types of volunteers, and values of your community. Knowing your audience and following up quickly with volunteers are keys to recruitment or retention strategies. Understanding why your volunteers are giving their time and providing incentives can dramatically increase your retention rates. If your program needs some new ideas, see the Volunteer Recruitment or Volunteer Retention sections in the Appendix.



Concluding Remarks

MPA Watch data are contributing to the understanding of human uses of MPAs and the adjacent coastlines of California. Since the inception of MPA Watch, thousands of surveys have been completed by volunteers throughout the state. This data is essential in the management and understanding of MPAs and the conservation and protection of our oceans. We hope this manual will aid you in creating an MPA Watch program of your own, fine-tuning a current program you have, or setting a standard for the data collected in surveys through this program.

Acknowledgements

- The MPA Watch California Master Manual was constructed, updated, reviewed, and improved with the contributions and suggestions of the following people and organizations:
- The Otter Project: Jeanée Natov, Steve Shimek, and Mark Welden-Smith
- Heal the Bay: Dana Roeber Murray and Sarah Abramson Sikich
- Ocean Science Trust: Aaron McGregor and Ryan Meyer
- Orange County Coastkeeper: Ray Hiemstra
- WiLDCOAST: Diane Castaneda and Zachary Plopper
- Santa Barbara Channelkeeper: Penny Owens
- LightHawk: Lee Pagni
- Farallones Marine Sanctuary Association
- Los Angeles Waterkeeper
- GreenInfo Network
- Resources Legacy Fund
- USC Sea Grant

Funding Provided By: Resources Legacy Fund

Photo Credits: *Ana Luisa Abern, Mike Dooley, Bryan Murray, Dana Roeber Murray, Jeanee Natov, Penny Owens, Michael Quill, and others.*

Design Credits: *Sheana Brown*



Appendices

Core Data Sheet

Aerial Data Tally Sheet

Boating Data Tally Sheet

MPA Watch 2-page overview

Quick Field ID Reference Guide

Safety & Liability

Conducting & Submitting Surveys

Model Transects/Maps

Volunteer Recruitment & Retention

Sampling Strategy Design Manual

MLPA (1999)

*Volunteer Field Manual**

*Volunteer Training PowerPoint Presentation**



** For access to this content, visit <http://www.mpawatch.org>*



MPA Watch Core Data Sheet

Name(s):		Date: ____/____/____	Transect ID:
Start Time:	End Time:	Clouds: clear (0%)/ partly cloudy (1-50%)/ cloudy (>50%cover)	Precipitation: yes / no
Air Temperature: cold / cool / mild / warm / hot		Wind: calm / breezy / windy	Tide Level: low / med / high
Visibility: perfect / limited / shore only		Beach Status: open / posted / closed / unknown	

On-Shore Activities	Rocky	Sandy
Recreation (walking, resting, playing, etc. NOT tidepooling)		
Wildlife Watching		
Domestic animals on-leash		
Domestic animals off-leash		
Driving on the Beach		
Tide-pooling (not collecting)		
Hand collection of biota		
Shore-based hook and line fishing		
Shore-based trap fishing		
Shore-based net fishing		
Shore-based spear fishing		

Off-Shore Activities (Non-Boating)	
Offshore Recreation (e.g., swimming, bodysurfing)	
Board Sports (e.g., boogie boarding, surfing)	
Stand-Up Paddle Boarding (alternatively can tally in paddle operated boat below)	
Non-Consumptive SCUBA and snorkeling	
Spear Fishing (free diving or SCUBA)	
Other Consumptive Diving (e.g., nets, poles, traps)	

Boating	Recreational		Commercial		Unknown	
	Inactive	Active	Inactive	Active	Inactive	Active
Boat Fishing - Traps						
Boat Fishing - Line						
Boat Fishing - Nets						
Boat Fishing - Dive						
Boat Fishing - Spear						
Boat Kelp Harvesting						
Unknown Fishing Boat						
Paddle Operated Boat (can separately tally stand-up paddle boarding above under board sports)						
Dive Boat (stationary – flag up)						
Whale Watching Boat						
Work Boat (e.g., life-guard, DFW, research, coast guard)						
Commercial Passenger Fishing Vessel (5+ people)						
Other Boating (e.g., powerboat, sail boat, jet ski)						

