

Getting Involved in Caring for Hawaii's Coastal Resources

A COMMUNITY GUIDEBOOK



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# GETTING INVOLVED IN CARING FOR HAWAII'S COASTAL RESOURCES

*a Community Guidebook*



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This document is available online for download at DLNR-DAR's website at: <http://www.hawaii.gov/dlnr/dar/index.html>

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## HO'OKULEANA - TO TAKE RESPONSIBILITY

“Ho'okuleana” (it means “to take responsibility”) is the theme of the Department of Land and Natural Resources’ (DLNR) outreach efforts that strive to involve communities and constituencies in assisting in the protection of our natural and cultural resources.

In a single word, “Ho'okuleana” is focused on “responsibility” – our individual and collective responsibility to:

- » participate – *rather than ignore*;
- » prevent – *rather than react*; and
- » preserve – *rather than degrade*.

This is not really a “program,” but, rather, an attitude we want people to share about resource management and protection.

No one constituency, no one community, no one resource management entity has the sole responsibility for and jurisdiction over the resources. Each of us shares that responsibility.

A goal of the “Ho'okuleana” perspective is to help encourage local community members to support DLNR in education, regulation and observation to protect natural and cultural resources.

What each of us does every day affects Hawaii’s environment. If we want Hawaii’s resources to remain healthy, we must each make a personal commitment to protect and care for them.

Each of us shares in the responsibility of wise stewardship and conservation of our resources.

DLNR is tasked with immense responsibilities and recognizes that it cannot accomplish its mandate alone – DLNR needs the cooperation and participation of others to get things done.

DLNR has management, maintenance and oversight over (among others):

- 1.3 million acres of State-owned lands
- 1.9 million acres of “Conservation” lands
- Historic preservation programs
- Freshwater and stream resources
- Endangered plants and animals
- 800,000 acres of Forest Reserves (the nation’s 11th largest state-owned forest)
- 750 miles of coastline (the country’s 4th longest ocean coastline)

- 3 million acres of near-shore waters
- 410,000 acres of coral reefs in the Main Hawaiian Islands
- Ocean recreation management areas
- Hunting and fishing activities
- 69 state parks, sites and monuments
- 21 small boat harbors and 50-launch ramps
- And much, much more.

Our natural and cultural resources are not just historic sites, ocean, streams, mountains, trees, birds and fish.

They are the foundation of our quality of life and backdrop for our economy. Our natural and cultural resources define Hawaii’s “sense of place.” They make and keep Hawai’i, Hawai’i.

There is urgency today to reconnect Hawaii’s people with the health of the resources and environment.

Resource protection is not about us and it’s not about now – it is about protecting and preserving our natural and cultural resources for the generations to come, for people we will never meet.

“Ho'okuleana” is based on the context that the active participation of communities and constituency groups is a critical element in community health and safety -- not through vigilantism or exclusion, but simply through a willingness to help prevent wrong-doing through presence and education, look out for suspicious activity, care for the resources and report inappropriate activity to law enforcement and to each other.

“Ho'okuleana” serves as a vehicle in helping people “make a difference” in their own community, for now and for years to come. *It is our responsibility.*

Peter Young, Chairperson  
State of Hawai’i Department of Land and  
Natural Resources



## HOW TO USE THE COMMUNITY GUIDE

### SECTION 1 | INTRODUCTION

**Why should I get involved?** In this section you'll learn about why community based management is needed in Hawai'i due to threats to the marine environment, and lack of available resources to help manage and monitor our marine environment. It outlines what happens when a community becomes more involved. If you are not ready to organize a community group, there are some options listed in this section for you.

### SECTION 2 | GETTING STARTED

**What you need to know.** If you've decided to start a community based project, read this section first to find out what's involved. This section will give you some guidelines on who to contact, setting goals and objectives and how to develop your community program. You'll find out how to identify and prioritize projects, identify threats, develop an action plan, finding funding as well as safety and liability concerns.

### SECTION 3 | ACTIVITY TYPES

**What are some of the projects I can get involved with?**

**What will work best with my program?** This section lists out four types of projects- Awareness/outreach, Observation and voluntary compliance, Monitoring (biological, human use, marine animals, water quality) and other ways to get involved (alien algae cleanups, beach cleanups, etc).

#### Activity Pages Layout

**What is a {topic title}?** This tells you what the project is, and what is involved.

**Why use a {topic title}?** This part tells why this project is useful, where the problem lies and/or the benefits of using this approach.

**Overview.** This section gives an overview of what the project entails and some general steps in completing the project.

**Methods.** Some sections may have a methods section, which lists protocols or procedures.

**Example from the field.** Some sections that don't have case study references may give you a short description from another organization that has used this activity.



**Pros.** This section gives you some reasons for taking on this project.



**Cons.** This section gives you some reasons why you may not want to take on this project.



**Tips.** This section gives you some tips from the field on how to proceed with the project, some unique ideas, or some "don't forget to do" tips. It includes some keys to success with your project.



**Checklist.** The checklist gives a list of some of the tools that you may need for this project.

#### For More Information






**Related activities.** This part tells you what other activities are similar or may work in conjunction with this project.

**Additional resources.** Here are some other resources for you to use, found in Appendix D, other resources.











**Case Studies.** Take a look at this case study in Appendix A to find more detail on this project.

**Contact.** Who you can contact for more information.

**What the symbols in the table represent.** This guide gives you a quick glance at what are the basics needed for the project: the number of people, funds required, amount of training required (in hours, per person), and type of tools needed.

Number of People Required (for each project)	 1-3
	 4-10
	 11-20
	 20+
	 Activity for/geared towards keiki



Amount of funds required	 \$0-\$100
	 \$101-\$500
	 \$501-\$2,500
	 \$2,501-\$5000
	 \$5,000+
Amount of training required (time required per person)	 0-2 hours
	 2-5 hours
	 5-10 hours
	 10-20 hours
	 20+ hours

### Types of Tools Required

	Simple – pencils, clipboard, paper, bags
	Electronic – computer related, cameras, video recorders
	Electric Tools – drills, mooring buoys
	Manual Tool – hammers, saws, wrench
	Test Kits – water quality
	In Water Equipment – SCUBA, snorkel, fins, mask
	Expert Needed

## SECTION 4 | APPENDICES

### Appendix A – Where can I find information on other programs?

It is helpful to see how others have developed their program, where their funding comes from, keys to success, obstacles faced as well as contact information. You'll see references to these case studies throughout this guidebook.

**Appendix B – Who can help me?** This section gives a list of local and federal organizations that are involved in marine resource conservation. It is organized by type of organization- nonprofit, local agencies, educational facilities, and federal agencies.

**Appendix D – What are some other resources?** In this section you'll find contact information for resources mentioned in section two, as well as additional resources in helping you start your program. This includes documents, books, internet resources, businesses or information on other volunteer programs.

**Appendix E – How do I fund my project? Where can I find help?** This section gives a list of grant opportunities as well as some general resources to various funders and assistance in writing a grant proposal.

**Appendix G – I'd like to have a brief summary about marine resources in Hawai'i.** This section provides a brief overview about Hawaii's marine resources, the history, threats, Hawai'i geology and Hawai'i species.

**Appendix H – What can I do on a daily basis to improve the health of our environment?** This section lists some ways that you can reduce your impact on the environment. You can also use these tips when distributing educational material to others.

**Appendices C, F, I – Where are some sample forms? What types of regulations should I be familiar with? I don't know what that word means.** These sections include sample forms used by organizations mentioned in the project and case study sections, a brief summary of state and federal regulations and a glossary of common terms.



SECTION ONE

*Introduction*

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## INTRODUCTION

### MAUKA TO MAKAI

Mauka (toward the mountains) and makai (toward the ocean) are not just directional references; they embody our fundamental natural and cultural resources, land and ocean. Hawaiians believe there is a balance between ocean and land. In traditional times, the ocean and its marine life were as well known as the life attributes of the upland areas. This intimate relationship with nature resonates today in the modern principle of sustainability. We continue a strong interconnected, interrelated and interdependent relationship with our natural and cultural resources. Some call it ecosystem-based stewardship. To Hawaiians, this was exemplified in the ahupua'a, an ancient land division system divided into strips of land from the mountain to the sea, supporting self-sustained communities. The legacy of the mountain-to-sea management system and ecosystem-focused sustainability continues today. Living on islands requires a balance between addressing human needs and protecting natural and cultural resources. We must hold our islands in good stewardship for the generations to come.



Photo provided by Carl Berg, Hanalei Watershed Hui

### TODAY – THE NEED FOR COMMUNITY BASED MANAGEMENT

Despite significant State and Federal marine resource management programs in Hawai'i, the condition of marine resources has generally degraded in the Main Hawaiian Islands over the past 20 years. According to the *Status of Coral Reefs in the World* report (Friedlander et al, 2005), while Hawaii's reefs are in better condition than that of the worlds, urban areas and embayments are threatened by



Hanauma Bay, O'ahu

land based pollution, fishing pressure, recreational overuse, and invasive species.

#### Threats

**Land based pollution** – Construction along coasts, inshore construction, agricultural production, and overgrazing by feral goats, pigs and deer along coastal streams combined with natural events can all increase erosion. Much of this development occurs on wetlands, which serve as natural filters for pollutants. An increase in development also leads to an increase in impervious cover, which decreases the amount of water and pollutants that the ground can naturally absorb, thus resulting in more urban runoff. As a result, particles end up in the ocean and cover coral reefs. This 'smothers' coral and deprives it of the light it needs to survive.

**Fishing pressure** – The numerical density, size and biomass of fish that inhabit shallow reefs are dramatically lower in the Main Hawaiian Islands compared to the remote and lightly fished Northwest Hawaiian Islands (Friedlander and DeMartini, 2002). In Hawai'i, inshore commercial fishing catch rates are declining and the majority of people who fish believe that fishing is not as good as it used to be and there are less fish than 10 years ago (Hawai'i Division of Aquatic Resources, unpublished data).

**Recreational overuse** – From 1984 to 2004, there has been a 43% increase in tourism, which represents an increase of over 2 million visitors. Almost 40% of these visitors went snorkeling or diving (DBEDT, 2004). This places additional pressure on marine resources, as many visitors seek calmer



Ta'ape, Photo © James Watt

waters; these areas generally have very few facilities to alleviate their impact. The greatest damage to corals occurs in high-use, shallow areas; Holland and Meyers (2003) found that the greatest concentration of human-substrate contact occurred at shoreline entry points, where people tend to congregate.

**Invasive species** – Invasive species are plants, animals and microbes not native to a region, and when introduced either accidentally or intentionally, out-compete native species for available resources, reproduce prolifically, and dominate regions and ecosystems. The impact of some alien species has been devastating. On land, introduced goats, pigs, sheep, and cattle graze on native plants and spread alien species, leading to increased erosion and sediment in streams and ocean. Several species of alien marine algae have become well established in Hawai'i over the past several decades, including *Hypnea musciformis* and *Gracilaria salicornia*. These invasive algae smother, shade and kill coral reefs, as well dominate the benthos. Alien fish such as ta'ape were introduced as a sport fish and may be outcompeting native species.

#### WHY GET INVOLVED?

Effective management and protection of marine resources in Hawai'i is very difficult without cooperation and support from local residents and resource users. There are too few aquatic biologists and conservation enforcement officers to provide the level of presence in the field that is necessary to educate sufficient numbers of people about the rules

intended to protect marine resources and to enforce these rules.

There are several ways communities and non-governmental organizations (NGOs) can increase public compliance with the rules that are intended to protect marine resources. It is generally accepted that public compliance goes up when there is increased public:

- awareness of the rules and why they are necessary to protect marine resources;
- awareness of the condition of the marine resources in their area;
- awareness and education about their impacts to the marine ecosystem;
- opportunity to be meaningfully involved in planning how to protect marine resources and to help government implement the management rules; and
- opportunity to help government agencies monitor the

#### WHY GET INVOLVED

by Butch Kaihimalaihi Helemano,  
Hui Mālama o Pūpūkea-Waimea

There is a sense of “being” and pride (from a personal level) when you get involved with a project. It takes a special person to go out and get involved and not all residents will take action or take a stance to help protect marine or land issues....

The efforts of a community to take a stance against further or future impacts is not a sign of the times but the age old concept of getting involved and pitching in to help the helpless, in this case, helping the marine ecosystem to have a chance to exist without negative impacts, by outreach and educational efforts in concert with state and local agencies who care about the environment.

The ocean and the land have been our provider and as a Hawaiian it is my kuleana or duty to do something to help our natural treasures like the coral reef or water quality, by laulima or working together with others from our community. Changes can only take place by positive actions and action taken by getting involved. The only reward, if any at all, is that you can help make a positive change by taking part in a collective effort to help educate and protect our home and natural environment. The personal rewards and spiritual rewards are well worth the time invested.

condition of biological resources and the public's use of those resources.

Active community involvement in marine resource management often results in locally acceptable resolution of resource management issues, increased conservation and compliance with the rules, and greater capabilities within the community to influence resource management decisions. Empowering local residents and resource users to help government manage marine resources is likely to increase their feeling of responsibility and ownership in the future of local marine resources and result in their greater compliance with the rules.

The Department of Land and Natural Resources (DLNR) initiated a community-based program and partnered with Community Conservation Network, The Nature Conservancy and the Hawai'i Wildlife Fund to develop a program patterned after the nationally successful Neighborhood Watch program, called Makai Watch. The Makai Watch approach is based on the idea that the people who use, deal with, or live closest to natural and cultural resources are in the best position to help in understanding the nature of the area. Community members are the "eyes and ears" that look out for their resources, and their direct involvement reduces inappropriate uses of those resources. Makai Watch has three components: Awareness/Outreach, Observation and Voluntary Compliance, and Monitoring. See Section 2 for more information on what it takes to become a Makai Watch community.

#### **OTHER WAYS TO GET INVOLVED**

This guide book can be used to assist communities that want to take action at a particular coastal area. You can select one or more projects in Section 3, or create your own! This guidebook is just that: a book to help give you some ideas and get you started on what you can do to protect and conserve Hawaii's marine resources. Even in cases where the community is not yet organized to take action, individuals can and do make a difference. Here are some ways that individuals can get involved:

- Attend community meetings on any development or regulations impacting your area, such as fishing

regulations, proposed developments (i.e. buildings, sewage, streets).

- Provide comments on environmental impact statements when issued by local and federal agencies.
- Attend local lectures, nature walks, events to gather more information for your projects.
- Talk to people about caring for the area when walking the beach or swimming.
- Write letters to agencies or your legislators voicing your concerns.
- Volunteer at a beach clean up or other event.
- Get trained as a docent at Hanauma Bay, Waikiki Aquarium, Maui Ocean Center, Bishop Museum, the Hawaiian Islands Humpback Whale Visitor Center, the Northwestern Hawaiian Islands Mokuapapa Visitor Center, etc. to learn more about the ocean and share by teaching others.
- Get trained in monitoring through REEF or Reef Check and adopt a reef to monitor.
- Check out Pono Pacific's or Hawaii's Volunteer Zone's websites for a list of organizations looking for volunteers: <http://www.ponopacific.com/conservation3.html>; [http://www.volunteerzone.org/vz/jsp/vz\\_home.jsp](http://www.volunteerzone.org/vz/jsp/vz_home.jsp)
- Most counties have a storm drain stenciling program, as well as other programs such as Clean-a-Reef, Adopt-a-Stream, Adopt-a-Block programs. Check out Clean Water Honolulu website: <http://www.cleanwaterhonolulu.com/>
- The State of Hawai'i Department of Transportation sponsors an Adopt-a-Highway program. See what you can do to reduce litter than can eventually end up in the ocean. <http://www.state.hi.us/dot/highways/Adopt-Highway.htm>
- Become involved with the Sierra Club's Blue Water Response Team and report environmental pollution violations: [http://www.hi.sierraclub.org/bluewater/response\\_team.htm](http://www.hi.sierraclub.org/bluewater/response_team.htm) or call 808-537-9019.





SECTION TWO

*Getting Started -  
What You  
Need to Know*

GETTING STARTED

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## GETTING STARTED – WHAT YOU NEED TO KNOW

Establishing a community program for marine resource management can be a fairly simple process or can become very complicated, depending on the dynamics of the community and the threats to the area. To be effective at the community scale will require patience, enthusiasm, creativity, and perseverance. While every community is different and will have its own unique challenges and advantages, experience throughout the world has indicated that the following steps are very helpful in establishing a strong foundation for success in a community program. These steps are presented below in chronological order, but they are iterative rather than linear. Each step should be periodically revisited and reconsidered to ensure adaptive management. The steps are as follows:

1. Assembling your team.
2. Identifying stakeholders.
3. Securing assistance if necessary.
4. Reviewing your options.
5. Preparing a conceptual model of concerns and possible solutions.
  - i. Clarifying the group's vision.
  - ii. Clarifying the group's goal.
  - iii. Identifying key threats and obstacles.
  - iv. Identifying current activities, opportunities, and key players.
  - v. Assessing community resources.
  - vi. Setting objectives.
  - vii. Developing activities.
6. Developing your community program.
  - i. Understanding general activity types.
  - ii. Prioritizing activities.
  - iii. Developing a work plan.
  - iv. Addressing funding issues.
  - v. Addressing safety and liability issues.

### ASSEMBLING YOUR TEAM

#### Introduction

Involving the right people is a key to successful community-based management. It is critical to involve both (1) a **core group** of committed individuals who are motivated to move the project forward, and (2) a broad range of stakeholders who have an interest in the area. The core group may be made up of people who have long sought to improve management in the area, active members of a



*Miloli'i, Photo provided by the Community Conservation Network*

neighborhood board, or anyone else who is willing to put in a lot of volunteer time designing the project, providing advice, and getting their hands dirty.

**Stakeholders** are the parties who have a stake in the resource or who are simply interested in the resource. These may include community members, fishermen, commercial dive and snorkel operators, local businesses, law enforcement, recreational users, native Hawaiians, and many others. Securing the involvement of people from each of the major stakeholder groups helps to ensure that different concerns and ideas for addressing those concerns are considered in program development. This, in turn, can lead to decreased long-term conflict over resource use and greater community support for the project. The end result is increased voluntary compliance with regulations and an informed public that effectively educates resource users.

While it is very likely that not all stakeholder groups will get enthusiastically involved in the activities of the program, it is still critical to get their opinions, provide them a means for getting involved if they want to, and periodically inform them of program progress. The basic rules of thumb in terms of involving the community are as follows:

1. Involve committed people that will work hard as volunteers on a consistent basis to move the program forward.
2. Involve as broad a range of stakeholders as possible to ensure that their opinions are represented in program design and implementation, and then offer them opportunities to become as active as they would like to be in program implementation.



You may especially want to contact your local Department of Land and Natural Resources (DLNR) office and include them from the start—especially if the area of your interest includes a Marine Life Conservation District (MLCD) or other similarly designated area. Engaging governmental agencies from the start helps to facilitate the necessary collaboration and may provide access to some funding for your project.

### Method

To begin, gather together people you already know who share your interest in the natural and/or cultural resources of the area. It is very helpful to first have a discussion with this smaller group of interested people in order to determine whether engaging a larger group of stakeholders in a discussion regarding a program focused on the marine resources of the area is worthwhile.

It's best to keep the conversation broad at this point:

- Explain your interest in the area
- Ask for the group's ideas and opinions regarding the status of the area's resources.
- Ask whether the condition of the resource has changed over time and, if so, why they think it has changed.
- Ask what their vision is for the future of the area and its resources.
- Ask if they think there are ongoing threats and obstacles to achieving this vision and, if so, what those threats and obstacles are.
- Ask for their ideas regarding what should be done, if anything, to address those threats and obstacles.
- Ask if they are interested in moving to next steps to get a project going. If they say "yes," there are several options,

including the following:

- o *Option 1* – If the smaller group feels you should immediately get input from a larger group of stakeholders, go ahead with the process of identifying stakeholders and holding a large meeting to create a conceptual model (see the sections below). This approach is often the best one so that key stakeholders feel they are being involved.
- o *Option 2* – Undertake one-on-one meetings with other key stakeholders that are recommended by the core group. Meeting one-on-one usually leads to a more intimate dynamic that may be appropriate and very useful for your area. It may be useful to have several one-on-one meetings before assembling a large group. When you meet with people individually, you can ask the same questions above that you asked your small group.
- o *Option 3* – Before getting input from a larger group, first take an inventory of what is going on in your area. This inventory would summarize the activities of all the groups and individuals involved in the area, any research on the marine resources of the area, and any other relevant activities that are going on. Undertaking the inventory is an excellent way to get started because it provides detailed knowledge of the area. Even if you choose Option 1 as your first step, you should complete an inventory at the beginning of the conceptual modeling process so that you begin with as much knowledge of the area as possible.