Comments	
<p>Did you observe: <input type="checkbox"/> scientific research; <input type="checkbox"/> education; <input type="checkbox"/> beach closure; <input type="checkbox"/> large gatherings (e.g., beach cleanup); <input type="checkbox"/> enforcement activity</p> <p>Describe below and provide counts of individuals involved where possible, and whether it took place on rocky or sandy or sandy substrate.</p> <p>Did you report a violation: <input type="checkbox"/> yes <input type="checkbox"/> no If yes, how many violations did you report _____</p> <p>Who did you report the violation to (mark all that apply): <input type="checkbox"/> DFW <input type="checkbox"/> State Parks <input type="checkbox"/> other entity (e.g., lifeguard, harbor patrol)</p> <p>Which method did you use to report your violation (mark all that apply): <input type="checkbox"/> phone call <input type="checkbox"/> text <input type="checkbox"/> mobile app <input type="checkbox"/> website <input type="checkbox"/> email <input type="checkbox"/> in person</p>	



MPA Watch

Name _____ Date: ____/____/____ Transect ID: _____

Start Time: _____ End Time: _____ Clouds: clear (0%)/ partly cloudy (1-50%)/ cloudy (>50%cover) _____ Precipitation: yes / no _____

Air Temperature: cold / cool / mild / warm / hot _____ Wind: calm / breezy / windy _____

Visibility: perfect (>1mile)/ limited (>200 yds<1mi) / poor (<200yds) _____ Sea State: Calm Sea (0-2 ft) / 2-4ft swell; 4-6ft swell; Too rough to observe _____

MPA Watch Crew Names:

Vessel ID #	Time	Lat/Lon	Heading	Distance (yds)	Vessel Type	Vessel	Qty	Activity	# of Photos	Notes
1	N									
	W									
2	N									
	W									
3	N									
	W									
4	N									
	W									
5	N									
	W									
6	N									
	W									
7	N									
	W									
8	N									
	W									
9	N									
	W									
10	N									
	W									

Commercial Fishing		Commercial Fishing: Net Boats		Vessel Types		Activity		Comments	
Commercial Fishing	Commercial Fishing: Net Boats	Comm Non-Fishing	Recreational	Commercial Fishing: Net Boats	Commercial Fishing: Net Boats	Comm Non-Fishing	Recreational	Commercial Fishing: Net Boats	Commercial Fishing: Net Boats
CPV	Trawler	Passenger Boat (Ferry, Cruise ship)	Sport Fishing Boat	CPV	CPV	Passenger Boat (Ferry, Cruise ship)	Sport Fishing Boat	CPV	CPV
Lobster Boat	Purse Seiner	Oil Tanker	Power Boat	Lobster Boat	Lobster Boat	Oil Tanker	Power Boat	Lobster Boat	Lobster Boat
Trap Boat	Light Boat (squid)	Cargo Ship (Barge, Container)	Sailboat	Trap Boat	Trap Boat	Cargo Ship (Barge, Container)	Sailboat	Trap Boat	Trap Boat
Urchin Boat	Gillnet	Support Vessel (Tug, Tender)	Dive Boat	Urchin Boat	Urchin Boat	Support Vessel (Tug, Tender)	Dive Boat	Urchin Boat	Urchin Boat
Other	Other	Res-Mil-Enf (Science or Gov or Enf)	Shore Diving	Other	Other	Res-Mil-Enf (Science or Gov or Enf)	Shore Diving	Other	Other
		Charter (Whale, Diving, Ecotour)	On Shore			Charter (Whale, Diving, Ecotour)	On Shore		
		Other (Dredge, parasail, etc.)	Kayak			Other (Dredge, parasail, etc.)	Kayak		
			Jet Ski				Jet Ski		
			Other (SUP, canoe, etc.)				Other (SUP, canoe, etc.)		