### IDENTIFYING STAKEHOLDERS

Regardless of which option you use to begin, it's helpful to develop a comprehensive list of stakeholders. When you believe the time is right, you will want to inform all of these stakeholders about your effort and provide them with an opportunity to participate. Use brainstorming to develop a list of everyone else the group can think of who may have an interest in the natural and/or cultural resources of the area – these are typically people who may be directly affected by any project you develop. To brainstorm, have someone keep track of every single idea. Don't stop to discuss ideas; just continue adding to the list until no new ideas are forthcoming. When the group has finished brainstorming, group similar ideas together to eliminate



*Pupukea Workshop, photo provided by Jill Komoto*

unnecessary repetition. Then evaluate whether the ideas truly belong on a list of stakeholders.

<i>Potential Stakeholders</i>	
<ul style="list-style-type: none"> <li>• Local residents</li> <li>• Neighborhood boards</li> <li>• Clubs</li> <li>• Parent Teacher Associations</li> <li>• Church groups</li> <li>• Civic organizations</li> <li>• DOCARE officers</li> <li>• Fishermen</li> <li>• Boat harbors</li> <li>• Lifeguards</li> <li>• Teachers</li> <li>• Nonprofit organizations</li> <li>• Dive shops</li> </ul>	<ul style="list-style-type: none"> <li>• Tour operators</li> <li>• Park users</li> <li>• Park authorities</li> <li>• City council members</li> <li>• State representatives</li> <li>• Business owners</li> <li>• Surfers</li> <li>• Divers</li> <li>• Snorkelers</li> <li>• Kayakers</li> <li>• Boat owners</li> </ul>

Include both sexes and the different ethnic groups that live in the area, and be sure to include the area's *kupuna*. Finally, determine who will speak with each stakeholder interest and a deadline for doing so.

Invite these stakeholders to attend subsequent meetings, and get their contact information if they want to be kept informed. Ask each person you talk with if there are other persons or groups that should be included. After the conversation, write down notes to help you remember and share with others what you learned.

#### **SECURING ASSISTANCE IF NECESSARY**

As you begin developing your community-based program, you may seek direct advice from an organization that specializes in this field. There are many groups that can help you adapt the basic process outlined in this document to best suit your needs. Many of these organizations are collaborating on the establishment of the Makai Watch Program (See section "What does it take to become a Makai Watch Community") and, therefore, are very interested in helping you create your community-based program. These partners are available to help interested communities in various stages of project planning and implementation.

If you are interested in engaging in some stewardship projects but are not yet ready to become a Makai Watch Community or do not have an organized community group, then check out each project type for examples or the

case studies for contact information. See Appendix B for additional contact information.

#### **REVIEWING YOUR OPTIONS**

If you are not yet ready to become a Makai Watch Community, but are still interested in forming an organized community group, then check out the following guidelines on how to get started. You may choose to do some or all of these; this is up to you. All of the projects listed in Section 3, however can be done separately- it is up to you to select the projects best suited to your abilities, time available and funding.

#### **PREPARING A CONCEPTUAL MODEL OF CONCERNS AND POSSIBLE SOLUTIONS**

##### *Introduction*

A **conceptual model** is a tool that illustrates the relationships between various elements that are thought to impact the status of a particular resource. Many communities choose to prepare a conceptual model very early to aid the development of their projects. A decision-making tool that helps to clarify how the chosen activities are predicted to impact the resource, a conceptual model condenses complex information so that a problem can be approached systematically. The model also is adaptable; as you learn additional information, you can change the model as needed and adjust your activities accordingly. Finally, a conceptual model can help to identify weaknesses in project design if the desired results are not being achieved.

##### *Method*

Conceptual modeling only works if it utilizes the most accurate information available, so it's imperative to include all the key stakeholders in meetings to develop the model. The steps to developing a conceptual model follow. (Throughout the process, keep a separate list of assumptions made so that they can be verified or negated later. For example, if the group lists "use exceeds carrying capacity" as a direct threat even though the group is not sure whether use truly exceeds carrying capacity, include this on your list of assumptions. If you develop activities around excess carrying capacity when use does NOT exceed carrying capacity, then the activities will not make a palpable difference.)



## Clarifying the Group's Vision

### Introduction

Before your group begins any specific project planning, group members first need to establish and agree upon a clear idea of what they want to achieve. Understanding the group's vision for the area will frame the subsequent discussions.

### Method

1. Distribute index cards and pens to each group member.
2. Ask participants to think about what they would like to see at the site in the future—what do they envision as an ideal situation for the program site and its resources? Ask them to write down on the index cards a sentence or two that captures this vision.
3. Collect the index cards, and read them aloud. Create a list of outcomes, grouping together those that overlap.
4. Discuss the outcomes until the group reaches an agreement on one key idea or focus.

### EXAMPLE FROM THE FIELD

Members of one Big Island community listed such outcomes as “Practice the values of the Hawaiian culture, tradition, and heritage” and “Build community unity with opio around our marine resources.” This was condensed to one central vision: “We seek to replenish and sustain the marine resources and ecosystems in our community.” This becomes the goal of the conceptual model, as shown in the diagram on page 13.

## Clarifying the Group's Goal

### Introduction

A **goal** is a general statement of a desired state of affairs your group will work toward. It should reflect the group's

Photo by Jason Philibotte, Community Conservation Network



vision and be brief and measurable—for example, “To replenish and sustain the natural and cultural resources of our Ahupua’a for present and future generations.”

### Method

1. Review the group's vision for the area.
2. Reword the group's vision so that it becomes a brief statement that retains the vision but is measurable.

## Identifying Key Threats and Obstacles

### Introduction

The next step in developing the conceptual model is to determine the threats and obstacles that affect the vision. There are three main categories of threats: 1. direct threats, 2. indirect threats, and 3. contributing factors.



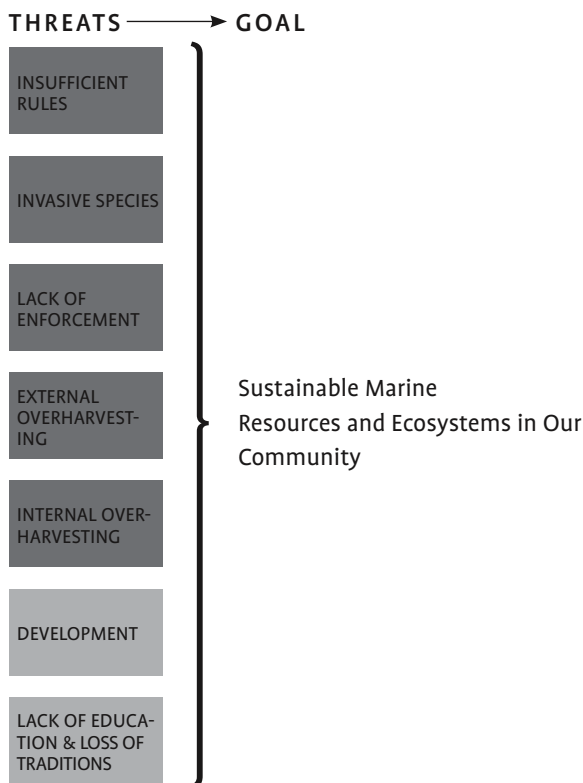
Photo by Community Conservation Network

1. **Direct threats** – These are factors that immediately affect the resource or cause its physical destruction. For example, if your goal or purpose is to “to preserve and enhance our community's coastal resources,” then a direct threat may be “over-harvesting of fish” and/or “coral mining.”
2. **Indirect threats** – These factors are the underlying causes or the causes that lead to the direct threats. For example, if one of the direct threats to the resource is “over-fishing,” then an indirect threat may be “poverty” that causes fishermen to try to take more fish than is sustainable so that they can feed their families. Lack of environmental education, drug use, and loss of cultural or traditional knowledge are all indirect threats.
3. **Contributing factors** – These are factors that are neither direct nor indirect but somehow still influence the resource. These factors can include the weather, religion, and cultural values.

*Method*

1. Remind your group of its goal – “sustainable marine resources and ecosystems in our community,” for example.
2. Ask the group to brainstorm for the threats they believe impact the status of the resource.
3. Combine similar threats into groups.
4. Categorize the threats as “direct,” “indirect,” and “contributing factors.”
5. Rank the threats according to their perceived importance to the group. To do this, you may ask each group member to choose his or her top two or three threats. The threat chosen most often is the “number one” threat, and so on.
6. List those threats in order to the left of your group’s goal (see below for an example).

**Categorizing threats:** Big Island community participants included direct threats such as over harvesting and lack of enforcement and indirect threats such as loss of traditional values and lack of education



**Identifying Current Activities, Opportunities, and Key Players.**

*Introduction*

In addition to identifying threats, the big picture as captured in your conceptual model should illustrate the current activities, opportunities, and key players that affect the target. This will provide a well-rounded, complete picture that will enhance the group’s decision-making.



1. Current activities: These are any activities that may involve or affect the resource. For example, a school group may be monitoring water quality in the area, a neighborhood group may be attempting to create a new public park, a real estate developer may be considering purchasing a parcel of land, or a nonprofit organization may be working on conservation efforts in your area. Your group will want to consider how any such activities may affect the resource, especially when it plans its own activities.
2. Opportunities: These are factors that may support your program or the status of the resource. For example, area kupuna who support conservation, funding available to local groups or even land for sale can be opportunities to enhance the resource.
3. Key players: These are people or groups who are the primary stakeholders interested in and involved in activities that affect the resource. Some of these may have an official role—DOCARE agents, for example. Many may hold unofficial but powerful places in the community, though—local leaders, for example. These key players may or may not be supportive of your program; either way, your conceptual model should include their influence.

*Method*

1. Remind your group of its goal—"sustainable marine resources and ecosystems in our community," for example.
2. Ask the group to list any current activities they know about that they believe may impact the status of their target. (You may want to assign someone the task of researching activities before the meeting so that your group paints the most complete picture possible.)
3. Ask the group to brainstorm for any opportunities. They may even repeat some items listed as threats. For example, poverty that leads to overfishing may be listed as a threat, but poverty that motivates people to engage in sustainable economic development is an opportunity.
4. Combine similar opportunities into groups.
5. List the activities and opportunities to the left of the threats and obstacles in your conceptual model. See below for an example.
6. If key players are involved in specific activities, opportunities, or threats that are already listed in your conceptual model, add their names directly under those items. If key players are not involved in those items, add their names under the threats or opportunities, as your group interprets it.
7. Draw lines to show which threats the opportunities address. See the example in right column.

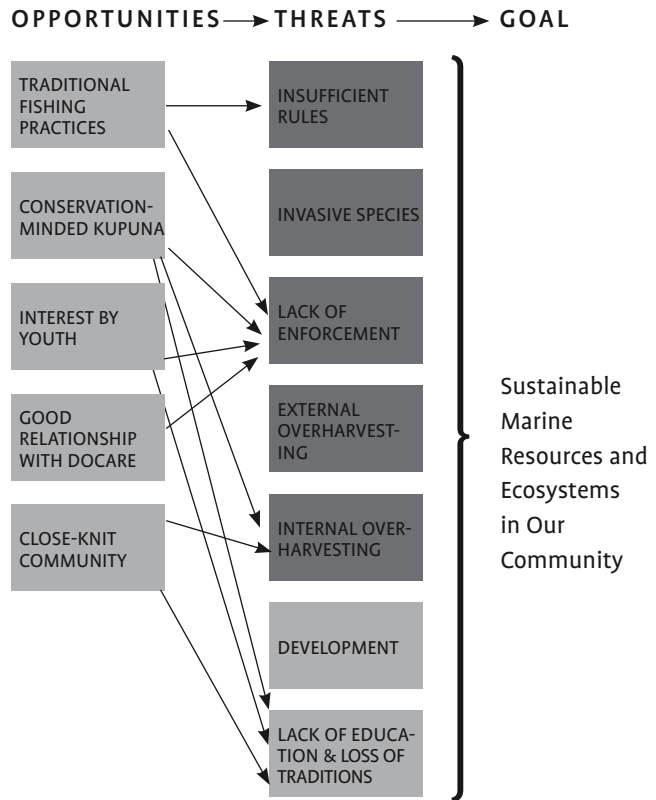
Now your conceptual model reflects everything your group members know about factors affecting the resource. Next your group begins to assess how your community can work toward your group's stated vision.

**Assessing Community Resources**

*Introduction*

Your group now has a good idea of what factors are affecting the resource. Before you begin to develop the specific activities of your program, though, your group should take stock of the community's resources. During this discussion, the group is basically trying to answer two questions: (1) What is the condition of the resource? (2) What can the community bring to this program? The answers will affect whether your program goals, objectives, and activities involve scores of expert scientists or a small group of volunteers, require a large budget or no budget at all, and so on.

1. What is the condition of the resource? The scale and



scope of your program will be determined, in large part, by the condition of the resource you are hoping to affect. If the ecosystem is largely intact and relatively healthy, the bulk of your program activities may focus on prevention of further degradation. If, on the other hand, the ecosystem is enormously degraded, your program may focus largely on restoration.

2. What can the community bring to this program? Every community brims with assets that can be applied to conservation programs. If your group is creative in identifying these assets, you will find that your program can achieve more than initially seems possible.

*Method*

First assess the condition of the resource:

1. Collect any data you can find on the resource. Search the Internet and the library for printed and digital sources. Talk to educators (from elementary school to university professors) and any local, formally trained experts such as DOCARE officers and scientists. Especially talk to local





View from Diamond Head

long-term residents and others who are familiar with the resource. Look for information that tells you how the ecosystem in your area is doing—this may mean species counts, water quality data, stories about “the way things used to be,” and so on.

2. Share the information collected with all group members.
3. Discuss with group members what the data indicates about the condition of the resource.
4. Create a scale from 1 to 10. At “1,” write down the group’s stated vision for the resource. Distribute a piece of scrap paper and a pen to each person.
5. Have each person write down how close to that vision they perceive the resource to be—with “1” being “the resource is already meeting that vision” and “10” being “we couldn’t be further from the vision.” Have everyone turn in their responses, and then average the numbers (add all the responses together, then divide that sum by the number of people in your group) to arrive at the group’s perception of the condition of the resource. Generally, your group may choose to focus more heavily on restoration if they rated the condition of the resource at 5 to 10; they may choose to focus more heavily on preservation if they rated it at 1 to 5.

Then assess what the community can contribute:

1. Create a chart with six columns. Label the columns “who/what,” “time,” “skills,” “money,” “supplies/equipment,” and “comments.”
2. Brainstorm for anyone or anything the community offers that the program could utilize, and write them in the “who/what” column. It may help to brainstorm

the following categories: individuals, citizen groups, organizations, and businesses. Individuals are those persons in the community who may have special knowledge, expertise, or technical skills that may be useful. Citizen groups can be any group of people who may have resources to offer such as canoe clubs, halaus, senior citizens, lifeguards, youth, art guilds, church groups, fishing clubs, veterans, historical restoration groups or cultural groups, educators, and so on. Organizations can be any formal or informal nonprofit organizations such as neighborhood boards or local environmental nonprofits. Businesses can include any businesses—local or not—that have an interest in the resource (and therefore may be willing to contribute to the program) such as hoteliers, dive operators, the surf industry, etc.

3. For each person or group listed, indicate whether they may be able to contribute time, skills, money, and/or supplies or equipment. In the “comments” column, add any notes such as what skills or equipment might apply. Skills might include technical expertise, public relations, political connections, manpower, mana, educational experience, and so on.

### Setting Objectives

#### Introduction

Your group has stated its vision and goal. It has identified the threats and obstacles to the resource, along with any current activities and opportunities that could affect the resource. It understands who the key players are, what the condition of the resource is, and what the community could bring to the program. Now it’s time to utilize all this information to develop specific objectives and activities that will move the resource toward the group’s vision for it.

**Objectives** are specific statements of measurable outcomes to be achieved in a stated amount of time. While the goal reflects the group’s vision for the final outcome, objectives reflect intermediate results—the elements needed in order to reach the broader goal. Objectives should address the threats and obstacles identified by the group, and each objective should deal with only one item. Good objectives should be “SMART:”

- **Specific** – Clearly define what is to be accomplished so that everyone involved understands.



- **Measurable** – State the criteria for success as defined by percentages, scales, or some other measurement.
- **Attainable** – Ensure that the group can attain the objectives given the resources available, the time available, the context of the target resource, and factors the program can and cannot control.
- **Realistic** – Ensure that the objectives are based upon reality as reflected in the conceptual model the group developed.
- **Timely** – Define a time frame for each objective.

Consider this example goal: “To replenish and sustain the natural and cultural resources of our Ahupua’a for present and future generations.” If the group identified poaching as a threat, then one objective might be “to reduce the amount of poaching in the reserve by 25% in two years.”

It’s common to accidentally write activities at this stage such as “develop a program to enforce fishing regulations” rather than objectives. Objectives should be impact-oriented rather than focused on specific tasks.

#### Method

1. Break into small groups, and distribute paper and pens to each group.
2. Have each group develop a list of five or six objectives that will lead to the achievement of the stated goal.
3. Have small groups share their ideas. As they do, create a list, grouping together common ideas.
4. Evaluate ideas to determine whether they deal with only one item and whether they are impact-oriented. If, upon further examination, an idea seems to be an activity instead of an objective, you can start a list of potential program activities.
5. Rewrite all ideas as **SMART** objectives.

### Developing Activities

#### Introduction

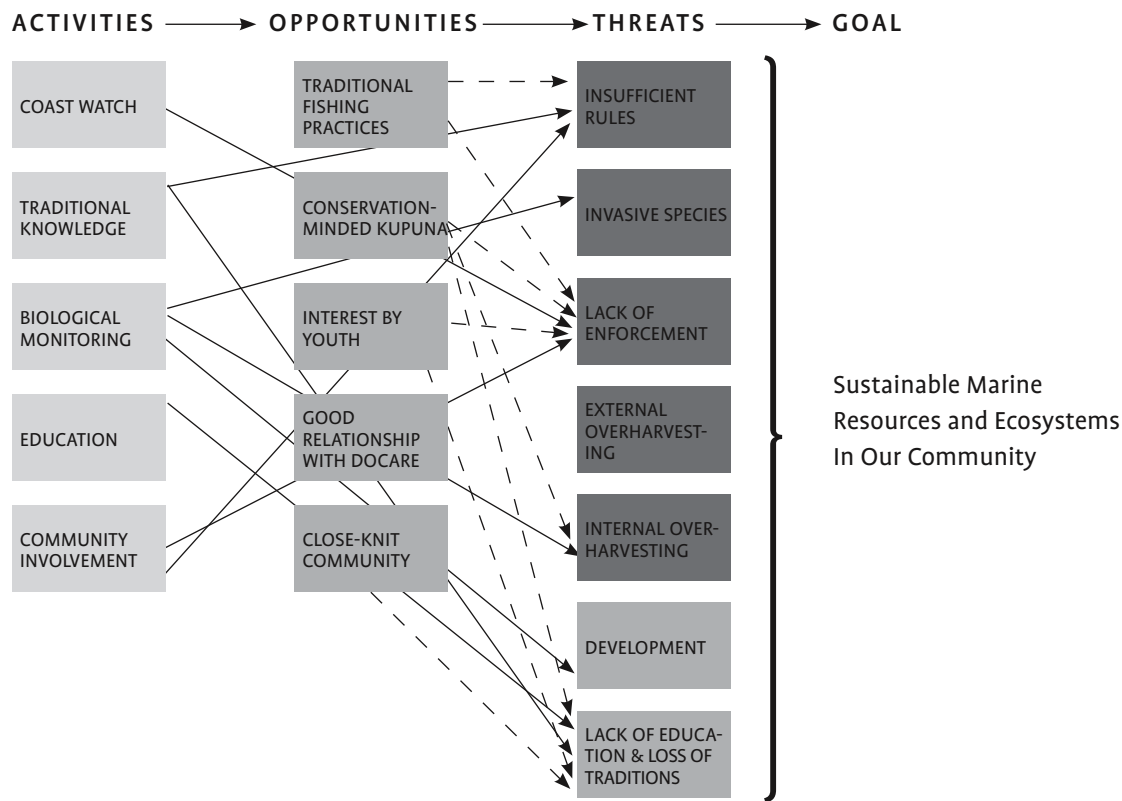
Activities are the actions that will get the objectives accomplished. Each activity should be linked directly to an objective and should be process-oriented rather than impact-oriented. For example, if an objective is “to reduce the amount of poaching in the reserve by 25% in two years,” an activity might be to “recruit volunteers to talk with people fishing in the reserve about the regulations.”



#### Method

1. Break into small groups, and distribute pens and paper to each group.
2. Assign each small group at least one objective, and have small groups create a list of activities that will help to achieve each objective.
3. As small groups share their lists, create a master list of activities, grouping common ideas together.
4. Evaluate each activity to ensure that it is directly linked to an objective, is feasible, and is appropriate.
5. Write the activities to the left on the conceptual model. See page 17 for an example.
6. Draw arrows on the conceptual model to illustrate which threat(s) each activity addresses.
7. If any threats are unaddressed, review the community resources, opportunities, and key players, and then explore whether a creative activity to address that threat exists.
8. To complete your conceptual model, write the activities to the left of the opportunities. Draw lines to show which threats the activities address.