Boat-based monitoring is currently being conducted by Los Angeles Waterkeeper.
For information, visit <https://lawaterkeeper.org/mpa-watch/>

Aerial Survey Data Tally Sheet

		Vessel Type
Vessel Categories	Commercial Fishing	CPFV
		Lobster Boat
		Trap Boat
		Urchin Boat
		Other
	Recreational	Sport Fishing Boat
		Power Boat
		Sailboat
		Dive Boat
		Kayak
		Jet Ski
		Other (outrigger, row boat, etc.)
	Commercial Non-Fishing	Passenger Boat (Ferry, Cruise ship, Party cruise)
		Tanker
		Cargo Ship (Barge, Container)
		Support Vessel (Tug, Tender)
		Res-Mil-Enf (All Science and Gov't Boats)
		Charter (Whale watching, Diving)
		Other (Dredge, parasail, etc.)
	Commercial Fishing Net Boat	Trawler
		Purse Seiner
		Light Boat
		Gillnet
		Other
Activity	Fishing	
	Underway	
	Not Fishing/ Moored	

The aerial monitoring project is a partnership between The Bay Foundation and LightHawk. For more information, visit www.santamonicabay.org.



MPA Watch 2-Pager

Background on MPAs

California's marine ecosystems are stressed and continue to face many threats such as habitat destruction, fishing pressure, and pollution. Several fish stocks have crashed statewide, causing many fisheries to be closed or severely limited. As a valuable tool for both ecosystem protection and fisheries management, Marine Protected Areas (MPAs) will help replenish these depleted populations. MPAs have shown to be effective in parts of California, the Florida Keys, New Zealand, and other areas of the world. In 1999, California adopted the Marine Life Protection Act (MLPA) requiring the implementation of a science-based statewide network of MPAs implementation. This law includes conservation goals focused on ecosystem protection, natural diversity and habitat protection.



What is MPA Watch?

MPA Watch is a citizen science monitoring program that trains volunteers to monitor human uses of coastal natural resources by training and supports volunteers in the collection of relevant, scientifically rigorous, and broadly accessible data. Data are meant to inform the management, enforcement, and science of California's marine protected areas (MPAs) and allow us to see how human uses are changing as a result of MPA implementation. By involving local communities in this important work, MPA Watch programs inspire and empower stewardship, and educate individuals about California's ocean ecosystems. MPA Watch volunteers collect data from both within and outside MPAs, allowing for useful comparisons. The California Ocean Science Trust (OST) is collaborating with MPA Watch programs throughout California to enhance and expand the relevance and utility of the data collected by MPA Watch programs, and coordinate between programs and regions.



Goals

1. To help determine how effective MPAs are at meeting their goal of enhancing recreational activities by tracking changes and trends over time.
2. To provide contextual information on human use for interpretation of biological monitoring data.
3. To inform MPA enforcement and management decisions regarding human activity inside MPAs.
4. To train MPA Watch volunteers as effective public educators regarding MPAs.

Methods

MPA Watch volunteers walk along California's beaches and bluffs surveying and recording all offshore and onshore coastal activities within and outside MPAs. Volunteers are trained to recognize different types of activities, using binoculars to view activities offshore, and to record what they see on data sheets. Examples of activities that volunteers record include consumptive activities such as commercial lobster fishing and shore fishing, and non-consumptive activities such as swimming, SCUBA diving, and wildlife watching. Volunteers are trained to use compasses to accurately begin and end their surveys, as well as to identify MPA boundaries. All data that is collected undergo rigorous quality assurance and quality control protocols by coordinating organizations before being accepted and shared.

MPA Watch Data

Potential users of MPA Watch data span academia, natural resource management agencies, and local communities. A key focus for the program is to inform California's management of MPAs. Data are meant to inform:

- Management
- Enforcement
- MPA Science
- How are human uses changing as a result of MPA implementation?

Growing Statewide Network

Groups that are currently training MPA Watch volunteers:

- Heal the Bay
- Los Angeles Waterkeeper
- Marin Environmental Action Committee
- Orange County Coastkeeper
- The Otter Project
- San Diego Coastkeeper
- Santa Barbara Channelkeeper
- WILDCOAST

For more information, visit www.mpawatch.org.



Shore Fishing

Rules of thumb

Remember the following rules:

- Only record ACTIVE fishing
- People carrying fishing equipment that is not in active use are recorded in another category (beach recreation)

Classification: Shore-based trap fishing

Common types: Crab, lobster, & fish traps

What to look for:

- People setting enclosed mesh systems (may be a cube, cylinder or other shape) into shallow water

Classification: Shore-based spear fishing

Common types: Pole spear, spear gun, poke polling, clam digging

What to look for:

- Hand-held equipment used to spear/dig in both the sandy & rocky intertidal areas
- SCUBA or freediving equipment (wetsuits, fins, etc.)

Classification: Shore-based net fishing

Common types: Cast nets

What to look for:

- People throwing a net by hand into a body of water

Boat Fishing

Rules of thumb

Look for indicators that the vessel is actively fishing:

- Make sure to properly mark if active or inactive fishing
- Active fishing: lines in the water, Davit arms lowered, traps being set or pulled up
- Sea birds in great numbers following a vessel
- Equipment being let out or retrieved either by deck hands, onboard systems or small support boats

Classification: Boat fishing-Traps

Common types: Lobster, Crab

What to look for:

- Pots or cages stacked onboard the vessel with fluorescent marker buoys
- A block system on the side of the boat used to haul the traps out of the water

Classification: Boat fishing-Nets

Common types: Squid, Purse Seiner, Trawler

What to look for:

- Large spools of netting
- Small support boats helping draw out long, fluorescent lines that float on top of the water
- Davit arms in a lowered position on either side of the vessel with nets hanging in the water
- 'V' shaped wake lines occurring separate from the vessel

Classification: Boat fishing-Lines

Common types: Troller, Long Line

What to look for:

- Surface floats trailing out behind the vessel along trailing lines
- Long davit arms with trailing lines attached to surface floats
- Multiple pulley block systems & lines looped together

Classification: Boat fishing-Dive

Common types: Urchin, cucumber, lobster

What to look for:

- Divers bringing traps, nets, or single catches to the surface
- Collection bags, big buoy, divers on a dive boat or fishing boat
- A dive flag (reddish/orange with white diagonal stripe)
- Coiled air supply line on vessel— yellow, orange, or black

Classification: Whale Watching boats

Common types: Depends on region

What to look for:

- Breaching whales, spouts, etc.
- Groups of sightseers onboard, often with cameras and binos

Classification: Commercial Passenger Fishing Vessel (5+ people)

Common types: Charter/Sport fishing boat

What to look for:

- Vessel ID # and signage on the sides of the boat
- Multiple people on board (5+) with rod/reel fishing gear
- Birds often following vessel



Shore-based trap fishing



Shore-based spear fishing (pole spear)



Shore-based spearfishing



Shore-based spear fishing



Shore-based net fishing



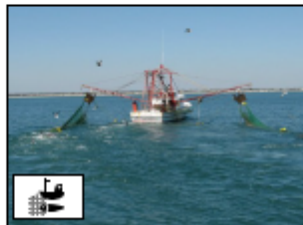
Boat Fishing-Traps (Crabs)



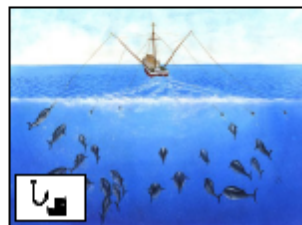
Boat Fishing-Traps (Lobster)



Boat Fishing-Nets



Boat Fishing- Nets (Trawl)



Boat Fishing-Lines (Trolling)



Boat Fishing-Lines (Trolling)



Boat Fishing-Dive (Cucumber)