Now your conceptual model is complete. At one glance, you are able to see the goal for the resource, the threats affecting that resource, the opportunities available to address those threats, and the activities your group wants to pursue to address those threats. See the example on the next page.



## DEVELOPING YOUR COMMUNITY PROGRAM

### Introduction

Once your group has completed the conceptual model and has developed objectives and potential activities for the program, you are ready to develop the program itself. The program will be based on the work done during the conceptual modeling process, which has given you a very sound start in the program development process. The next steps, beginning with selecting and prioritizing which activities the group can most effectively undertake, are detailed below.

### Understanding General Activity Types

#### Introduction

During the last step of the conceptual modeling process, your group compiled lists of common activities. For each group of common activities, it's important to consider why the activities may be important and pros and cons to each so you can then prioritize which activities your group wants to attempt.

Makai Watch incorporates three types of activities: awareness/outreach, observation/voluntary compliance, and monitoring. These are more thoroughly examined later in this guidebook, but we will briefly explore the importance, the pros, and the cons of each:

1. Awareness and outreach activities are important because they transmit information regarding the importance of the resource and how to use it appropriately. Damaging activities decrease, and a growing group of knowledgeable resource users has the information needed to teach others. The collection of pertinent information can include the collection of traditional knowledge through means such as interviews and storytelling, which is important because it preserves a unit of knowledge that otherwise would be forever lost. These activities also provide the perspective of history, culture, and science. Awareness and outreach can include activities such as developing and distributing printed materials, posting signs, approaching resource users





Photo by Hannah Bernard, Hawai'i Wildlife Fund

- one-on-one or through speaking events, and so on. Pros include the involvement of multiple generations, from kupuna to keiki; empowerment as information is transmitted to local residents and other stakeholders; and the interest generated as those carrying out the awareness campaign become a “face” that resource users utilize for information. Cons include the number of hours required to reach resource users, the difficulty is securing volunteers, and safety risks if some resource users are offended when approached by volunteers.
2. Observation and voluntary compliance activities are important because it is thought that they often lead to decreased regulation violations. When people understand the regulations governing an area or know that the area is being watched, they are more highly motivated to comply. Because DOCARE has such few resources, its officers cannot effectively “police” all the areas; program staff and/or volunteers can make a large difference. Pros include a solid working relationship between the community and the DOCARE officers and the increased likelihood that violators will be prosecuted. Cons include the safety risks inherent when any citizen is thought to be “spying” on another and when your testimony is needed in court.
  3. Monitoring activities are important because they indicate the current, or baseline, status of the resource and then any changes to that resource. Your group also can use monitoring activities to indicate whether their work is making the intended difference. Monitoring

activities may include fish or other species counts, water quality monitoring, studying the number of people using the area, counting violations in the area, and so on. Pros include the interest generated as your group appears in T-shirts or with data clipboards and the ability to test whether the group is meeting its goals. It also promotes active stewardship of the environment; when people are physically collecting data themselves, they more readily accept their kuleana, or responsibility, to the resources in their community. Cons include the need for at least some scientific expertise, the need for consistency in data collection, and safety as monitoring activities often include in-the-water components.

### **Prioritizing Activities**

#### *Introduction*

Your group listed potential activities during the conceptual modeling exercise. Now it's time to begin determining which activities to pursue because most likely, you cannot pursue them all.

#### *Method*

1. Have your group consider each activity listed during the conceptual modeling exercise.
2. Determine whether any of the “current activities” identified by the group during conceptual modeling are represented in your activities list. If so, the group should discuss whether they want to try to collaborate with the group or organization leading that activity.
3. Discuss what resources would be necessary for the group to pursue each activity. Utilize the list of key players, opportunities, and community resources to determine whether the necessary skills, equipment, money, and so on are potentially available to your group.
4. Rank the activities by (a) how well they will affect your target resource, (b) whether they address the identified threats, and (c) whether the necessary resources are available within the community. To rank, allow each person to select one-third of the total list of activities that they think the program should pursue based on the criteria. The activities that are selected most often, up to about one-third of the total, are your group's high-priority activities. Highlight these on your conceptual model.

## Developing A Work Plan

### Introduction

The work plan details how your group will move from collecting ideas to actually pursuing the program goal. It includes the specific tasks that will need to be completed under each activity your group chooses to pursue, who will be responsible for the task, when the task will be done, any funding needed for the task, any resources potentially available, and any key players that should be consulted.

### Method

1. Break into small groups, and distribute paper and pens.
2. Divvy up the program activities evenly among the small groups. For each activity, have small groups answer the question, “What would it take to get this done?”
3. Have small groups list the identified tasks in order—what needs to be done first, then second, and so on.
4. Have small groups create a chart with seven columns: tasks, responsible party, start date, due date, funding needed, available resources, and key players. They should fill out the “tasks” column in the order the tasks need to be completed and then fill out any available resources and key players.
5. Have each small group present its chart to the large group, who can help to fill out the remaining columns.

### Addressing Funding Issues

In previous sections, you assessed your community resources, and you’ve developed an action plan for the key activities you’d like to pursue. Now is the time to think about how to fund your program. While a federally recognized nonprofit (501c3) organization may qualify for a multitude of grants, obtaining nonprofit certification can be a long and painstaking process. After the Enron scandal and with the public’s heightened concern about nonprofit activities, rules and application procedures have been tightened. Ask a local nonprofit for assistance to jumpstart your program. Each activity in this guidebook gives a range of costs you can expect. To reduce costs, try partnering with other organizations and/or businesses which may be able to provide in-kind products or services. Check out Appendix E for a list of funding sources.

### Addressing Safety And Liability Issues

Your group will have to decide how best to handle situations that may put volunteers at risk. We offer the following recommendations.



Using the buddy system

### Safety Procedures

- Analyze all volunteer assignments to identify potential hazards and establish safe practices.
- Any use of volunteers in tasks considered to be hazardous must be evaluated in a case-by-case basis, taking into account the volunteer’s training, experience, and qualifications to perform such work.
- Ensure that proper evacuation and emergency response protocols are established and in place in the event of an accident or injury. Consider requiring a number of participants to complete first aid and CPR training, and provide a first aid kit for activities.
- Encourage volunteers to use the buddy system.
- Never send volunteers into the field without some type of communications equipment, especially if they are alone.
- If you’ll be working in the water, take extra precautions to avoid problems. Ask people who are certified in CPR and first aid such as local lifeguards to assist. Have one or two kayaks or canoes in the water to provide extra support.
- Avoid confrontations with people who may be breaking the law—vandalizing an area, littering, or poaching, for example. Gather your group and leave the area, then call the police, harbor agent (in a state harbor), or DOCARE.
- Your group may want to have volunteers sign liability waiver forms.

### Safe Work Habits

To ensure that the project is safe, make sure you and your volunteers are aware of the following procedures:

- Volunteer should be well supervised and thoroughly



- trained in proper work methods and safety procedures.
- Ensure that all volunteers are capable of performing the assigned work.
- If tools are used, ensure that they are in proper working condition, that they are handled properly, and that volunteers are briefed on proper use.
- Stop work during bad weather or when unsafe conditions arise.

#### *Safe Work Clothes*

- Volunteers should wear appropriate clothing such as covered shoes, protective clothing, gloves, and eye protection.
- Rubber gloves should be worn when handling hazardous materials, including water quality testing materials.
- Wear a hat and sunscreen (waterproof) for protection from the sun. Drink plenty of water while working in the heat or the sun.
- Wear brightly colored clothes or safety vests when working along roadways or near traffic.



Photo by Carey Morishige

#### *Potential Hazards During Cleanups*

Volunteers may find potentially dangerous items while performing cleanups/maintenance at the beach, in harbors, or in the streams. Be sure volunteers are aware of how to handle the following hazards:

- Broken glass, boards with nails, splinters, and other sharp objects should be handled with care and covered before discarding into a trash bag.
- Watch for tripping hazards, such as cleats and mooring lines, large branches, etc.
- Medical waste (hypodermic needles, pill containers,

etc.) should only be handled by responsible adults and carefully disposed of in trash containers. They should not be thrown into garbage bags. Avoid direct contact with needles or anything that may have come into contact with bodily fluids such as blood.

- Never open or pour out closed containers of liquids. We can't be sure of what these liquids are, and they need to be carefully disposed of in trash containers.
- Avoid lifting heavy objects to keep from hurting your back. Don't overfill trash bags.
- Do not handle large dead animals. Instead, contact DOCARE or the Marine Mammal hotline at 1-888-256-9840 if the animal is a marine animal such as a whale, dolphin, or seal. See the section on marine mammal observation for more information.

#### **WHAT DOES IT TAKE TO BECOME A MAKAI WATCH COMMUNITY?**

Makai Watch consists of three elements: Awareness and outreach, observation and voluntary compliance and monitoring.

1. Awareness and outreach: This is based on the principle that most people will care for a resource when they understand its importance and how to care for it. Inappropriate behaviors decrease when people engaging in those behaviors are made aware of healthier alternatives. Local residents and kupuna have as much to offer regarding the understanding of an area as the formally trained and educated "experts."
2. Observation and voluntary compliance with regulations: This is based on the principle that most people will comply with regulations if they're aware of those regulations and when they know that caretakers are watching out for the resource.
3. Monitoring: This is based on the principle of adaptive management — that activities need to be adapted if they aren't helping to reach the project's goals.
4. Your project may also consider the integration of traditional and contemporary management techniques as a fourth element.

Makai Watch is a program especially suited to communities with the following elements: (1) a biologically, socially, and/or culturally significant area; (2) a core group of community



*Makai Watch Workshop, November 2005*

members who are motivated and willing to lead the effort; (3) broad community support for the program; (4) the involvement of appropriate stakeholders; and (5) appropriate agency endorsement.

Communities who can demonstrate that they fit elements 1 through 4 and who are ready to participate in all three components of Makai Watch—awareness/outreach, observation and voluntary compliance, and monitoring—can pursue the endorsement of DOCARE. For more information on how to get involved with Makai Watch, contact [makaiwatch@yahoo.com](mailto:makaiwatch@yahoo.com).

If your community is not ready to participate in all three Makai Watch elements, you can participate in one or two. Or you can choose other activities that will improve marine and coastal resources. These are discussed in more detail later in the guidebook.







## SECTION THREE

# Activity Types

<b>AWARENESS/OUTREACH</b>	<b>23</b>
<b>OBSERVATION AND VOLUNTARY COMPLIANCE</b>	<b>51</b>
<b>MONITORING</b>	<b>55</b>
<b>OTHER WAYS TO GET INVOLVED</b>	<b>99</b>
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SECTION 3A

*Awareness/Outreach*

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## ACTIVITY WEEK

### What is an activity week?

An activity week has a general topic, such as Reef week where activities during the week are related to the topic. Activity weeks are comprised of a variety of smaller ventures, such as lectures, field trips, informational meetings, kids' days, contests, beach



One of three free fish ID seminars given during REEF week on Maui. Photo by Steve Gittings

cleanups, films, concerts or monitoring events. A partnership of organizations may form a committee to help brainstorm ideas for events, and each partnering organization provides one or more activities for the general public. Regularly scheduled events may be promoted as part of the activity week.

### Why use an activity week?

Activity weeks are a great way to bring awareness about a topic to a wide variety of people. Events don't need to be new, but the week can be arranged around a regularly scheduled event. Using a variety of partners helps to reduce costs for one organization and promotes the activities of the organization as well.

### Overview

Bring a group of people/organizations together who are involved with education and public outreach. Develop a catchy name for your activity week for promotion purposes. You can even further define the topic. Brainstorm ideas for events, perhaps using existing events. With a wide topic, you can have activities that cover many subtopics. Include fun, yet educational events for kids. Each partnering organization can put on an event. Check out event calendars when selecting a date to make sure that your activity week doesn't coincide with another major event. Promotion of your activity week is important; utilize local newsletters, event announcements in the newspaper, public service announcements, flyers, email lists or your new site display. Use other events to pass out flyers about your events. You can ask local businesses to donate prizes or other giveaways to draw people to your event- make sure these sponsors are noted in your promotions!

### Example from the Field

REEF week in Hawai'i. To kick off the REEF organization expansion into Hawai'i, they held an activity week in 2001. This included a social hour, followed by several presentations on reef ecology, current scientific research, and local conservation and management efforts. They introduced the program and a raffle was held to raise funds for the Hawai'i expansion. Throughout the week, free fish identification seminars and survey diving opportunities were offered. Check out: <http://www.reef.org/webres/Press/hawaii.htm>

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Local event calendar
- Sponsors
- Promotion/media contacts
- Central coordinator for activity week
- Raffle prizes

**FOR MORE INFO**

*Related Activities*

See all education/outreach topics

*Additional Resources*

REEF week in Hawaii

*Case Studies*

None

*Contact*

N/A



**Pros**

1. Great way to draw attention to an issue.
2. It is a great way to showcase an organization and incorporate their regular activities into a highly promoted event.
3. By partnering together and forming a committee, organizations can plan their activities together so that they don't conflict with each other. It can also pool resources together more efficiently.



**Cons**

1. It's sometimes difficult to draw people to an event, especially if it becomes an annual event.
2. Activity weeks can cost quite a bit if they are held outside, as it is almost always necessary to put up tents to house the booths and activities.
3. A large event will require a permit for the site in which it is held.



**Tips**

- Form a committee with local organizations. Find out what each organization is already planning or doing. Brainstorm new activities with the group.
- Activities don't have to be a major event; they can include field trips, lectures, films, beach cleanups or a reef monitoring day. Start small, and schedule around already scheduled events. This reduces costs tremendously.
- Think of a catch phrase for your activity week, and develop themes for each year.
- Obtain raffle prizes from local businesses and have them available at each event to entice attendance.

## BOOTH AT LOCAL EVENTS

### What is a booth at a local event?

A booth at a local event usually includes a tent, table and chairs. Multiple organizations can utilize one big tent or you can have your own if you have a large display. It can be a way to simply promote the activities of your organization, educate the public about issues, recruit new members, and/or other fundraising activities.

### Why use a booth?

Booths are a way to attract a large audience at events where people like to gather. They are good way to introduce people to your organization, attract volunteers or promote new activities. Booths can also be set up on the site as a place to provide information about the site.



Harbor Festival: Photo by Hawaiian Islands Humpback Whale National Marine Sanctuary

### Overview

Check your local event calendar and contact event organizers to see what the parameters are to have a table at the event. Be careful as some events may be geared towards tourists and your audience is the local community. Don't just look for special events, regularly scheduled events like farmer's markets may also let you put up a table. To attract people to your booth, you can try interactive displays, models, "live" displays, giveaways, food. If you have a larger booth, walk around and engage the public in conversation.



### Pros

1. Useful for showcasing the activities of your organization.
2. Good way to promote upcoming events, recruit volunteers.
3. Relatively inexpensive way to let people know about what you are doing.



### Cons

1. Weather and location can be factors in attendance at events, and in how you set up your display.
2. To attract people to your booth, it needs some thought in planning and some design elements to get your key points across.
3. If you have an interactive activity to draw people in, you will need more than one person to man the booth at one time.

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Local event calendar
- Display material
- Tent
- Tables
- Chairs
- Water for volunteers



**FOR MORE INFO**

*Related Activities*

Printed material, signage/  
displays, activity weeks

*Additional Resources*

Check out your local event  
– there is usually one every  
weekend!

*Case Studies*

None

*Contact*

N/A



- Start small with a table top display that portable. Booth activities can be simple and educational such as coloring pages, rubbings, ‘go fish’ games, and the like.
- Any photos used to tell the message need to be large enough to be seen from several feet away.
- If the event is all day, recruit volunteers to man the booth. Two hour shifts are ideal.
- Engage people in conversation- you don’t need to have activities to draw people in if you have outgoing volunteers manning the booth.



## COMMUNITY BARBEQUE

### What is a community barbeque?

A community barbeque is a way to draw local residents together to talk or obtain input about issues in their neighborhood. It can be used in conjunction with a meeting, workshop or monitoring event.

### Why use a community barbeque?

Events that have a lot of good food are a sure way to draw people to an activity that they might not normally attend. It also creates an informal atmosphere for community members to meet with agency representatives. A barbeque can also be used to draw volunteers and utilized as a reward for volunteers who commit to activities such as monitoring.

### Overview

If the barbeque is associated with a community meeting, form a small committee to help organize. See if you can get local businesses or nonprofit organizations to donate funds for the food, or to donate some of the food. Funds from state and federal agencies usually can not be used for food. Estimate the number of people attending, and after determining a budget, decide on a menu. Next you'll need to locate a venue and this will depend on the information you need to provide. If you need to show a visual presentation (i.e. PowerPoint) then you'll need to find an inside location. This may cost additional money for facility rental, unless you can find a local neighborhood association that has a meeting room. If the barbeque is held outside, make sure you have shade and enough tables. You can also have displays here as well. Ask someone from the local community to be the master of ceremony. Your meeting topic should have a specific draw, for example presenting the results of a reef monitoring effort, or an event to thank your volunteers and show some of the monitoring results. Promotion is important, utilize newsletters, email lists, or flyers.



Photo by Liz Foote, Project S.E.A-Link

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Location for barbeque (find a place with tables)
- Food and drink!
- Paper, plates, napkins, utensils
- Garbage bags
- Serving containers and utensils
- Charcoal or gas grill, and supplies (matches, fuel)
- Apron for the cook!
- Tents
- Coolers/bins for cold drinks
- Presentation materials
- Displays

**FOR MORE INFO**

*Related Activities*

Activity weeks, open house, monitoring and cleanup projects

*Additional Resources*

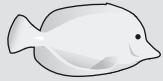
N/A

*Case Studies*

None

*Contact*

N/A



**Pros**

1. Great way to bring local community members out to show them the results of your work.
2. Way to reward volunteers for their hard work.
3. Food is always a draw to an activity.



**Cons**

1. If you don't have an exciting topic to present, people may not show up. Any presentation should be with new material.
2. An event with food requires additional logistics to cook, serve and clean up.
3. It is often difficult to know how much food to have on hand, if the event is 'open' invitation. You do not want to run out of food.



**Tips**

- Partner with other organizations; many will help contribute funds or volunteers for the BBQ.
- Assign tasks- food planner, cook, setup and cleanup, promotion.
- Invite local politicians who have been supportive of your efforts, and ask them to give a short speech.
- If you are trying to recruit new volunteers, have current members of your group contribute to a potluck to save on costs.
- If weather looks to be problematic, see if you can schedule an indoor facility. Many local Hales or organizations like the Rotary club have facilities for events at low cost. By partnering with a local nonprofit, rates may be even cheaper.

## INTERPRETIVE CENTER

### What is an interpretive center?

An interpretive center is a facility which provides biological, geologic and/or cultural information on a particular site, and can be housed in a medium to large facility, a small covered hut, or can be just a table staffed by a volunteer. A variety of educational tools can be utilized, such as simple brochures, maps, videos, 3-D models, large displays, viewing stations and other interactive methods. The areas may be staffed by volunteers or paid staff of the area.

### Why use an interpretive center?

An interpretive center is good on-site method to provide education to its users. Visitors can be directed to utilize the center before visiting the area. This is an opportunity to educate the users about proper etiquette when snorkeling, diving or simply enjoying the beach.

### Overview

In many cases, a table placed at a strategic entry point is all you may need. The table may be staffed during peak use hours and provide users with displays, verbal, or printed information about the area.

Constructing a permanent interpretive center can be costly. Think about what you intend to use the center for, as this will determine the size. If the purpose is simply for a one time education purpose, then a smaller hut may work. But if you intend to use the facility for meetings or lectures, then a bigger place is needed. A larger facility will also need to plan how it will be utilized, in order to pay for maintenance costs. You will need to develop a budget in order to find funds to pay for the facility. Costs include construction of facility, educational material in the center, permits, possible rental costs, maintenance costs. Here are some things to think about when designing an exhibit:

- *Multi-sided*: families can cluster around the exhibit
- *Multi-user*: interaction allows for several sets of hands
- *Accessible*: comfortably and safely used by adults and children
- *Multi-outcome*: observation and interaction are sufficiently complex to foster group discussion
- *Multi-modal*: appeals to different learning styles
- *Readable*: text is arranged in easily understood segments
- *Relevant*: provides cognitive links to visitors' existing knowledge and experience

### Example from the Field

*Table* – Ahihi Kina'u utilizes a table staffed by a volunteer during peak hours, 9-1pm.

*Information table at Ahihi Kina'u. Photo by Hannah Bernard, Hawai'i Wildlife Fund*



### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Budget
- Permits
- Use plan
- Purpose of center
- Table, chairs, tent

**FOR MORE INFO**

*Related Activities*

Printed material, signage/  
displays

*Additional Resources*

Hanauma Bay, Lapakahi  
State Park

*Case Studies*

None

*Contact*

Hawaii Wildlife Fund  
(interpretive table),  
Hanauma Bay

*Interpretive hut* – At Lapakahi State Park, visitors are directed to visit an interpretive hut, staffed by a volunteer who can answer questions about the restored heiau. The hut is filled with posters and small models, as well as a brochure to guide the visitor on self-guided tour.

*Other large center* – Hanauma Bay requires all visitors to see a short video on proper reef etiquette before entering the bay. While waiting, visitors can tour the educational center about biological, cultural and geological resources of the area.



*Interpretive hut at Lapakahi State Park  
Photo by Sara Peck*



**Pros**

1. Good way to educate first time users to the area.
2. Larger facility can be used on a continual basis to provide a gathering place for lectures, meetings or workshops.
3. Interpretive centers can be used to collect entry fees to raise funds for managing and maintaining a site.



**Cons**

1. Construction and maintenance costs can be high, and it may be difficult to find funding for overhead costs.
2. A well planned interpretive center takes a special kind of expertise to design the displays. This cost needs to be included in the overall budget.
3. Even facilities that are mostly set up for self guided education need staff, an additional expense.



**Tips**

- Start small with a table and chairs and learn what works before you plan big. If the goal is to develop an interpretive center, it is usually better to partner with an agency or larger development group to fund the construction and operations. An interpretive hut, or larger center needs to be designed to be secured to minimize vandalism.

## OPEN HOUSE

### What is an open house?

The public is invited to drop by on a set day and time to tour informational displays and stations at their own pace. Open houses can be used to give basic information about an issue or area, provide information about ongoing projects or obtain information from attendees.

### Why use an open house?

Open houses are a way to bring different people and organizations together in one forum to showcase their projects and draw in volunteers. They are a good way to gauge initial public reaction to proposals, options and confrontational issues.

### Overview

Do some research to find out who is conducting projects or research in your area. Check with the local state Department of Land and Natural Resource office, Hawai'i Sea Grant program, nonprofits or University of Hawai'i researchers. Assemble a committee to develop the open house agenda, find an appropriate venue and date/time. Organizers should be on hand to answer questions. An 'open' house does not need to be housed in a building, but if it is set up at the site, there is a need to coordinate logistics such as tents and chairs.

Some ideas for open house displays (adapted from Wates, 2000):

1. Welcome panel to show the history of the area and goals of the proposal or initiatives on display.
2. *Likes and dislikes:* People place sticky dots on a map to show their likes/ favorite areas or dislikes/least favorite areas.
3. *Mapping:* People draw or write on a map their vision for an area.
4. *Process:* Display shows the next steps in the process
5. *Comment section:* Area to provide comments, and contact information for further information.



Photo provided by Hawaiian Islands Humpback Whale National Marine Sanctuary

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Venue for open house
- Tables
- Snacks
- Electricity and AV equipment

**FOR MORE INFO**

*Related Activities*

Activity weeks, printed material, signage/displays

*Additional Resources*

Wates, Nick

*Case Studies*

None

*Contact*

N/A

**Examples from the Field**

*Bishop Museum and Waikiki Aquarium* – The two organizations partnered to host a workshop about invasive species (by invitation only) and then held an open house the next day at the Aquarium for the public to learn about Hawaii’s alien plants and animals.



**Pros**

1. Great way to reach a wide audience.
2. If an annual event, can provide updates to the community on what organizations are doing.



**Cons**

1. It is often difficult to find a site to hold an ‘open’ house close to your location.
2. Planning for this event takes time and a committee.



**Tips**

- Providing good snacks or even entertainment can be a big draw.
- Hold an open house to introduce your new organization or a new project.
- Combine an open house with field trips to engage the audience.
- Ask students to provide presentations about the topic of interest.
- Ensure that there is enough staffing to answer questions.

## PRINTED MATERIALS

### What are printed materials?

Printed materials such as brochures, fact sheets and newsletters are educational materials produced in large quantities to provide information about an organization, interesting topic areas or updates on groups' activities. They are meant to be brief rather than contain detailed information to gather the targeted audiences' attention.

### Why use printed materials?

Utilizing printed materials is the easiest way to distribute information to the general public. They are easily portable to events, left in public gathering areas like libraries or posted on websites.

### Overview

*Brochures* can range from very colorful multi-fold pamphlets, to a single fold one-color sheet. Many organizations utilize fancier brochures to give information about their group and the projects they are working on. You can prepare these in-house, or hire a graphics artist to assemble the layout. Keep brochures simple using bullet points, pictures, cartoons or graphs.

*Fact sheets* can be used to present findings on research such as water quality monitoring or the health of a reef. They can also include tips on what the public can do to help. Even if you can print in one color, think about different ways to draw attention to the fact sheet, such as different paper colors. You can also use small folded wallet size sheets with tips for people to use on a daily basis. Check out the Monterey Bay Aquarium's "Seafood watch" which has a printed card about which seafood is good



ID cards

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Pictures or other graphic material
- Research articles
- Graphic layout artist (if creating a fancier document)
- Logos
- Examples of great printed materials
- CD ROMs plus cases for distribution at workshops

for you and the ocean. This site is updated regularly and includes regional information. <http://www.mbayaq.org/cr/seafoodwatch.asp> If fact sheets are to be used around the water, you may want to have them laminated.

*Newsletters* can provide updates on your groups' activities or issues of concern to the community in your area. Some groups send out newsletters every month or quarterly. Usually there is an editor or layout person who coordinates the topics every month. Ask people from your organization, groups you partner with or local community members to write articles. Newsletters are increasingly distributed via email either as an attachment or within the email itself. Think about the method of distribution; if mailing, consider using a nonprofit organization (if you are not one) and utilize the US Postal Service nonprofit rate for bulk mailing. Don't forget to post your newsletter on your website!

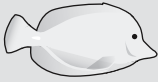
*Calendars* can also be utilized to promote an educational message. Think of a theme for your calendar and sponsor an art contest for keiki to submit drawings for the calendar. You can insert helpful tips on protecting marine resources into the calendar. Calendars can also be used for fundraising purposes.

*Decals, bumper stickers and bookmarks* are another great way to get a single message out or to promote your organization. *Flyers* are used to announce events or recruit volunteers.

*"How to" guides* like this one, take time to assemble, but can provide the community with valuable information. Form a committee to develop a plan and outline for the guide. Ask others to assist, but limit the number of people (3-5) conducting the actual writing. Too many people make it difficult to coordinate. Utilize students to find research material, references, examples or pictures. Distribute a draft to the intended audience and then hire a professional graphic layout person to make your guide eye catching.

*Newspaper inserts*, like a "how to" guide, can reach a wide audience, but also can take time and cost money to develop and distribute. Partner with government agencies that may be in getting your message out. Check out the Division of Aquatic Resources insert on Marine Protected Areas in Hawai'i: <http://www.hawaii.gov/dlnr/dar/pubs/MPApub.pdf>. Check out the Hawaiian Islands Humpback Whale Sanctuary for an insert on whales and other marine resources: [http://hawaiihumpbackwhale.noaa.gov/special\\_offerings/sp\\_off/Sanctuary\\_Insert.pdf](http://hawaiihumpbackwhale.noaa.gov/special_offerings/sp_off/Sanctuary_Insert.pdf)





## Pros

1. Easiest method to provide information to the public.
2. Easy to carry around to a variety of events.
3. Some printed materials like calendars, can be used as a fundraiser.



## Cons

1. Can be time consuming: with writing, editing, layout and final approval of the document. Sometimes you may need to obtain government agency approval on distributed material.
2. Can create additional litter problems, especially if distributed on-site.
3. Laminating and colored materials can add additional costs.
4. You may need to consider translating some documents if your target audience does not speak English. Translation adds to the cost of materials.



## Tips

- Hand out to the public when monitoring or conducting enforcement efforts.
- Use to encourage interest and support in a topic before embarking on projects.
- Utilize students to help develop fact sheets, obtain research material and pictures, write articles.
- If you are a member of any type of group, ask group members who are “experts” in a topic to write or provide information for the more technical fact sheets.
- See if you can get column space in smaller local newspapers to write articles every month to educate the community about topics or activities your group is involved in.
- Think about using “cartoons” instead of pictures.
- Place printed material on your website in a PDF format for others to print out.
- Use CD-ROMs to distribute materials to volunteers.
- Don’t forget about brochures, booklets that are geared towards keiki.

### FOR MORE INFO

#### *Related Activities*

Activity weeks, open house, interpretive center, booth at local events, website, monitoring events.

#### *Additional Resources*

Surf the internet to find out different uses of printed materials

#### *Case Studies*

All case studies utilize some form of printed material

#### *Contact*

N/A





## PUBLIC LECTURES/NATURE WALKS-SWIMS

### What are public lectures/nature walks-swims?

Public talks are a method used to educate the community about an area – its geology, history, cultural aspects, wildlife, policies or issues.

### Why use public lectures/nature walks-swims?

Public lectures are used as a vehicle to inspire further involvement in community stewardship. They may allow the public to trek in an area not normally open for public access. Nature walks/swims allow an “up close” look at the natural resources with species identification and other information to generate a greater appreciation for the environment.

Nature talks/walks /swims can be one time event or part of a reoccurring program. They can be utilized during activity weeks (see Activity week section). If part of a re-occurring program, monthly themes may be utilized and experts from those fields contacted to give the lectures or walks. Getting the word out is key to attendance at re-occurring programs. Try using some of the other educational techniques in this guide such as flyers, outreach to users of facilities, at local events, via newsletters, or through website to publicize. Ask partners to send flyers to their local mail lists or walk into businesses asking if they will post your flyer. If trying to target specific neighborhoods, you may want to try door mailers. Some radio stations or TV stations may provide airtime to promote your event as well.




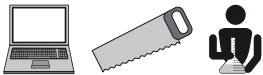
### Examples from the Field

Hanauma Bay conducts a weekly lecture and film series: ([http://www2.hawaii.edu/~hanauma/programs\\_02\\_community.htm](http://www2.hawaii.edu/~hanauma/programs_02_community.htm))

The Kailua Bay Advisory Council holds Stream walks where community members can learn about their local streams from experts: <http://www.kbac-hi.org/streamwalks.asp>



*Stream walk- Kailua Bay Advisory Council, Waianu & Waiāhole Streams*

BASIC PROJECT NEEDS	
Number of people required:	
Amount of funds required:	
Amount of training required:	
Tools required:	

Checklist	
<input type="checkbox"/>	Experts/presenters
<input type="checkbox"/>	Location for training
<input type="checkbox"/>	Electronic equipment (i.e. projector, laptop)

**FOR MORE INFO**

*Related Activities*

Activity weeks, interpretive center, open house

*Additional Resources*

Hanauma Bay Nature Preserve

*Case Studies*

West Hawaii Sea Grant, REEF, Reef Check

*Contact*

Hanauma Bay, West Hawaii Sea Grant



**Pros**

1. Great way to reach a wide audience.
2. A good way to teach folks a lot more about an area.
3. Can help to build relationships with a community to educate about a resource before embarking on a project.



**Cons**

1. Advertising events can be costly and is needed if not a regularly scheduled event. Many local papers do provide event announcements for free.
2. Keeping a group together and engaged is a skill.
3. It is important to gauge the capabilities of the group you are taking on a walk, and especially on a swim, as there is a high liability assumed with this kind of activity.



**Tips**

- Schedule lectures related to hot topics at the time.
- Survey the community to see what type of information they'd like to hear.
- Use lectures to help provide training for new docents in the field.
- Have a "topic of the month" to provide variety in lectures.
- Schedule special presenters at your regular group meeting and invite the public.

## SIGNAGE/DISPLAYS

### What are signage/displays?

Signage informs users about the rules of an area or proper etiquette for using the area. It can also be used to give warnings (i.e. High surf) or to educate about an area. A display can be permanently housed at a site to give general information about the biological, geological or cultural resources about an area. It can include places to put informational brochures or maps. Displays can also be portable and can provide results of research, or information about a specific topic. Some displays are three dimensional, and can be also interactive to demonstrate what happens to a resource when it is disturbed.

### Why use signage/displays?

Signage, when properly placed are utilized to inform users when an on-site volunteer is not available. Displays are yet another method utilized at interpretive centers, at events or meetings and workshops to help to visually educate the public about a particular resource, why it's important, or what we can do to protect/save it. Permanent displays at a site can be used to inform the public of upcoming events such as a beach cleanup, or to educate of environmental issues or hazards.

### Overview

Think about the message you want to convey on your sign and who is your target audience. Plain, bland signs tend to be ignored. Keep signs simple, with good symbols. Placement of the sign is important as many people steal or vandalize signs. You may want to conduct a survey to see where people access the area. Make sure the sign doesn't block views or is placed in critical habitat. The sign needs to be made of sturdy material to withstand a variety of conditions



Photo provided by the Maui Ocean Center

Hawaii Wildlife Fund resource protection sign  
Photo by Liz Foote

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



Layout Artist



### Checklist

- Permission of landowner/permits
- Signage/display materials
- Pictures/drawings
- Contact phone numbers
- Rules for area
- Information about area

**FOR MORE INFO**

*Related Activities*

Booth at local events, interpretive center, open house, visitor outreach, videos

*Additional Resources*

N/A

*Case Studies*

None

*Contact*

Hawai'i Wildlife Fund,  
Hanauma Bay Education Center

– sun, sand, wind and heavy rain. Be sure to check with your local authorities before placing a sign on the property, it may require permits or be disallowed. Partner with the local agency/landowner to develop appropriate signage. Permanent displays may be housed in a protective barrier and can be changed as needed. Portable displays are useful for events, workshops or meetings. They can be as simple as pictures or drawings on cardboard. Other displays can be interactive, for example to show what happens to coral reefs during and after a big storm. Some displays can provide a shock value, for example pictures of whales entangled in nets, stomach contents of a bird composed of plastic and other litter. Large solid display panels are more costly, but the topic can be changed.



**Pros**

1. Provides basic use guidelines for an area.
2. Method to use when on-site monitors are not available.
3. Permanent displays on-site can be an avenue to provide updates to users.
4. Interactive displays are a visual method to educate users about what impacts they have on the environment.



**Cons**

1. Signs are stolen or defaced when not properly affixed or easily accessible.
2. Many people ignore signs.
3. Even well designed signs need to be replaced form time to time.



**Tips**

- Signs should convey the key points and not be too wordy.
- Photos/diagrams need to be large enough to be seen from several feet away.
- Graphics and symbols used on signs need to be clearly understood.
- It is important to use an appropriate style, color and sized font, to enable easy reading.
- Be aware of different finishes on signage, a glossy finish can make outdoor signs difficult to read.
- Have a local school put together their own displays about a particular topic and show them at different events or your new interpretive center.

## SNAPSHOT DAY

### What is a snapshot day?

A snapshot day is a picture or “snapshot” of environmental conditions at one point in time. It is used in conjunction with activities such as water quality monitoring or coastal cleanups. The event can be held once a year at the same time or at set intervals (i.e. quarterly)

### Why use a snapshot day?

Snapshot days are a great way to get people involved and educated about the impacts we have on the environment. They provide a measure of the health of the environment (i.e. streams and coastal waters or amount of litter) and over time can provide a picture of the general trends. Data can be used to support grant proposals, target restoration projects and encourage collaboration among various agencies.

### Overview

Organizing a snapshot day can be as simple as promoting the event to recruit volunteers to pick up trash. The Ocean Conservancy sponsors an International Coastal Cleanup day each year where trash is collected from streams, lakes, beaches and underwater. Each area has a local coordinator, who collects data such as number of people participating, pounds of trash collected and the type and category of marine debris.

A water quality monitoring snapshot day can be a little more involved, especially if you plan on using the data for grant proposals. Participate in World Water Monitoring Day: <http://www.worldwatermonitoringday.org/>. Check with your local Sea Grant or Humpback Whale Sanctuary office to see if they are participating in the event. The water quality monitoring section has details on equipment and training needed.





### Examples from the Field

The Hanalei Watershed Hui conducts quarterly snapshot days at the mouth of streams and up and down the Hanalei River, as well as anything coming in from pipes or drains. They also participate in National Water Monitoring Day, where they take people off the



*Lining up to take samples along the beach, photo by Carl Berg, Hanalei Watershed Hui*

beach and send them every 50 feet to grab water samples. When everyone is in place, the horn sounds and the people go in and get a water sample. The Friends of Honolulu Parks and Recreation is the local coordinator for the International Coastal Cleanup day sponsored by the Ocean Conservancy. They sponsor a “Get the Drift and Bag It” day on each island, usually as part of International Coastal Cleanup day.

BASIC PROJECT NEEDS	
Number of people required:	
Amount of funds required:	
Amount of training required:	
Tools required:	

Checklist	
<input type="checkbox"/>	Water quality sampling materials
<input type="checkbox"/>	Trash bags
<input type="checkbox"/>	Gloves
<input type="checkbox"/>	Snacks, water
<input type="checkbox"/>	Hat, sunscreen
<input type="checkbox"/>	Beach chairs



**FOR MORE INFO**

**Related Activities**

Activity weeks, water quality monitoring, beach cleanups

**Additional Resources**

Friends of Honolulu Parks and Recreation, Hawaiian Islands Humpback Whale National Marine Sanctuary – whale count

**Case Studies**

None

**Contact**

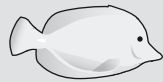
Carl Berg, Hanalei Watershed Hui

Participate in the Humpback Whale Sanctuary Count! The Sanctuary Ocean Count was initiated as a means to provide Hawai'i residents and visitors with the opportunity to actively participate in evaluating the status of Humpback whales in their breeding grounds by conducting a yearly shore-based census during the peak breeding season. The count also serves to promote public awareness about humpback whales and shore-based whale watching opportunities, and to get a sense of how whales use inshore waters on an average peak season day.



*Photo courtesy of Hawaiian Islands Humpback Whale National Marine Sanctuary*

For more information check out: [http://Hawaiihumpbackwhale.noaa.gov/volunteer\\_program/ocean\\_count.html](http://Hawaiihumpbackwhale.noaa.gov/volunteer_program/ocean_count.html)



**Pros**

1. Great way to get local community members involved in active stewardship.
2. It is not a huge time commitment on the part of volunteers and they may be more likely to get involved with other activities.
3. Helps to educate the community about what is happening to the environment and what they can do to help.



**Cons**

1. Events occur, rain or shine and there may be a lack of volunteers if planned during the rainy season.



**Tips**

- You will collect a lot of garbage! See if your local waste collector or public works department can assist with the collection. Scope the area out before the event to see if there are large items which need to be removed.
- Be prepared to answer questions about water quality and marine resources. Have material on hand to distribute to volunteers.
- Plan snapshot days as part of an activity week.
- Engage local newspapers to write articles about the event and about the resources it is helping to improve or protect.



## VIDEOS-PUBLIC SERVICE ANNOUNCEMENTS

### What is a video-public service announcement?

A video can document a particular activity your group has conducted, provide a basis for training workshops or document conditions of the environment. A public service announcement is a short clip, either on TV, radio or on a website that gets the message out, in a creative way about a particular topic.

### Why use a video or public service announcement?

Videos can be used to educate the general public about proper etiquette when using a resource, such as not standing on reefs or getting too close to sea turtles or monk seals. They can be utilized before the visitor enters an area (such as at Hanauma Bay), as part of a training workshop, or part of an educational facility. You can also use short animated clips, particularly useful on a website to draw attention to a particular issue (i.e. effects of marine debris on reefs). A public service announcement can be simple, to promote an activity and attract volunteers or attendance, or again to make people aware of an issue.

### Overview

Unless you're just videotaping a land-based 'how to' session such as the protocols for water quality sampling, you'll probably need to hire someone to gather underwater footage for your video or to put together your public service announcement (PSA). Check with local organizations to see who they've used. Think about the purpose of the video or PSA- is it to educate or promote awareness, announce your event or attract volunteers/encourage contributions? See the example section for ways organizations are bringing attention to their issues. Many local TV and radio stations, as well as cable providers will provide free airtime (usually 30 seconds) for nonprofit organizations. Some PSAs are serious; others use comedy, while others may use cartoons to get the message across.

### Examples from the Field

Malama Hawai'i has four videos, one to promote their organization and three others on fish, forest and birds. Check out [www.malahawaii.org](http://www.malahawaii.org), click on the PSA link.

The Coral Reef Outreach Network (<http://www.hawaiireef.net/-index.htm>), hired a videographer

to make a short five minute film about proper etiquette when entering Hawaii's waters. The film shows different fish, talking and instructing the viewer about how to behave in their home. The DVD is distributed free of charge, with hopes to be shown on airlines, cruise ships, hotels and other areas where tourists gather. See [www.forthesea.com](http://www.forthesea.com).



*Hawai'i Reef Etiquette PSA video, by Ziggy Livnat*

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Message to the public
- Videographer, public announcement consulting firm, cartoonist, etc.

**FOR MORE INFO**

**Related Activities**

Website, public lectures, open house, interpretive center, activity weeks, booth at local events

**Additional Resources**

See video resources in Appendix D

**Case Studies**

None

**Contact**

See video resources in Appendix D

Save our Salmon uses a cartoonlet to bring attention to the plight of salmon on the Columbia River and the uphill battle they face (dams). Check out [www.hippoworks.com](http://www.hippoworks.com), click on the cartoonlets library link, and find the one dated 1/24/05.