Dive boat flag



Other Consumptive Diving



Boat fishing—Dive (urchin)



Whale watching Boat



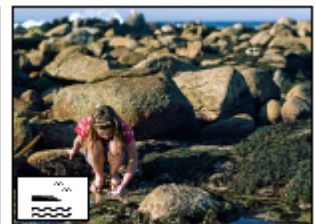
Whale watching



Commercial Passenger Fishing Vessel


































Hand Collection of Biota (note use of bucket or bag)



Tidepooling (NO collecting)

MPA WATCH—QUICK FIELD REFERENCE GUIDE

Onshore Activities		What to look for
	Recreation	Walking, hiking, running, resting, playing, sitting, camping, art (NOT TIDEPOOLING)
	Wildlife Watching	Possession of binoculars or a spotting scope OR overt interaction with wildlife (e.g. pointing)
	Domestic animals on-leash	Dogs, horses, etc. Count animals as individuals, and count people separately in recreation
	Domestic animals off-leash	Mostly dogs, but could apply to other domestic animals. Note non-dogs in the comments section.
	Driving on the Beach	Motorized vehicles, actively driving, or parked on the sand. (Lifeguards, Beaches & Harbors vehicles)
	Tidepooling	Actively observing or non-collecting interaction with tidepools
	Shore-based hook and line fishing	Actively fishing. Line in the water, casting, etc.
	Shore-based trap fishing	Actively fishing. Hoop nets being deployed from shore (rocks, likely)
	Shore-based net fishing	Actively fishing. Net in, throwing, etc. See reverse for a picture reference
	Shore-based spear fishing	Spear fishing from shore (includes poke-poling & clam digging). See reverse for a picture reference
	Hand Collection of biotic material	Extraction into a bucket or net— may typically occur on rocks, tidepools, or for sand crabs
Offshore Activities (Non-Boating)		
	Board Sports	Surfing, Boogie Boarding, Kite Surfing, Wind Surfing
	Stand-up Paddle Boarding	Stand-up Paddle Boarding
	Swimming/Bodysurfing	Swimming, wading (knees or deeper), bodysurfing, etc.
	Non-Consumptive SCUBA and snorkeling	In water, gearing up, entering or exiting the water— no collection of biota and no fishing gear
	Spear Fishing (free diving or SCUBA)	In water, or gearing up, entering or exiting the water with observed spear gun
	Other Consumptive Diving	Possession of marine life (lobster, scallops, etc.) and/or presence of goodie/net bags.
Boating		
	Boat Fishing - Traps	Boat with occupants setting or hauling in traps. Can be square traps (commercial) or hoop nets.
	Boat Fishing - Line	Boat with occupants using rod/reel systems. See reverse for a picture reference
	Boat Fishing - Nets	Boat using net system to fish. Davit arms at 45 degree angle, tow lines, 2 boats setting purse seine
	Boat Fishing - Dive	Boat with occupants collecting resources from dive operations. Big buoy, round nets, coiled air lines
	Boat Fishing - Spear	Boat with occupants collecting resources using spear equipment. See reverse for a picture reference
	Boat Kelp Harvesting	Boat with occupants harvesting kelp. See reverse for a picture reference
	Unknown Fishing Boat	Visual evidence that boat is fishing, but unable to discern gear type— try to get vessel ID #
	Commercial Passenger Fishing Vessel	5+ people visible on board, look for vessel ID # (or local knowledge of vessels).
	Paddle Operated Boat	On the water, launching, or pulling out. (includes kayaks, dinghies, canoes, etc.)
	Dive Boat	Stationary with a flag up. No presence of fishing gear (nets, traps, etc.)
	Whale Watching Boat	Passengers observing marine life (dolphins, whales) - can be 2 levels or 1 on boat, binos, cameras
	Work Boat	Including lifeguard boats, enforcement, research, military, coast guard
	Other Boating	Any powerboat, jet ski, or sailboat, which is not obviously a work-boat
	Other	This is for things volunteers note as important, but which are not accommodated by the data sheet