**Pros**

1. Many people listen to the radio or watch TV and can help with letting people know about upcoming events, or rules.
2. If creative, can draw attention to an issue, or provide proper etiquette information.
3. Can be used in conjunction with an interpretive center.



**Cons**

1. Can be an expensive venture, especially if making underwater clips.
2. PSAs that are aired by the TV and radio stations with no funding are often only aired during non-peak hours and not effective at getting your message to the public.



**Tips**

- Beautiful pictures are great, but you need to have a captivating message with the right delivery. Choose your “actors” carefully.
- But even beautiful pictures alone, if caught at the right moment, can portray the message itself. For example, in *Winged Migration*, the video caught a bird that had its foot entangled in nets trying to fly away.
- Not everyone has the same taste in videos or music. Show the video to a wide audience before placing into production.

## VISITOR OUTREACH

### What is visitor outreach?

Visitor outreach uses trained volunteers to educate the public about the resources, proper ways to use the resources and what they can do to protect the environment. Volunteers may be situated in an interpretive center, sit at entry table at the main access area, walk the beach or be placed on a tour boat. Volunteer guides are provided necessary training (i.e. how to talk to people, general information about the resources, numbers to call in case of emergencies, etc.) and sometimes a uniform (hat, t-shirt, name badge) identifying them as a volunteer.

### Why use visitor outreach?

Coral reefs can be degraded by snorkelers and divers not paying attention to their equipment, or pausing to rest by standing on the reef. In addition, endangered Green sea turtles and Hawaiian monk seals, as well as other marine mammals can have their routines interrupted by tourists keen on getting a better look or picture. If provoked, they may bite the visitor. Dogs can also harass a resting seal or turtle. Volunteer educators at the beach or on a boat can educate the public about the biology of the animal, coral reef ecosystems, and how to be careful around coral reefs and marine animals.

### Overview

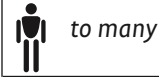
Human use impact studies have shown that educating users about proper etiquette before entering the water can greatly reduce habitat damage. Volunteers or trained naturalists undergo training on proper resource etiquette, biological content information, and interpretive techniques prior to engaging the public. If a volunteer spots a visitor or resident engaging in “ecologically unfriendly” behavior, they are encouraged to approach and instruct in a positive manner, rather than yelling at the person or immediately pointing out what



Photo by Liz Foote, Project S.E.A-Link

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Reference books, ID Cards, printed materials
- Training site
- Presenters at training-regulations, biological, geological and cultural resources, observation and compliance.
- T-shirts and other gear for the volunteers



**FOR MORE INFO**

*Related Activities*

Printed material

*Additional Resources*

Mau'i Ocean Center,  
Hanauma Bay

*Case Studies*

West Hawaii Sea Grant

*Contact*

Hannah Bernard, Hawaii  
Wildlife Fund; Liz Foote,  
Project S.E.A.-Link

they are doing wrong. For example, if someone is feeding fish or standing on the reef a volunteer may want to point out a concern for the individual's safety rather than discussing what is 'inappropriate' about the behavior. Naturalists are not expected to be an expert on any one subject, but to be an ambassador for Hawai'i and a steward of its resources. To look "official", the volunteer naturalist is usually given a t-shirt and/or name badge. Volunteers may also be provided with resources such as interpretive photos, marine life ID guides, and may use natural artifacts such as coral fragments or marine life models.

Volunteers should also be familiar with the rules and regulations of the area. The training workshop that naturalists take will include an overview of the rules, and what to do if they spot a violation. They are also given a list of appropriate enforcement or emergency phone numbers.

**Example from the Field**

*Kānaka Mālama Kai, Project S.E.A.-Link* – The Kānaka Mālama Kai ("Ocean Caretakers") program is a new initiative developed by Project S.E.A.-Link. After completing a series of training workshops, participants serve as "roving marine naturalists" at Mau'i snorkel sites and onboard recreational snorkeling charters. It is a free program open to anyone of high school age and older. The objective of the program is to preserve and protect Maui's reefs by educating visitors and residents. Participants each receive a "naturalist kit" consisting of photos, name badge, and a t-shirt, which makes them recognizable to people as a volunteer.



**Pros**

1. Helps to reduce habitat damage.
2. Educates new volunteers as well as visitors about the resources.



**Cons**

1. The training required for a volunteer or paid naturalist can be extensive.
2. Usually to do the training requires the development of a naturalist curriculum and compilation of many materials.



**Tips**

- By simply wearing an "official" hat, t-shirt and/or name badge and carrying a clipboard, visitors will be drawn to you to ask questions.

## WEBSITE

### What is a website?

The internet provides easy access for anyone with a computer to thousands of topics and data not easily obtained prior to its inception. Websites provide information about a group and its projects or about a specific topic area. Many websites provide links (Uniform Resource Locators-URL) to other sites for the user to obtain additional information.

### Why use a website?

A website can provide high visibility to your group and its efforts. Websites can be used to post information about upcoming events, topics of interests, picture galleries, community bulletin boards, data, or be a vehicle for fundraising. Printed materials provided by your organization are easily posted to the website to reduce printing and distribution costs.

### Overview:

The first step is to think about a domain name that is easy to remember and/or is the name of your organization or topic area. Check to see if your selected name has been registered. There are a variety of different web domain registration websites, all providing different deals. Web hosting services also provide domain registration, usually as part of a package deal. These services also may include email addresses with your domain name, i.e. yourname@yourwebsite.org. Other sites such as Yahoo, Lava net, Hawaii-on-Line, etc. may host your site for a small fee. Domains will allow you to look up your proposed domain name and register it.

The next step is to think about who to use as your website developer. You may find that your group has website gurus or students with an interest in becoming web developers. Commercial developers can be very expensive. You may also need software if your website developer



does not have his/her own, and the software can vary in price. Dreamweaver is popular, but is expensive software (\$400). Ask others with websites or check out [www.zdnet.com](http://www.zdnet.com) for software reviews and user comments. Namo Webeditor is one inexpensive alternative (\$100, [www.namo.com](http://www.namo.com)).

Remember to keep your layout simple and easy to navigate. Too many photos or too much text make a website unappealing. A reference section with links to other sites is a great way for web surfers to look for additional information. Make sure you include a contact section for more information.

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Pictures or other graphic material
- Site domain name
- Register domain name
- Website host provider
- Website development software

**FOR MORE INFO**

**Related Activities**

Printed materials, videos/  
soundtracks

**Additional Resources**

See website hosting  
resources in Appendix D,  
and just surf the net to see  
what you like in a website

**Case Studies**

None

**Contact**

Anyone with a website you  
like!

**Examples from the Field**

Community forums are a great way to bring people together to share ideas. Check out Project S.E.A-Link website (<http://projectsealink.org//phpBB/>) for an example of a community bulletin board.

Use a virtual tour of a marine/coastal area. These can be with still pictures or utilize videos. Check out Virtually Hawaii’s website for an example <http://satftp.soest.hawaii.edu/space/hawaii/virtual.field.trips.html>

The Kailua Bay Advisory Council (<http://www.kbac-hi.org/index.html>) has a great interactive website with information on water quality, data collected by volunteers as well as best management practices for the community to follow.



**Pros**

1. Great way to reach a wide audience.
2. Websites are the quickest way to provide the most current information on your activities and any data that you are collecting.
3. Everyone uses the internet today, and if you do not have a site, it is harder to obtain volunteers, promote your organization or obtain funding.



**Cons**

1. Website development costs can be expensive unless you utilize a volunteer or student.
2. Websites need to be updated to be kept interesting.
3. There is a cost to keep a website active and this needs to be planned into any operating budget.



**Tips**

- Some web hosters provide free or reduced hosting fees for nonprofits.
- Some commercial websites may pay you a fee or other in-kind services for a logo and link to their website.
- Put fun stuff on your website to draw people in- videos, games.
- Keep updating your website with new information, even if it is just pictures. Use a “new” logo with date the website was updated to draw people in.

## WORKSHOPS

### What is a workshop?

A workshop is a how-to, hands-on session used to instruct people in techniques for restoration, observation, compliance or monitoring activities. They may also be used for class instruction such as grant funding or obtaining nonprofit status. Workshops utilize experts in their respective career fields and can range from a few hours to several days.

### Why use workshops?

Workshops allow interested communities to obtain proper training before commencing on monitoring or enforcement activities. They are given hands-on training and the opportunity to ask questions or correct errors as they occur. Workshops are also a great way to introduce people who would like to learn about the different options for restoration or grant funding opportunities and writing proposals.

### Overview

Assign someone to be the coordinator for the workshop. Form a committee to assemble an agenda and assign tasks. Someone can be in charge of obtaining speakers, food/drink, facility arrangements, promotion, housing arrangements (if necessary), transportation, or equipment needs.

*Some questions to think about:*

- What is your goal for the workshop- what is your topic of interest? This will also help determine how long the workshop will be- from a few hours to several days. Try to be creative when putting together presentations/activities. Allow for breaks, and have activities where people can move around.
- Who is your target audience? What is the best way to promote the event? Your promotion of the event could be determined by who you would like to invite. Is it for the general public? Try public service announcements, local newspapers, flyers, or website postings. If for a specific audience, find the local contact person and distribute information through that person.
- How many people will be invited? If you have a larger workshop, you may want to assemble a workshop committee.
- Where can you hold the workshop? If it is a hands-on activity, then you can meet at the beach or local park. Check out local nonprofit organizations or community associations for meeting areas.



Photo by Kathy Chaston

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Experts/presenters
- Location for training
- Advertisements-flyers, email, newspaper, radio, TV.
- Food



**FOR MORE INFO**

**Related Activities**

Printed material, activity weeks, monitoring, observation/compliance, other ways to get involved section

**Additional Resources**

Makai Watch workshop

**Case Studies**

None

**Contact**

Sherry Flummert, Coral Reef Alliance

- What is your budget? Where can I find funding or additional help? You may want to partner with other local organizations or agencies. Some agency employees are willing to help give presentations/demonstrations. You may also want to charge a fee to cover basic costs.
- Do you need expert presenters? Again, local agency employees can give presentations. Also check with your local University of Hawai'i Sea Grant program. Nonprofit organizations usually have experts on staff.
- Food and drink are good to have at workshops, especially if they are held outside.
- Do you need to provide transportation? See if you can partner with local organizations that may be able to provide vans to transport people to other workshop sites.
- What are my equipment needs? PowerPoint projectors, laptop, screen, hand-outs, tent, chairs are just some of things to think about.



**Pros**

1. Good way for people to gather to share ideas, successes (and failures-lessons learned!)
2. Gives people new skills needed to engage in stewardship activities.



**Cons**

1. Can take a great deal of people coordination, even if it is a small event.
2. For smaller, informal workshops, it is difficult to determine how many people may attend. This is critical when you need to purchase food.



**Tips**

- Sometimes independent business members will give presentations for an honorarium fee in order to receive exposure to their services.
- Hands-on workshops which engage participants are more likely to attract more people.
- Some formal facilities can be costly, so you might want to check with your local park for use of a pavilion. Local halls and community centers may also provide rooms at no cost. Try partnering with local organizations to secure workshop space.



SECTION 3B

*Observation and  
Voluntary Compliance*

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## OBSERVATION & VOLUNTARY COMPLIANCE

### What is observation and compliance?

Observation and compliance utilizes citizens to be the “eyes and ears” for DLNR’s Division of Conservation and Resource Enforcement (DOCARE), by providing as much information as possible about possible marine resource violations to their local DOCARE office. The information provided can then be follow-up by the DOCARE Officers. Violations include poaching or other fishing violations, illegal commercial tour activities, problems with boating and ocean recreation activities and most other natural resource violations. In addition, you may witness activities associated with illegal drug use and the illegal consumption of alcohol. Citizen volunteers are given minimal basic training by DOCARE Officers on how to observe, identify, and clearly report their observations. Citizen volunteers may be asked to testify in court or provide outreach to communities.

### Why use observation and compliance?

Probably the number one complaint about protecting our marine resources is the lack of enforcement-due to lack of funding and staff. Today DOCARE officers are assigned to a variety of areas of responsibilities that cover the mountains to the sea. In addition, they respond to other criminal activities including tasks associated with Homeland Security. There are simply not enough officers to witness and catch every violator. By simply providing a presence and observing activities along our shoreline areas, communities can help to reduce poaching and other illegal activities. The fact that violators know their actions are not tolerated will help to protect our precious natural resources and historical sites. Local volunteers can help track repeat violators and help DOCARE build cases that can be prosecuted.

### Overview

If you are interested in providing observation and compliance support, please



*Spotting a potential violator at a training for Hui Mālama O Pūpūkea Waimea*

### BASIC PROJECT NEEDS

Number of people required:



to as many as you want

Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- DOCARE report forms, with contact numbers for DOCARE and Police
- Clipboard, pens
- Binoculars
- Camera, video camera
- Public information brochure



contact your local DOCARE office or work with a local nongovernmental organization to set up appropriate training. Training will include a section on statutes and rules as well as what and how to complete basic reports. Some things to keep in mind:

1. Do not take any offensive action like blocking cars or trying a citizen's arrest.
2. Don't confront the individual(s) as they may have weapons (including their fishing gear!) on hand. Only in cases where it is very clear that the individual can be approached without causing any harm to you or others, you may want to approach them and provide them basic information on how best to access /utilize our resources.
3. Never engage in a debate or argue with people that you approach.
4. If you feel that the situation is escalating, leave the individual and leave the area.
5. Call 911 and ask Police to respond to any threats or physical violence.

Response by a DOCARE officer may not happen immediately. They will follow up on your call and depending on the circumstances they may try to locate the guilty person for follow-up action or interview. Each time a report is made it adds to the body of information that is often used to identify suspects, and their illegal activities.

**There are four levels in this program:**

**Level 1 Learning the Rules and How to Report** – The first step in accurate observations and reporting is to become familiar with the DLNR Administrative Rules (fishing, boating, etc.) that exist for your area. Only by clearly understanding these Administrative Rules can you make a determination that someone is violating those rules. It is also important to understand how to gather the most critical information needed in order to accurately document the violation and ensure that the information reported is as useful as possible. Working with a DOCARE officer, the community has the opportunity to learn first hand what they need to know to do their job and how best to assist them.

**Level 2 Reporting Violations** – If you'd like to report a violation, write down everything that you see in vivid detail. DOCARE will need to know who is involved (description-approx. age, height, weight, hair color and type, type/color of clothing, identifying marks, etc), what they are doing (good description with type of equipment using), when (day and time), where the violation is occurring (be specific), how, vehicle information (make/model/year, license plate, color, other characteristics, any other occupants). Take pictures or video if possible, but be discrete and at a distance. Reports must be timely. If a pattern can be shown through observations, then the officer may make a patrol of the area. (See report form in Appendix C) For information on marine mammal/sea turtle issues, see page 65.

**Level 3 Testifying in Court** – The best chance that DOCARE has to prove a case is with an eyewitness testimony.

**Level 4 Community Outreach** – A volunteer can make observations and report



*Ahihi Kina'u: Photo provided  
by Matt Ramsey*

violations, be willing to testify in court, or learn the rules and talk to the community about protecting marine resources, what the statutes and rules are and what they can do to help. These stewards may go into classrooms to talk to students or attend local meetings.

#### **Examples from the Field**

***Makai Watch, Ahihi Kina'u*** – The Natural Area Reserve System (NARS), Ahihi Kina'u on Mau'i has recently hired two rangers to provide outreach to visitors as well as document any violations in the NARS area. The rangers have different schedules during the week to provide as much coverage as possible. They are given a Division of Forestry and Wildlife (DOFAW) uniform, binoculars and a radio and report violations to DOCARE.

***Miloli'i Coast Watch*** – The Coast Watch program, started in 2005 with community patrols, to educate ocean users about resource regulations and discourage illegal activity or taking too much. The program was designed with DOCARE and trained six community members in resources regulations and how to approach ocean users in a friendly and positive but firm way. Still in its early days, Coast Watch has the potential to reduce over-exploitation and encourage ocean users to use marine resources in a respectful legal manner.

**HOW TO CONTACT  
DOCARE**

24 hour, Statewide toll-free: 643-DLNR (3567)

Hawai'i, Hilo: 974-6208

Hawai'i, Waimea: 887-6196

Hawai'i, Kailua-Kona: 323-4961

Hawai'i, Captain Cook: 323-3141

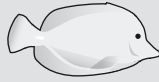
Kaua'i: 274-3521

Mau'i: 984-8110

Moloka'i: 553-5190

Lana'i: 565-7916

O'ahu: 587-0077



**Pros**

1. Learning the statutes and rules and documenting violations will increase compliance within a given site.
2. Getting the community engaged with a DOCARE officer builds relationships and understanding.



**Cons**

1. There are many statutes and rules to learn and understand.
2. Even with observation and reporting, a citation or arrest may not be made, due to a lack of needed information.
3. There is a high level of expectation that when a call is made, an officer will come, and there is simply not enough man-power to make this often happen.



**Tips**

- Find out what other communities are doing. Contact your local Makai Watch coordinator.
- Don't confront a potential violator, except if it is clear that no harm will come to you or others. Take pictures or video and record all details on the DOCARE report form.
- Contact DOCARE as soon as possible with information you have recorded

SECTION 3C

*Monitoring*

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## CORAL REEF AND FISH MONITORING

### What is coral reef and fish monitoring?



Reef monitoring can include the collection of fish and invertebrate survey data (relative abundance, presence/absence, species distribution, length/size class distribution), coral diversity, abundance and health, tracking the extent of invasive algae, or notation of sea turtles.

### Why use coral reef and fish monitoring?


Reef monitoring is a great way to educate and actively involve people in the stewardship of marine resources. It can provide baseline data and a snapshot of the health of a reef ecosystem at a point in time. Continued long-term monitoring can provide management agencies with data from the impacts of different management regimes. Utilizing volunteers can significantly reduce the costs of reef monitoring as well as expand the number of sites being monitored. Results from volunteer reef surveys can be utilized to promote responsible and sustainable use of the coral reef resources.


### Overview


There are a variety of ways to conduct reef monitoring, with pros and cons for each method. The following section will give an overview of some common methods; refer to the case studies in Appendix A for additional details. See the matrix summarizing the methods below, as well as those described in the case studies.


METHOD	DESCRIPTION	TRAINING	PROS	CONS
Makai Watch	Modified Reef-Watchers; adds on DAR approved level for scientific monitoring		Easy for communities to use; provides ability to compare Makai Watch sites.	Comprehensive level can be costly to conduct for the long term; Database for housing data still needs to be developed
Reef Check	Uses transects to measure substrate type. Presence and species abundance of fish, invertebrates, and algae; uses set indicator species		Only a set amount of fish species need to be learned. Database capabilities – info is given to National headquarters	Some areas may have different indicator species, depending on the area and community interest  Difficult to use tape for substrate measurements due to wave action

**BASIC PROJECT NEEDS**







**Number of people required:**  
 to as many as you want

**Amount of funds required:**  


**Amount of training required:**  


**Tools required:**  




METHOD	DESCRIPTION	TRAINING	PROS	CONS
R.E.E.F.	Roving diver technique, no limits. Novice and expert levels, presence and species abundance		Good for learning how to id fish; can conduct survey at any time, anyplace; useful for identifying presence of rare species; Database capabilities- info is given to National headquarters	Info can't be used scientifically
ReefWatchers (see case study in Appendix A)	Random swims (set area); beltless transects. Presence and species abundance; Note juveniles and other sizes	 	Can be used in areas with waves or currents; pins not used so less damage to substrate	Does not measure substrate, coral cover or other measures of habitat. No database capabilities
Kapoho Reef Watch: Wai'Opae Tidepools (see case study in Appendix A)	Transects with visual-strip method (side by side swim); survey fish species abundance and length/size class distribution, invertebrates, algae cover, coral diversity, abundance and health	  	Uses West Hawaii Aquarium Project (WHAP) protocols; all species identified	More complex; utilized paid UH divers trained in Quantitative Underwater Estimation Techniques (QUEST)

**REEF CHECK HAWAI'I**

Reef Check Hawai'i collects four types of data and uses transects for its surveys: site description, fish belt transect, invertebrate belt transect and line transect for substrate. Site selection is important, and if a group can only survey one site, they are asked to survey the best site that is least likely to have been affected by human impacts. Those who can survey multiple sites should select two or more sites that are representative of moderate and heavy human impacts. Two depth contours are surveyed, 3 m and 10 m below chart datum, however the highest coral cover may not be found in these areas. Thus, the range with the highest coral cover should be selected: Shallow (2-6 m depth), mid-reef (>6 – 12 m depth). Four 20-m long line transects are deployed and surveyed along each contour.

Pre-dive trainings are conducted for each team and will depend on their experience and knowledge. This is best done the day before the dive so that the training can be absorbed and allow time for questions. A Team leader/Team Scientist makes a presentation which includes:

1. Explanation of the goals of Reef Check
2. Review of sampling design and rationale of indicator organisms, field identification for all organisms and Reef Check definitions for substrata
3. Data recording format and preparation of data entry sheets
4. Difference between work diving and pleasure diving and how to avoid reef damage by proper buoyancy control
5. Post-dive data entry, checking and submission procedures.

Three forms are to be filled out, the site description, line transect and belt transect (See Appendix C for forms). Use underwater paper or a plastic writing slate for the surveys. Obtain pictures of the indicator species from the Reef Check website and laminate or place in plastic bag.

**Post dive** –The team scientists gather the slates and data, and review them immediately with the team members. This quick assessment allows errors to be corrected while the team is still on site and the transects are in place. Data is entered into spreadsheets and emailed to Reef Check headquarters.



## Checklist

- Underwater paper or plastic writing slate
- Underwater pen
- 100 m fiberglass measuring tape
- Camera
- Photos of indicator species, laminated or placed in plastic bag
- GPS unit (or detailed charts)
- Compass
- Marker floats



*Reef Check pre-dive training,  
photo by Dave Raney*

**FOR MORE INFO****Related Activities**

Education/outreach, Alien algae removal, water quality

**Additional Resources**

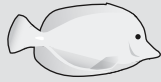
N/A

**Case Studies**

Reef Check Hawai'i

**Contact**

Melissa Mac Garrett, Reef Check Hawai'i

**Pros**

1. Reef Check is a standard methodology used worldwide in more than 82 countries, with a special set of indicator species for Hawai'i. Results can be compared site to site and also allows comparisons of data globally.
2. Reef Check is specifically designed for community volunteers, using a minimum of equipment.
3. Most surveys are conducted at snorkel depths, allowing maximum participation by community volunteers.
4. Because Reef Check includes other components such as alien algae removal, a larger volunteer database is created- more opportunities for people to get involved.
5. Reef Check uses indicator species for fish and invertebrate surveys, which simplifies the training of volunteers.
6. Reef Check uses transects in order to obtain results which are standardized by area. It also provides data on benthic habitat, including percentage of live coral.
7. The core Reef Check survey methodology can be, and has been, expanded to incorporate other data collection of interest to resource managers, including recording presence or absence of the major invasive algae species and encounters with green sea turtles.
8. Reef Check can be combined with other methods such as REEF to provide additional information on the fish species abundance.

**Cons**

1. It requires participation of a trained coral reef scientist at the Master's degree level or equivalent experience to ensure the accuracy of the data collected by the volunteers.
2. Using transects requires an organized team to locate and place transects in suitable areas. This can limit to some extent the number of sites which can be surveyed over the course of a year.
3. Because Reef Check uses indicator species which are highly impacted (e.g. lobster), it is not uncommon for volunteers to report zeros for most or all of the indicator species. This is a very important finding, but can be disappointing to some volunteers. This is one reason why Reef Check surveys are augmented with REEF surveys.

## Tips

- Make sure you have a core team with dedicated people in place for a consistent program.
- Partner with other groups and organizations to assist in setting up and continual management of the project. Partnering also helps with providing funds and other resources you might need.
- Hold a half-day training on land prior to the dive day so that the training can be absorbed and there is sufficient time for questions and discussion

### R. E. E. F (THE REEF ENVIRONMENTAL EDUCATIONAL FOUNDATION)

The Hawai'i REEF project utilizes the Roving Diver Technique (RDT) to collect fish survey data. Divers swim freely at a site and begin recording every fish they see as soon as they enter the water. Sea turtle species seen are also marked.

There are two types of surveys conducted, species only and abundance. The species only data is collected at one site over the course of 1-30 days and records the presence of species only. Species only data is good for beginners but can also be used in conjunction with abundance surveys. For the abundance surveys, each recorded species is assigned one of the abundance categories based on how many were seen during the dive 1) Single -1, 2) few (2-10), 3) many (11-100), and abundant (>100). Every surveyor records the following information on the REEF scansheet: survey time, depth, temperature, and other environmental information specific to the area. A scansheet is completed after every survey and sent to REEF headquarters where the data is compiled and analyzed.



Photo by Liz Foote, Project S.E.A.-Link



## Checklist

- Underwater slate and pencil (starter kit available) with wrist lanyard
- REEF scanforms
- Fish ID book or card

### FOR MORE INFO

#### *Related Activities*

Education/outreach, snapshot days, BBQs

#### *Additional Resources*

REEF, Project Sea-Link REEF  
[http://www.projectsealink.org/pages/programs/reef\\_main.html](http://www.projectsealink.org/pages/programs/reef_main.html)

#### *Case Studies*

Reef Environmental Education Foundation

#### *Contact*

Liz Foote (Project Sea-Link),  
 Robin Newbold (Maui Coral Reef Network),  
 Donna Brown (Mau'i CC Marine Option Program)





## Checklist

- Clipboard and grease pen
- Fish ID card
- Stopwatch – for each team conducting the survey
- Computer with word processing and spreadsheet software
- Stopwatch
- PVC pipe (for quadrats)
- Fishing line
- Mask, fins, snorkel
- Rope or 25 meter plastic measuring tape

Survey data is separated into two categories based on experience level- novice and expert. Experience levels are determined by the number of surveys completed and examination scores, and each region has its own levels. After completion of requisite number of surveys and associated fish quiz, the volunteer receives a certificate (on request)



### Pros

1. REEF is fun and anyone who can learn to identify reef fishes can conduct a REEF survey, regardless of scientific training or experience.
2. The REEF database is well-organized and provides good feedback to those who submit surveys or wish to view survey statistics for various areas.
3. REEF is a good supplement to Reef Check, providing additional information about fish species in the general areas of Reef Check surveys.
4. Less likely to damage coral as there is no substrate contact with transects.
5. The focus on common names & relative abundance/roving diver technique make it easy for any diver/snorkeler to use this method and integrate it into their normal dive/snorkel activities.



### Cons

1. REEF requires volunteers to become proficient in identifying fish at the species level. This level of detail may not be necessary in order to collect information relevant to resource management.
2. The requirement for positive identification of fish at the species level can result in under reporting of parrotfish, and other species which undergo changes as they mature from juveniles to adults.
3. REEF does not include size data, which makes parrotfish data hard to interpret. There are generally a lot of juvenile parrotfish, but few large parrotfish.
4. REEF does not provide standardized data on benthic habitat, e.g. percent coral cover.



### Tips

- Make it fun by having a BBQ!
- Don't always give the quiz during the novice workshop- make it optional. Participants may get nervous and frustrated.
- Partner with other organizations that have materials before investing in your own.
- Include adopt-a-reef and participate in the Great America Fish count!

## MAKAI WATCH

The Makai Watch curriculum follows suggests the following basic protocol for biological monitoring:

1. Work with community members to divide the area into zones.
2. Work with community members, including local fishermen to identify fish or other marine life that are important to them. Keep the initial list small. 6 to 10 species is good. If the community list does not already include them add a few species that are indicators within specific feeding guilds.
3. Make a field data sheet with photos of these species, laminate these, attach them to clip boards, and attach grease pens to the clip board as well.
4. Prepare a data entry sheet for transfer of monitoring information. Include the following general information: a) Date/time b) Names of Surveyors c) Weather conditions d) Tide information

In order to provide comparability among community partner sites, Makai Watch recommends the following overall protocol derived from the ReefWatchers program (see West Hawai'i Sea Grant case study in Appendix A). There are two survey techniques, a comprehensive and community biological survey. The comprehensive survey, conducted at least twice a year for the first several years, includes the use of 10-minute timed swims to determine species presence, a fixed 25 meter transect (with leash/tether, inside and outside control sites), and a photo-quad transect for coral point count analysis. The community survey (conducted once a month) is similar, but does not include a photo-quad transect and the transect style is site-dependant. The comprehensive survey includes benthos, fish and invertebrates, while the community survey includes fish and invertebrates, and may include general substrate cover, depending on the community.



### **Pros**

1. Timed swims are less accurate, but it does help to get a better sense of marine resources in your area, by allowing you to see things you may not have been able to see on the transect.
2. Uses local knowledge to identify species of interest to the community.
3. Combines both a DLNR-DAR approved method for scientific analysis and community involvement in monitoring.
4. Standardizes protocols among Makai Watch communities.

## FOR MORE INFO

### *Related Activities*

Printed materials, signage/ displays, visitor outreach

### *Additional Resources*

N/A

### *Case Studies*

Kapoho Reef Watch, West Hawai'i Sea Grant, Milol'i Coast Watch

### *Contact*

Community Conservation Network, Hawai'i Wildlife Fund, The Nature Conservancy, West Hawai'i Sea Grant



Photo by John Coney,  
UH-Hilo





### **Cons**

1. May be difficult to find funding for long-term comprehensive monitoring.



### **Tips**

- Work in teams of two for safety purposes; one person should be someone familiar with the identification of the fish. Be careful of multiple counting.
- Lay transect first, get equipment order and then count fish. This allows the fish who may have been spooked by the transect to return to the site.



## HUMAN USE SURVEYS

### What is a human use survey?

A human use survey takes a look at numbers of people using an area, how it is utilized and time of usage.

### Why use a human use survey?

Human use surveys can be used to determine carrying capacity or the maximum number of people that can use an area without causing extensive damage to the resources. Surveys can also show when the peak period of use is for all users, by type of user and where they access the water. This can help you target enforcement and education efforts. For example, high use may be during the summer months and on the weekends, from 9am-2pm. You may decide to focus your outreach efforts during this time.

User surveys can also be used to see if implementation of a new management action had any impact on the use of the area. For example, conducting surveys before and after a no-fishing rule is implemented can determine the amount of compliance and knowledge about the new rule and assist in targeted education/outreach to users.








### Overview


**Getting started** – Make some general use observations over a period of 2-3 days, including both weekdays and weekends in this time frame. Look at where people are accessing and using the area. Note what type of activities, including fishing, boating (commercial motorized, recreational motorized, kayak), diving (scuba and snorkeling), and others (sunbathers, surfers, picnickers). Also make a note about the weather conditions, including water clarity, waves, cloud cover, winds. You may decide to divide the area into zones, for example north, middle and south zones. These zones can be further divided into areas such as lagoon, tidepool, reef crest. Areas such as Wai’Opae on the Big Island that have tidepools and channels are best divided into subzones to determine intensity of use. The use of zones is best in a smaller area with a few entry points. For larger areas, you may want to divide the area by access points. Again, if some areas have distinct usage areas, you may want to divide these access point areas by subzones.

Next you’ll want to put together a simple to use form, using spreadsheet software for later data entry use. See appendix C for an example of human use survey forms and protocols. Write a step by step protocol,



Human use zones + subzones at Wai’opae Tide Pools, provided by Linda Shea-Flanders

BASIC PROJECT NEEDS	
Number of people required:	 to many
Amount of funds required:	 to  
Amount of training required:	
Tools required:	  camera

 Checklist	
<input type="checkbox"/>	Clipboard or notebook
<input type="checkbox"/>	Pens
<input type="checkbox"/>	User survey forms
<input type="checkbox"/>	Binoculars
<input type="checkbox"/>	Observation and compliance forms
<input type="checkbox"/>	Hat, sunglasses, sunscreen, water
<input type="checkbox"/>	Camera, video camera
<input type="checkbox"/>	List of contacts for emergencies
<input type="checkbox"/>	Radio or cell phone



**FOR MORE INFO****Related Activities**

Visitor use of facilities,  
snapshot days, observation  
and voluntary compliance

**Additional Resources**

N/A

**Case Studies**

Kapoho reef watch

**Contact**

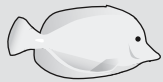
West Hawai'i Sea Grant,  
Kapoho tidepools, Hawai'i  
Wildlife Fund

which should include:

1. Description and location of zones
2. Explanation of codes
3. Definition of different fishing and user methodology (i.e. laynet, pole and line fishing, spear fishing)
4. How to record the data
5. Information about how to survey and not educate
6. Where to record enforcement violations
7. Where to send the completed form.

Conduct training sessions for volunteers, including DOCARE observation and voluntary compliance issues. Surveys should be conducted in 2-hour blocks, during a set time period (i.e. daily, weekly, one week day and one weekend day) and seasonally.

Data is entered into the spreadsheet and can be analyzed a number of ways. You can look at the data by type of user overall, break it down by time of day, week or year, usage areas, access points, etc. See Appendix A (West Hawai'i, Kapoho tidepools case studies) for an example on how to analyze the data. It is important to note that the data needs to be analyzed or summarized to get a clear and accurate understanding of the use patterns at any site. This important step should not be overlooked.

**Pros**

1. Simple to use and easy to train volunteers.
2. The amount of use and patterns of use doesn't exist for many areas and can be particularly helpful information to provide to the resource management agency.

**Cons**

1. In high use areas with many access points, is very difficult to conduct with just one person.
2. The data still needs to be analyzed and compiled to be useful and this takes time and needs to be assigned as someone's responsibility

**Tips**

- In areas where there is a lot of activity, take a snapshot- count each activity individually.
- Use a camera or install a video camera to help record activities.
- Try not to be too conspicuous, especially in areas where privacy is a concern.
- Be prepared to answer questions about the area; carrying a clipboard makes you look "official". Take advantage of the opportunity to educate people about the resource.

## MARINE MAMMAL/SEA TURTLE OBSERVATION/SURVEILLANCE








### What is marine mammal/sea turtle observation/surveillance?

There are three levels: 1) awareness/outreach activities 2) Haul out response and 3) Assisting with strandings. Trained volunteers can educate the general public about basic biology of marine animals and watchable wildlife guidelines, become part of an authorized team to provide haul out assistance or become a trained volunteer to respond to marine mammal strandings (non-listed animals, see below in why use).

### Why use marine mammal/sea turtle observation/surveillance?

In 1973, Congress passed the Endangered Species Act (ESA) to conserve, restore, and protect endangered and threatened species and their habitats. The ESA consists of five key regulations addressing: how a species gets listed, the process for consulting federal actions, a prohibition of “taking” a listed species, the process for getting a permit to “take,” and enforcement mandates of the act. The Marine Mammal Protection Act (MMPA) and the Migratory Bird Treaty Act also provide additional protection for marine and coastal species. See Appendix F and NOAA Fisheries Office of Protected Resources for more information on these acts (<http://www.nmfs.noaa.gov/pr/laws/>).

NOAA Fisheries and the US Fish and Wildlife Service (FWS) share implementation of the MMPA. Among other responsibilities, NOAA’s Protected Resources office is responsible for developing policies and regulations for implementing the provisions and requirements of the MMPA and ESA as well as issuing permits for “takes” of marine mammals. NOAA Fisheries also prepares species recovery plans- this is where action items are developed to assist in the recovery of the species. Many items can be considered “no-take” and include education and cultural activities. Other items are considered a “take” and can include whale and monk seal research or stranding/haul out response.

BASIC PROJECT NEEDS	
Number of people required:	 to as many as you want
Amount of funds required:	
Amount of training required:	
Tools required:	   

Checklist	
<input type="checkbox"/>	Caution tape
<input type="checkbox"/>	Stakes
<input type="checkbox"/>	Warning signs
<input type="checkbox"/>	Educational brochures
<input type="checkbox"/>	Chair



Roping off monk seal, photo by Liz Foote

**EMERGENCY RESPONSE NUMBERS**

Marine mammal emergencies, including whale entanglements  
– NOAA Protected Species hotline: 1-888-256-9840

Sea Turtle Hotline: 808-983-5730

NOAA Enforcement: 1-800-853-1964

DOCARE: See Observation and Voluntary Compliance Section

USFWS, shorebirds: (808) 861-8525

In Hawai'i, both the Hawaiian monk seal and Humpback Whale are listed as endangered under the ESA. Marine turtles are either listed as threatened (loggerhead, green and olive ridley) or endangered (leatherback, hawksbill). In the main Hawaiian Islands, marine mammal and sea turtle strandings and haul outs are becoming more common, and due to increasing population pressure, human interaction is a concern. In addition, swim with dolphin programs are becoming more popular and this can increase people's desire to touch the animals.

**Overview****Level 1: Education**

Volunteers can get involved at various levels. In the first level, you can become trained as a roving naturalist and educate beach goers about the marine animals and birds they may encounter in Hawai'i. See visitor outreach for more information. Or you can work with school groups or hotels on providing lectures or other informational materials. Check with NOAA Fisheries,

Hawaiian Islands Humpback Whale Sanctuary, Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, US Fish and Wildlife or the Department of Land and Natural Resources for access to free materials. You should also be aware of what numbers to call in case of a marine animal emergency. See contact numbers listed to the left.

There are several native and other Pacific area shorebirds that nest, forage or winter along Hawaii's coastline- beaches, estuaries, or wetland areas. These include: Hawaiian stilt (Ae'o), Pacific golden plover, and Wandering tattler. All species listed as threatened or endangered are protected by the Endangered Species Act; migratory birds are also protected by the Migratory Bird Treaty Act. Contact the US Fish and Wildlife Service for more information.

See the United States Shorebird Conservation Plan for the U.S Pacific Islands: <http://www.fws.gov/shorebirdplan/RegionalShorebird/RegionalPlans.htm>

**Level 2: Haul out or animal emergency response**

The next level involves responding to a potential haul out. Volunteers will be interviewed and trained by the appropriate agency. See "Example from the field" for contact information. The volunteer may be called to respond to a potential haul out. If it is a haul out with high human/animal interaction, the volunteer establishes a perimeter around the animal with tape, stakes and signs to keep people at a safe distance. He/she may stay around and answer questions that people may have about the animal. If an animal is being harassed, contact the local DOCARE office, NOAA Fisheries Enforcement or the local police department. Check out [http://hawaiihumpbackwhale.noaa.gov/special\\_offerings/sp\\_](http://hawaiihumpbackwhale.noaa.gov/special_offerings/sp_)



Photo courtesy of USFWS

off/publication\_pdfs/StrandingLayout.pdf for an information sheet on marine mammal emergencies.

Sea turtles frequently haul out on beaches to bask in the sun or nest. Visitors are asked to enjoy sea turtles from a distance – do not crowd, chase, surround, swim with, handle, feed or tease them.

For injured, hooked or entangled turtles, call 808-983-5730. Check out viewing wildlife guidelines for Hawai'i from NOAA: [http://www.nmfs.noaa.gov/prot\\_res/MMWatch/hawaii.htm](http://www.nmfs.noaa.gov/prot_res/MMWatch/hawaii.htm)

If you sight a potential whale entanglement, call 888-256-9840 immediately. Indicate that you have sighted a possible whale entanglement, with an estimated location. The appropriate individual on-call will call you back to ask more questions. If it is a confirmed sighting, a rescue team may be deployed.

### **Level 3: Stranding response (for non-ESA listed animals)**

Volunteers are provided training by qualified federal/state government biologists. The Hawaiian Islands Stranding Response Group (HISRG) was a volunteer-based 501(c)(3) non-profit corporation formed in early 2002 to respond to stranded or distressed marine mammals – alive and dead – in the Main Hawaiian Islands (MHI). They provided training to communities interested in providing assistance during strandings of marine mammals. Today, NOAA Fisheries is forming its own network of trained volunteers. A wide variety of training opportunities are available, depending on your interest and level of experience.

### **Example from the field**

DLNR-DAR has a marine conservation coordinator on Kaua'i who responds and coordinates the response to Hawaiian Monk Seal sightings, haul outs and births. She is seeking volunteers, who will be interviewed and then trained with appropriate protocols. Contact Mimi Olry, (808) 651-7668, [mimi.olry@hawaii.gov](mailto:mimi.olry@hawaii.gov).



### **Pros**

1. Marine mammal observation provides extra eyes and ears for response groups.
2. Having trained volunteers in communities around the state help to provide immediate on-site assistance before appropriate agency personnel can arrive on scene.



### **Cons**

1. Some people may not listen to guidelines about safe wildlife viewing. If they are harassing the animal or causing other problems, call your local DOCARE office, the Sea Turtle hotline or NOAA Enforcement



**FOR MORE INFO**

*Related Activities*

Printed material, lectures, workshops

*Additional Resources*

NOAA Fisheries Protected Resources and Fisheries Science Center, Hawaiian Islands Humpback Whale National Marine Sanctuary

*Case Studies*

None

*Contact*

NOAA Fisheries Protected Resources Division, 808-944-2268



**Tips**

- Be careful around the animals, as they may become agitated and aggressive towards you!
- Follow all marine wildlife viewing guidelines. See NOAA's Protected Resources website for more information: <http://www.nmfs.noaa.gov/pr/education/viewing.htm>

## TIDEPOOL MONITORING

### What is tidepool monitoring?

A tidepool is a rocky pool by the ocean that is filled with seawater, which forms when the ocean covers the beach twice a day during the tides. Tidepool monitoring takes a look at the occurrence and distribution of marine life in the intertidal zone. The intertidal or littoral zone can be divided further into sub zones and different animals can be found in these sub zones depending on the conditions. The highest zone is the splash zone, an area wetted only by waves' splash. The next zone is the upper intertidal and covered only during high tide. The middle intertidal is covered during moderate tides; the lower intertidal is only exposed during low tides. The subtidal zone is never dry, and includes many tidepools. Because the upper areas are exposed to sun and rain, conditions are harsher here and fewer animals are found in these zones.

### Why use tidepool monitoring?

Tidepool monitoring can be a fun and educational activity for keiki; they can learn “in the field” how to identify marine animals. Some fish like manini spend their first few weeks after settling as plankton in the tidepool before leaving for deeper water and more information is needed on this cycle. There may be some interesting trends develop as you monitor at different times of the day, tidal conditions and moon phases.

### Overview

This section gives an overview of the volunteer tidepool monitoring in West Hawai'i by Sara Peck of Sea Grant. It was designed to record fish association with types of substrate and allows for flexibility in data gathering.

In selecting tidepools to monitor, choose tidepool(s) that are safe to monitor at medium tides and ones that you can survey at least one to two times a month. Map the tidepool at both low and high tides to reflect the fluctuations in depth and size- map features and size.

**Data collection** – Water quality monitoring: For each visit to the tidepool, take some simple water quality measurements. Check the temperature and salinity using a thermometer and hydrometer or refractometer. See the Water Quality monitoring section for more details on these methods.

**Tidepool survey** – Approach the tidepool quietly, and sit until the inhabitants of the pool swim out from their hiding places. Begin taking data that is listed on the field data form (See Appendix C for forms). Describe the substrate as well. Try to visit the tidepool at various times of day and moon phases.



Photo by Sara Peck,  
W. Hawai'i Sea Grant

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Graph paper
- Tape measure
- Compass
- Camera
- Water quality monitoring equipment
- Clipboard, pen
- Field data recording sheet
- Fish and invertebrate ID book or card



**FOR MORE INFO**

*Related Activities*

Printed material, activity weeks, Coral reef and fish monitoring

*Additional Resources*

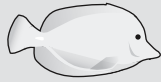
Hawaiian Reefs and Tidepools, Ann Fielding

*Case Studies*

West Hawaii Sea Grant

*Contact*

Sara Peck, West Hawaii Sea Grant



**Pros**

1. This is a great activity to get youth involved with.
2. Provides information not normally collected, such as length of time spent in tidepool before entering deeper water.
3. For those not wanting to get in the water, this provides an opportunity to assist in a hands-on monitoring activity.



**Cons**

1. Weather can be a limiting factor, especially during high surf time.
2. Tidepool monitoring requires the volunteer to be quiet and remain still, so it may not be best for smaller youth.



**Tips**

- Wear non-slip shoes- fisher’s tabbies with felt bottoms.
- Be careful near the shoreline edge; don’t turn your back on the ocean.
- Don’t go to your tidepool during high surf.
- For keiki, you might want to start with a game or other fun activity to help them learn the basics of tidepool monitoring.



## WATER QUALITY

### What is water quality?

Water quality measures the biological, chemical and physical attributes present in the water column. These attributes include oxygen content, temperature, salinity, turbidity, nutrient loading, amount of sediment and the presence of bacteria, metals, and other toxins. The sources of water pollution can be natural or anthropogenic (human induced), and are identified as either point sources or nonpoint sources. Natural sources of altered water quality include minerals worn from rocks or sediment from erosion. Point sources have a discrete discharge location, such as a pipe or culvert, and include wastewater treatment plants, power plants, and industrial facilities that discharge wastewater effluent. Nonpoint sources do not have discharges coming out of a defined point, but rather are difficult to identify and are typically conveyed as general runoff or groundwater seepage. Examples of nonpoint sources include surface runoff from agricultural land or urban areas.

### Why measure the quality of water?

The quality of water can affect the suitability of water for drinking, recreation, wildlife, agriculture, and other every day use. Anything that flows from yards, streets and gutters enters the storm drain and flows to the streams and ocean untreated. For example, fertilizer contains nitrates, which in disproportionate quantities can upset the ratio of nitrogen to phosphorus, nutrients that plants need for growth, but also cause the excessive production of algae. Too much algae can limit the amount of oxygen that other plants and fish need or crowd out native plants and algae.

Other pollutants such as bacteria are carried by the stream to the ocean and can cause bacterial levels to exceed state standards for recreational contact. High levels of bacteria can indicate an increased risk of disease for people who swim, surf, snorkel, dive, fish or have other contact with the stream or ocean water.

Metals such as lead and copper found in brake pads have been found in fish and can cause changes in reproductive behavior. Symptoms in humans can range from excessive headaches to kidney damage. These metals are found in significant quantities during storm water runoff. Researchers are even finding concentrations of the ingredients of sunscreen products in fish and other marine organisms. When streams are stripped of vegetation or buildings placed too close to the stream banks erosion can occur. The concrete streambeds facilitate the transfer of the sediment to the ocean, where it can smother corals.

Volunteer water quality monitoring programs help to build stewardship of local waters. Volunteers learn about the value of our water resources, the types of pollution impacting them and what they can do individually to protect our streams and coastal waters. A water quality monitoring program can help make the connection between watershed health and the health of our oceans, as well as build bridges among the community, businesses and various government agencies.



Photo provided by  
Carl Berg, Hanalei Watershed Hui

*Volunteer water  
quality monitoring  
programs help to  
build stewardship of  
local waters.*





## COMPONENTS OF WATER QUALITY

### What are bacteria and why are they important?

Water contaminated with fecal matter may contain pathogens (bacteria and other micro-organisms that cause illness). Many pathogens are difficult to measure in water samples. Certain bacteria, however, are relatively easy to measure in water samples and, if present, are used to measure the level of fecal contamination. These are called indicator bacteria. The State Department of Health uses enterococci (EPA approved) as an indicator of sanitary quality of water for drinking and recreational use like swimming or surfing. *Clostridium perfringens* is monitored as a secondary indicator. Both enterococci and *C. perfringens* are found in the intestinal tract of both humans and animals. Its presence is a good indicator of recent or past fecal contamination in water and spores survive well beyond the typical life-span of other fecal bacteria. Some organizations monitor for *Escherichia coli* (*E. Coli*), fecal coliform or total coliform, especially in streams. Total coliform is a collection of microorganisms that aid in the decomposition of organic material. Where total coliform is found in water, testing is also conducted for *E. Coli* and fecal coliform. *E. Coli* is a type of fecal coliform that is associated with human or animal waste and can originate from the presence of large congregations of birds, livestock, dogs, septic systems or non-treated human waste.

### Methods for Monitoring Bacteria

**Colilert 18 method** – This method tests for Total Coliform and *Escherichia Coliform* (*E. Coli*). EPA recommends testing for enterococci instead of Total coliform and *E. Coli* for salt water testing.

**Enterolert testing** – This method tests for enterococci using the Quanti-Tray sealer or 5 or 15 test tube method. The Enterolert reagent is used for the detection of enterococcus bacteria in fresh and marine water.

**Millipore Test (“paddle test”)** – This is a test used by students but not by Surf Rider chapters, as the results are unreliable. It can be used as a screening method to determine whether a problem exists at a site.

Quanti-Tray® – IDEXX is a company that supplies water quality testing materials and has created the Quanti-Tray® that improves the accuracy, reduces sample contamination and eliminates the need for the use of disposable test tubes. This is an EPA approved method.

See **method #3** for a description using the first two methods.

### What can I expect to find?

Department of Health (DOH) enterococcus standards are usually reported that a geometric mean should not exceed X amount per 100 per one hundred milliliters, where not less than five samples which shall be spaced to cover a period between 25 and 30 days. There is also a single sample limit. This depends on the location. You can find a wide range of levels; a look at the Department of Health’s website

(<http://emdweb.doh.hawaii.gov/CleanWaterBranch/WaterQualityData/default.asp>); a look at one period found samples ranging from .8 to 880.

### **What is dissolved oxygen and why is it important?**

All aquatic organisms need oxygen to live. Dissolved oxygen (DO) is the amount of oxygen dissolved in water and is measured in units of mg/L or percent saturation. Milligrams per liter is the amount of oxygen in a liter of water. Percent saturation is the amount of oxygen in a liter of water relative to the total amount of oxygen that the water can hold at that temperature. It varies inversely with temperature, as colder water contains a higher concentration of oxygen. Fluctuations in dissolved oxygen occur throughout the day due to changes in temperature, photosynthesis and respiration of aquatic organisms. Generally dissolved oxygen is highest at noon, due to photosynthesis from algae, and lowest in the evening or early morning hours due to uptake of oxygen through respiration of all organisms in the stream.



'O'opu nopili, DAR

### **Methods for monitoring DO (from CWT 2004):**

**Colorimetric** – This method uses a chemical reagent that reacts with oxygen to produce a colored product. The intensity of color is proportional to the concentration of oxygen in the sample and is compared to a series of color intensities that reflect known concentrations of dissolved oxygen. This method is found in most educational kits, is often used for screening low oxygen levels, and provides a quick and rough measurement of DO. See **method #1** for a description.

**Titrimetric** – In this method, samples are collected in a special bottle, with a specially-designed cap (or specially-designed mouth and glass stopper, often sold as “BOD bottle”), that allow for enclosure of liquids without contact with air. The Winkler method is the most common method, which involves fixing the sample with a series of reagents that form an acid compound that is titrated. Titration involves the drop by drop addition of a reagent that neutralizes the acid compound and changes the color of the sample solution. Titrimetric kits are useful for routine monitoring in streams and the sample can be fixed and titrated in the field or fixed and taken to a lab for titration. Most kits use an eyedropper and syringe type titration and is less precise than a digital titrator. If you need a high degree of accuracy and precision, obtain a digital titrator. See **method #2** for a description of its use.

**Polarographic** – This method uses an electronic device that converts signals from a probe placed in the water into units of DO in mg/L. It is useful when many measurements are needed in a short time, or if you'd like to transfer the data directly to a computer. Results are read directly as mg/L, whereas with the titration method, the results must be converted to mg/L. See **method #2** for a description of its use.

### **What can I expect to find?**

With cool, fast flowing turbulent freshwater, you can expect to find DO at saturation levels of 9-10 mg/L depending on temperature. In the ocean, you can





Photo by Jennifer Smith,  
Hawai'i Coral Reef Initiative

find a wide range of levels; the Department of Health's website shows values ranging from 4.3 to 7.3 during a period in September. Hawai'i administrative rules standards (HAR 11-54) require values ranging between 60 and 80 percent saturation (depending on the area) determined as a function of salinity and ambient water temperature.

#### **What are nutrients and why are they important?**

Plants require both nitrogen and phosphorus for growth; however excessive amounts of these nutrients that drain into surface water can stimulate the production of algae, which reduces the dissolved oxygen content in the water. Some algae can produce chemicals that are toxic to livestock and wildlife. Nitrogen and phosphorus are two of the most heavily applied nutrients in farming operations and the connection to water quality makes good management of fertilizer application crucial. Forms of nitrogen include ammonia, nitrates and nitrites. Excess nitrates can cause hypoxia (low levels of dissolved oxygen) and become very toxic to aquatic animals at high concentrations (10 mg/L or higher) under certain conditions.

Organisms on coral reefs require nutrients; very low concentrations of nutrients occur in coastal waters. High concentrations can cause phytoplankton and algae blooms and may indicate contamination from bacteria, which sources include pollution from sewage, agriculture and industrial runoff.

#### **Methods for monitoring nitrate-nitrogen**

*Cadmium reduction method* – The cadmium reduction method is a colorimetric method that involves contact of the nitrate in the sample with cadmium particles, which cause nitrates to be converted to nitrites. The nitrites then react with another reagent to form a red color whose intensity is proportional to the original amount of nitrate. The red color is then measured by comparison to a color wheel with a scale in milligrams per liter that increases with the increase in color hue. The color wheel should be used only if nitrate concentrations are greater than 1mg/L. For concentrations below 1 mg/L, a spectrophotometer should be used. See **method #2** for a description of its use.

*Nitrate electrode method* – This method uses a probe with a sensor that measures nitrate activity in the water. Accuracy of this meter can be affected by high concentrations of chloride or bicarbonate ions, as well as fluctuating pH levels.

*What can I expect to find?* DOH standards for Nitrate + nitrite nitrogen and total nitrogen vary depending on the area. Natural levels of nitrates or ammonia are low, less than 1 mg/L; however in the effluent of wastewater levels can be as high as 30 mg/L.

#### **Methods for monitoring phosphorus**

Monitoring for phosphorus is difficult because it involves measuring very low concentrations down to 0.01 mg/L or lower. But even low concentrations of phosphorus can have dramatic impacts on aquatic ecosystems. Less sensitive methods should be used only to identify serious problem areas.

*Ascorbic acid method* – In this method, a combined liquid or prepackaged powder reagent is added to either 50 or 25 mL of the water sample. This reagent colors the sample water blue in proportion to the concentration of orthophosphate in the sample. Absorbance or transmittance is measured after 10 minutes but before 30 minutes using a color comparator or an electric meter. Color comparators are useful for identifying heavily polluted sites with high concentrations (greater than 0.1 mg/L). Matching hues can be very subjective and lead to variable results. A field spectrophotometer or colorimeter is recommended for accurate determination of low concentrations (between 0.2 and 0.02 mg/L).

#### **What can I expect to find?**

DOH standards again vary depending on the area. In the UH study of the Waimanalo-Kailua area, researchers found phosphate levels ranging with geometric means of 2.75 to 27.97 ug/l (streams); 10.38 to 40.11 ug/l (estuaries); 2.75 to 9.86 ug/l (marine).

#### **What is pH and why is it important?**

The pH measures acidity and alkalinity of water, with a pH below 7 indicating acidic conditions, and above 7 indicating alkaline conditions. Changes in pH could be due to erosion of some types of geological features or effluent from wastewater treatment plants. Low pH levels present a problem for most organisms with the exception of bacteria, which can survive pH levels as low as 2.0. Some species of fish and aquatic life are more sensitive to low pH levels than others.

While pH is unlikely to change much over time, a change in pH in coastal waters can indicate the presence of a new source of pollution or indicate an increase in pollution from an existing source.

#### **Methods for monitoring pH**

*Soluble indicator* – These indicators are used in liquid indicator kits where some type of concentrate is added to the water and the color is compared to a pH scale. See **method #1** for a description of its use. This method is also found in litmus strips that contain the liquid indicator and bleed out when dipped in the water solution. The litmus strips are good for a laboratory or in a class exercise and not recommended for environmental conditions.

*Colorfast indicator strips* – These are non-bleeding strips made of absorbent paper where the indicator molecule has been chemically linked to the paper and does not bleed out. These can be used in environmental conditions.

*Colorimeter* – This method uses a vial filled with the sample water, to which a reagent is added. The sample changes color and is compared to a color wheel or spectral standard. The colorimeter can be used for grab sample measuring, but not continuous measuring. See **method #2** for a description of its use.

*pH meter* – A meter is recommended for precise and continuous measurement. See **method #2** for a description of its use.



Photo © James Watt



**What can I expect to find?**

DOH standards indicate that pH levels shall not vary more than 0.5 units from ambient conditions and be within a certain range, depending on the area. The pH usually varies in the ocean surface waters between 7.5 and 8.5 depending on the relative importance of photosynthesis versus respiration.

**What is salinity and why is it important?**

Salts that dissolve in water break into positively and negatively charged ions. Conductivity is the ability of water to conduct an electrical current, and the dissolved ions are the conductors. Salinity measures the amount of salts in the water. Dissolved ions increase both conductivity and salinity, so the two are related. High salinity values can impact ecological value of surface waters and limit usage for recreation, agriculture and industries. Fresh and marine water organisms have very different tolerances to changes in salinity. One cause of increased salinity (in addition to tidal fluxes) is land management practices such as over-clearing of vegetation that increases the recharge of water to groundwater resources. The water table is brought closer to the surface and thus increases the amount of the salt-laden groundwater into the streams or introduces more salt into the stream from runoff. Increases in irrigation or domestic use can also cause the water table to rise and flow can decrease as a result. Corals tolerate a narrow range of salinities between 30 to 40 parts per thousand.

**Methods for monitoring conductivity/salinity**

**Conductivity meters** – These electronic meters use a probe that applies voltage between two electrodes, spaced a known distance apart, and records the drop in voltage. These meters are best for measuring fresh or brackish waters. See **method #2** for a description of its use.

**Refractometer** – A refractometer measures the ability of the water to refract light. See **method #2** for a description of its use.

**Hydrometer** – The specific gravity, or density, of water is higher when the dissolved solids (salt and other substances) in the water are higher. A hydrometer measures specific gravity which can then be converted to salinity.

**What can I expect to find?**

Generally, DOH standards basically state that salinity shall not vary more than ten per cent from ambient conditions (wetlands, estuaries) or natural or seasonal changes considering hydrologic input and oceanographic factors (all other areas). DOH's website shows values ranging from 1.45 (in a river) to 35.4 g/L (ppt-parts per thousand) during a period in September. Hanalei Watershed Hui reported average salinity values of 1-4 ppt for monitored streams and 29-34 ppt in ocean waters.

**Why is temperature important?**

Many aquatic organisms require clean, cool water for reproduction and growth. Temperature of a water body can vary due to seasonal and diurnal influences. Inflowing water, flow rate, wind speed, air temperature and riparian shade can



Concrete channelization of stream

all affect water temperature. Concrete channelization of streams to provide for flood control can also increase water temperature and decrease recharge to groundwater due to the impervious surface and removal of a vegetative canopy cover which provides shade. Coral reef bleaching is associated with high temperatures, with concerns of impacts from global warming.

#### **Methods for monitoring temperature**

*Temperature strips* – These are quick and easy strips which change color to indicate the temperature. See **method #1** for a description of its use.

*Bulb Thermometers with colored alcohol (avoid mercury thermometers):* The thermometer is lowered three inches in the water, and read after 2 minutes. See **method #2** for a description of its use.

*Temperature probes and meters* – These usually come with other meters, such as pH or conductivity. The probe is placed in the water, and the temperature can be recorded separately, or some meters come with data loggers. See **method #2** for a description of a multi-parameter probe.

*Hobo temperature loggers* – These data loggers can be placed in the water for continuous measurements. The logger is removed and data is downloaded directly into a computer.

#### *What can I expect to find?*

DOH standards indicate generally that temperature shall not vary more than one degree Celsius from ambient conditions. In streams, the temperature shall not exceed 30 degrees Celsius, as a function of recent rainfall events and elevation at the sampling sites. Typical temperature ranges are: coastal waters – 23° - 27°C (71° - 81°F); streams 16° - 21°C; (60° - 70°F); in streams that have been channelized, temperatures can be found up to 30°C or more (86°F +).

#### **What is turbidity and why is it important?**

Turbidity is a measure of water clarity. When a water body is cloudy it is often due to the runoff of sediment containing small clay particles or other organic particles. Turbidity varies naturally with the soil type, for example a clayey soil is dominated by very small sized clays which remain suspended and cause the water to be turbid for several days. Over clearing of vegetation can result in increased erosion and turbidity in the streams and nearshore waters. Sediment particles suspended in seawater can prevent light from reaching corals and as it settles, can smother them.

#### **Methods for monitoring turbidity**

*Secchi Disk* – The observer measures the depth at which the secchi disc is no longer visible. The results are measured in feet or meters. This method depends on the amount of sunlight, shadows and ripples that are in your sample area. Because of this, it can't be used in the surf zone or in short depths. See **method #1** for a description of its use.

*Transparency tube* – The observer views an object or a Secchi pattern through



Honolua Bay after storm,  
Photo by Liz Foote



the water in a tube, adding water gradually till the object is no longer visible. The results are measured in centimeters or inches. This can be used anywhere, including the surf zone and is a relative measure of turbidity.

*Nephelometer or turbidimeter* – This measures how much light is scattered when directed at a water sample. The units are reported in nephelometric turbidity units (NTUs) or Formazin turbidity Units (FTU) which, numerically, mean the same thing. See **method #2** for a description of its use.

*What can I expect to find?*

DOH standards for turbidity are different depending on the area. DOH’s website shows values ranging from 0 to 41 NTUs during a period in September. Typical values are shown below:

WATER TYPE	TURBIDITY LEVEL
Water bodies with sparse plant and animal life	<0.1 NTU
Drinking water	<0.1 NTU
Typical groundwater	<1 NTU
Water bodies with moderate plant and animal life	1 - 10 NTU
Water bodies enriched with nutrients, supporting large plumes of planktonic life	10 – 50 NTU
Winter storm flows in streams and rivers	20 – 1000 NTU



Photo by Jeff Zimpfer, UH Sea Grant

**HOW DO I GET A VOLUNTEER PROGRAM STARTED? WHAT DO I NEED TO KNOW?**

There many documents which give tips to people wanting to start a volunteer program. Check out the water quality information section in Appendix D for additional resources. EPA’s Volunteer Monitor listserv is a great resource as well. Here are some things to think about prior to setting up a water quality monitoring program:

**1. What are your goals? Why do you want to monitor?**

- Do you want to provide high quality data to assist local agencies in monitoring the health of your stream? Do you need to comply with the Clean Water Act? If you need to provide data to comply with EPA standards, you’ll need to take measurements in EPA units. **Check out WQ #2.**
- Or is it simply to educate students and the local community about why clean streams and oceans are important to the health of the environment? Check out **WQ #1.**
- Are you also interested in testing for nutrients and bacteria? Check out **WQ #3.** Providing data to agencies will require more training, funds and stricter protocols, while a goal of education may utilize cheaper measuring materials that aren’t very accurate but may be fun for keiki to work with. See Appendix C for a summary of these methods.

**2. How much funds do I have? Where can I find additional funding? The**



amount of funds you have may limit the types of monitoring you can do. Try partnering with other organizations to obtain access to funding and/or equipment. See Appendix E for funding resources.

3. **Are you willing to travel to monitor streams/ocean waters or do you want to work in your own backyard? How much time do you have available?** A more stringent monitoring program will require more time and energy from your volunteers. They may be asked to sample during storm events.
4. **How much experience do I have? Is there someone who can assist me?** If you don't have any experience in water quality monitoring you'll want to seek technical assistance. Locate someone who has started a program that you are interested in. A good place to start is local schools, University of Hawai'i Sea Grant local offices. Also see the references mentioned in this section.
5. **What problems have been identified in the water body? Are there species of interest located in your sampling area?** Check with the Department of Health, DLNR-DAR or UH Sea Grant Water Quality Extension Program.
6. **Gather information about your watershed/waterbody.** This can include pictures, research in the library or internet, contacting government agencies (like DLNR, Board of Health, EPA), or talking story with local residents. Take a walk along the stream and take notes and pictures of what you are seeing.

*Keep in mind that each method has different detection limits*

#### **Quality Assurance/Quality Control**

If you are providing test results that provide more reliable data, you may want to look into creating a Quality Assurance Project Plan (QAPP). A QAPP contains a definition of the problem, project organization, data quality objectives (i.e. accuracy, comparability, completeness, precision), training requirements, documentation and records, sampling method requirements, sampling handling and custody requirements, analytical methods requirements, technical requirements, quality control, testing, inspection and maintenance, instrument calibration and frequency, etc. As you can see, creating a QAPP may take time and money, but the results are more likely to be considered to be reliable. There are several templates available for you, see additional resources in Appendix D. If you are interested in providing data for DOH to use, they require the development of a QAPP, QA/QC and Standard Operating Procedures (SOP).

#### **Safety Considerations**

- Team leaders should inspect and restock safety equipment including first aid kit, gloves and eye wash. They should keep a record of all injuries and report them to the project coordinator. All volunteers should sign a liability waiver.
- Wear gloves, especially if you have open cuts or wounds and safety glasses when working with chemicals.
- Be aware of pathogenic microorganisms such as Giardia and Leptospira, and try to avoid direct contact with the stream water. Avoid eating food or snacks during sampling to minimize hand to mouth contamination.
- Wash hands after every sampling event and after every experiment.

**Keep in mind** – Each method has different detection limits. A *detection limit* is










the lowest concentration of a given constituent that a method or instrument can detect and report as a value greater than zero. Detection limits vary from parameter to parameter and change from time to time due to improvements in analytical procedures and equipment. This is important for several reasons, depending on the area you are monitoring. Some parameters have low concentrations to begin with especially in certain conditions. If you need to provide more precise data, you will need to use the methods/instruments with low detection limits.

**Methods**

While there are a number of parameters to monitor, here are the most common. These include: pH, dissolved oxygen, turbidity, salinity, temperature, nutrients and bacteria. See the end of this section for references on other parameters to measure.

If monitoring in coastal waters, it is suggested that temperature, salinity, dissolved and turbidity be measured as part of a minimal monitoring plan. While these parameters do not fluctuate much over time, they can vary widely in shallow coastal waters, especially those that are close to fresh water input.

BASIC PROJECT NEEDS	
Number of people required:	 to as many as you want
Amount of funds required:	 to 
Amount of training required:	
Tools required:	  

**WATER QUALITY MONITORING PROTOCOL #1, BASIC LEVEL**

**Overview**

If your goal is just to get people educated about water quality issues or you want to get people actively involved in caring for aquatic resources, then use this simple protocol. Many schools and community groups utilize one of Lamotte’s educational kits such as GREEN Low Cost Water Monitoring Kit or GREEN Water Monitoring Kit. These types of materials can be used by kids as young as eight since they do not use hazardous chemicals used in method #2. The Low Cost Water Monitoring Kit monitors for eight parameters: pH, dissolved oxygen, biochemical oxygen demand, temperature, turbidity, nitrate, phosphate, and coliform bacteria. The kit comes with a step by step instruction manual, and necessary equipment with nonhazardous Testabs for 10 samples (3 coliform samples). It can be used to test fresh, brackish, or saline aquatic environments, costs about \$33 per kit. The GREEN Water Monitoring Kit can be used as part of a watershed education study and comes with nine individual modules (100 samples each, 44 for coliform, unlimited for benthic macroinvertebrates and turbidity): Benthic macroinvertebrates, biochemical oxygen demand, coliform bacteria, dissolved oxygen, nitrate, pH, phosphate,



Water monitoring day kit, photo by Megan Toaspern

turbidity, and temperature change. Each module is also sold separately, while the total kit costs \$185. While these kits do not include salinity, these modules can be purchased separately.

### Setup and General Sampling Protocol

- If possible, boil sample container and cap for several minutes to sterilize the container and avoid touching the inside of the container.
- Collect water sample(s) in a sterile wide mouthed jar or container, approximately 1 liter.
- For the turbidity test, adhere Secchi disk icon sticker to the large white jar 8-24 hours before sampling.
- Rinse the bottle 2-3 times with the stream or ocean water.
- Remove the cap just before sampling and avoid touching the inside of the bottle or cap.
- Wade slowly into the water, stand facing upstream or down current.
- Hold the bottle near its base and plunge it below the water surface. Collect a water sample 8 to 12 inches beneath the surface or mid-way between the surface and the bottom if the stream reach is shallow.
- Turn the bottle underwater into the current and away from you.
- Allow water to flow into container for at least 30 seconds.
- Cap full container while still submerged and remove from the water immediately.

### Method (temperature, turbidity, dissolved oxygen, pH, salinity)

**Temperature** – The Lamotte kit comes with temperature strips. Submerge the temperature strip on the white container four inches under water (if possible) for one minute. The water temperature will be indicated in green.

**Turbidity (using the enclosed container)** – Fill the white container included in the Lamotte kit to the fill line (being careful not to stir up the bottom sediment). Look for the secchi disk on the bottom of the container. Compare the visibility of the secchi disk to your color card.



**Turbidity-water clarity (using a secchi disk, \$43 or make your own)**

1. Check to make sure that the Secchi disk is securely attached to the measured line.
2. Lean over the side of the boat and lower the Secchi disk into the water, keeping your back toward the sun to block glare.
3. Lower the disk until it disappears from view. Lower it one third of a meter and then slowly raise the disk until it just reappears. Move the disk up and down until the exact vanishing point is found.
4. Attach a clothespin to the line at the point where the line



## Checklist

- Test kit- Lamotte or similar educational kit- one per teams of 2-3
- Secchi disk or transparency tube for measuring water clarity
- Salinity hydrometer
- Test tubes (20 mL size)
- Data forms
- Eye protection (i.e. goggles) and gloves
- Clipboard with attached pen/pencil
- Container to dump test results (DO, pH, all tests using test tabs or other chemicals)
- Larger plastic bag to store forms in case of rain

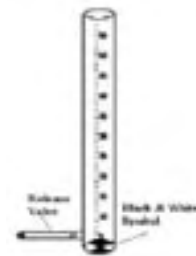


CENTIMETERS	INCHES	TURBIDITY VALUE
6.4 to 7.0	2.5 to 2.75	240
7.1 to 8.2	2.76 to 3.25	185
8.3 to 9.5	3.26 to 3.75	150
9.6 to 10.8	3.76 to 4.25	120
10.9 to 12.0	4.26 to 4.75	100
12.1 to 14.0	4.76 to 5.5	90
14.1 to 16.5	5.6 to 6.5	65
16.6 to 19.1	6.6 to 7.5	50
19.2 to 21.6	7.6 to 8.5	40
21.7 to 24.1	8.6 to 9.5	35
24.2 to 26.7	9.6 to 10.5	30
26.8 to 29.2	10.6 to 11.5	27
29.3 to 31.8	11.6 to 12.5	24
31.9 to 34.3	12.6 to 13.5	21
34.4 to 36.8	13.6 to 14.5	19
36.9 to 39.4	14.6 to 15.5	17
39.5 to 41.9	15.6 to 16.5	15
42.0 to 44.5	16.6 to 17.5	14
44.6 to 47.0	17.6 to 18.6	13
47.1 to 49.5	18.7 to 19.5	12
49.6 to 52.1	19.6 to 20.5	11
52.2 to 54.6	20.6 to 21.5	10
>54.7	>21.6	<10

enters the water. Record the measurement on your data sheet. Repeating the measurement will provide you with a quality control check.

**Turbidity (Using a transparency tube \$35-\$50)**

1. Collect water sample as directed in instructions. Remove any large objects from the water sample.
2. Stir sample for 15 seconds to suspend all materials.
3. Stand out of direct sunlight, or use your body to cast a shadow on the tube.
4. Slowly pour a small amount of sample into the tube. Look for target disk on the bottom of the tube. If disk is visible, add water until it just disappears.
5. If target is not visible, pour water off water a little at a time until disk is just visible.
6. Record nearest NTU mark, or use a tape measure to measure from disk at bottom of tube to top of water level.
7. Record measurement on data sheet. Make sure you indicate cm. or in. if you used a tape measure. Dump contents of tube on water.
8. Repeat steps 2 through 9.
9. Record the second measurement on the data sheet. Indicate if you measured in cm. (centimeters) or in. (inches).
10. Add both of the readings and divide by two and record this number on the data sheet.
11. Use the turbidity value conversion chart (see table to the right) to determine the turbidity value from the average measurement (step 12) if you measured with a tape measure. If you used the NTU measurements written on the tube, record this information.\*



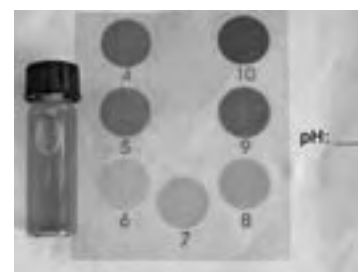
\*Note: If disk is still visible after being filled to the top mark, please record as <10 NTUs

**Using General Water Sample from Jar**

**Dissolved Oxygen (DO)** – Fill the small glass tube until it is overflowing. Add two DO test tabs to the glass tube. Cap the tube and shake it until the tablets have disintegrated (about four minutes). Wait an additional five minutes. Compare the color of the sample to the color card and record the results as ppm dissolved oxygen.



**pH (Soluble indicator)** – Fill a large test tube to the 10 mL line. Add one pH test tab. Shake the tube until the test tab has disintegrated. Compare the color of the sample to the color card and record the results as pH (you can take the reading immediately after the test tab has dissolved-you do not have to wait).





**Salinity** –Fill a graduated cylinder with salt water and obtain a temperature reading. Remove the thermometer and place the hydrometer in the cylinder. Wait until the hydrometer has stopped bobbing around. Be sure that your eye is even with the water level in the graduated cylinder, at the bottom of the meniscus. Viewing at an angle can give an inaccurate reading. Read and record the number on the hydrometer that best matches up with water level. This is the specific gravity of the sample.

Open the salinity conversion table to Table 1 (LaMotte hydrometer instructions). Follow along the top row of table to the column with the temperature (C) of the water sample. Then, follow down the right side of the table, the Observed Reading row, to the reading obtained from the hydrometer. Where the column and the row intersect on the table is the salinity reading for the water sample. It is expressed in parts per thousand (ppt). The range of this method is limited to 16-40 ppt, with an extent of error +/- 10%. Other test tabs are included with the Lamotte's kits; check out instruction manual for more detail.

#### FOR MORE INFO

##### *Related Activities*

Snapshot days, marine debris retrieval, beach cleanups

##### *Additional Resources*

Kailua Bay Advisory Council

##### *Case Studies*

None

##### *Contact*

N/A



### **Pros**

1. Good method for getting keiki involved due to use of nonhazardous materials.
2. Little training needed.
3. Good way to introduce people to understanding what is so important about water quality and what they can do to improve it. This interest can lead to a more stringent citizen monitoring group.



### **Cons**

1. Does not give accurate results; must be careful not to portray or report findings as scientifically valid.
2. Can be expensive if used on a regular basis.
3. Funding can be difficult to obtain if not part of a structured program with measurable results.







### **Tips**

- In order for new volunteers to understand how, what and why to sample, hold training sessions prior to monitoring days.
- Make sure you have enough test kits on hand- assemble volunteers in groups of 2-3. One person can record the results, others can sample. Rotate the duties around.



- Have people draw a simple map of where they are taking the test, write a short description of the area.
- To get new volunteers interested and educated about water quality monitoring, hold the sessions as part of Earth Day (<http://www.earthday.org/>), World Water Quality Monitoring day (<http://www.worldwatermonitoringday.org/>), International Coastal Cleanup day (<http://www.coastalcleanup.org/main.cfm>) or as part of an activity week, such as Reef Awareness week.

BASIC PROJECT NEEDS	
Number of people required:	 to as many as you want
Amount of funds required:	
Amount of training required:	
Tools required:	

## WATER QUALITY MONITORING #2

### Overview

If you are interested in starting a volunteer monitoring program that takes samples on a regular basis, then you'll want to use this method. You can start out small, measuring a few key parameters, and then move on to other sampling techniques. Make sure that you have a clear purpose behind your monitoring activities, with clearly defined goals and objectives. See Appendix C for sample data collection and data entry forms.

Below are two summaries of volunteer water quality monitoring groups:

*University of Hawai'i, Sea Grant Program* – The UH Sea Grant program in collaboration with the Clean Water Branch of the Department of Health created a Volunteer Water Quality Monitoring Manual for Streams. It was developed out of a need to work with volunteers during a pilot project on windward O'ahu. Volunteer monitoring for the pilot project included water quality sampling, algal surveys, and a biological survey of the stream. The biological survey included streamside and stream characteristics, stream habitat, and stream life.

A community advisory group and coordinating committee were formed to help direct and manage volunteer water quality activities. The coordinating team established and networked with scientists and technical experts. The scientific cooperators served as advisors, provided training and educational workshops, provided the project with an extensive resource base and offered mutual support and collaboration. Since they covered a large area, they formed Stream Teams, led by a Team leader. The Stream Report, prepared by the Team leader, included a cover page, maps, survey forms, sampling forms, algal survey forms, photographs and any other additional information.

*Santa Barbara ChannelKeeper, State of California Certified Citizen Monitoring Program* – The State of California Water Control Resources Board oversees a Citizen Monitoring Program. This program includes the preparation of a QAPP. The Santa Barbara ChannelKeeper (a member of the national Waterkeeper Alliance) is a part of this program with two successful Stream Teams in Goleta and Ventura. The goals and objectives of the program are to collect data on the health of the watershed, help identify sources of pollution and educate and train community watershed stewards. This group focuses on sampling in the creeks and estuaries, since the cities and counties focus on locations near beaches.

Quarterly training is offered, but due to the low turnout, volunteers are trained on-site. All volunteers fill out waivers (Appendix C), and there is no minimum requirement for length of volunteer commitment. Volunteers are recruited via a website, flyers, presentations and word-of-mouth. They also partner with other organizations to assist in recruitment. Volunteers are provided lunch (pizza and sodas) after the sampling event. If funding is available, t-shirts are provided to volunteers who help out at least three times.

Sampling is conducted monthly, where teams of volunteers measure physical and chemical parameters in the field, using portable, hand-held instruments. Flow is measured at some sites by measuring cross sectional area and velocity. Water samples are collected at each site and are processed in ChannelKeeper's laboratory for bacteria with approved standard methodology (Colilert-18 and Enterolert-24, manufactured by Idexx Laboratories). Samples are also analyzed at the University of California Santa Barbara (UCSB) laboratories for nutrients (nitrate-nitrogen and orthophosphate) to lower sample analysis costs. Other characteristics such as vegetation and aquatic life are recorded during sample collection on standardized forms. A consultant from UCSB who assists with the monitoring events analyzes the data, which is freely available on their website.

### Methods

#### *Preliminary protocols:*

- Hire a project coordinator.
- Develop a budget, and secure funding from federal, state and private sources, including charitable foundations.
- Develop a quality control/quality assurance plan to ensure the credibility of the data collected. Contact scientists and government agencies for their assistance in setting up the program and protocols.
- Develop Team Leaders and recruit volunteers. Train leaders who can train volunteers. All Team Leaders must complete at least two hands on training sessions on monitoring. Topics include: general hydrology, ecology, safety, quality assurance and quality control measures, sampling procedures, field analytical techniques, and data recording. Leaders train the volunteers and must also participate in semi-annual quality control sessions, which allow for the groups to check the accuracy and precision of their equipment and testing techniques.
- Identify the landowners, and obtain permission to access their property.
- Walk the stream length or coastal area to determine sampling/surveying locations.
- Select at least three sites, with the following criteria: 1) Water should be free and flowing 2) Water should be well mixed 3) Access to the stream/coastal area should be free and easy. You may want to establish sampling sites above and below areas of special interest, like storm drains, stream junctions, or effluent outlets. If you have a GPS unit, take coordinate readings for the site. Also write down a description of the area, with explicit directions on how to get there. Write down the altitude as well- you'll need this for calibrating the DO meter.



## Checklist

- WQ equipment, type depends on your needs and funding. GPS unit.
- Bucket/rope for obtaining samples in deep water
- Test tubes (20 mL size)
- Distilled water
- Data forms- use waterproof paper if sampling in rainy conditions.
- Clipboard, pen
- Eye protection (i.e. goggles) and gloves





- If sampling more than one stream, color-code the streams. All sampling/surveying material would be coded in that streams' color.
- Establish a sampling schedule. Sampling reports should be handed in at a set time each month. A stream report includes a cover page, maps, survey forms, sampling forms, algal survey forms, photographs and any other relevant information.
- Put together a monitoring protocol binder for your volunteers – it should include protocols, safety considerations, information about your sites, contact numbers, forms, etc.

**General Sampling Protocol**

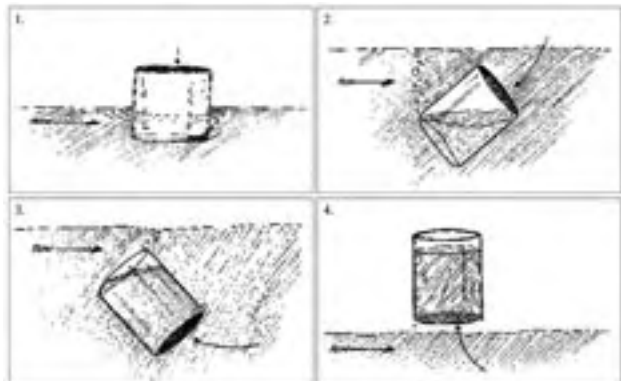
Preparing reusable sampling container: **Wear latex gloves for each method!**

**Method A (If monitoring salinity, turbidity, pH)**

- Wash each sample bottle or glassware piece with a brush and phosphate free detergent.
- Rinse three times with cold tap water.
- Rinse three times with distilled or deionized water.

*How to Collect Samples*

- Label bag or bottle with site number, date and time.
- Tear off the top of the bag or remove the cap just prior to sampling. Try to avoid touching the inside of the container.
- In a stream, sample away from the stream bank in the main channel- avoid stagnant water. If shallow, wade carefully out into the center current, disturbing as little of the bottom sediment as possible.
- In coastal waters, take the sample approximately six inches below the surface of the water in ankle to knee deep water from an area where waves are breaking or water is agitated. Take the sample during an incoming surge of water. Try to avoid taking the sample from an area where the water is not moving. (Surfrider Blue Water Task Force)
- For the bag, hold the two white pull tabs in each hand, lowering the bag into the water with the opening facing upstream or towards the incoming surge of water. The bag should fill with water, if not scoop the water in, by drawing the bag upstream and away from you. Fill no more than three quarter full.
- For the bottle, hold the bottle near its base



Turn the bottle into the current and scoop in an upstream direction.



and plunge it below the water surface. Collect a water sample 8 to 12 inches beneath the surface or mid-way between the surface and the bottom if the stream reach is shallow.

- Take the bag out of the water, pour out any excess water. Pull on the wire tabs to close the bag. Hold onto the wire tabs and flip the bag 4-5 times quickly to seal the bag- there is no need to squeeze the air out of the top of the bag. Fold the end of the wire tabs together at the top, twist them together forming a loop.
- For the bottle, leave a 1-inch air space (except for DO and BOD samples) so that the sample can be shaken right before analysis. Recap the bottle carefully.
- Place sample in the cooler with ice or ice packs.

#### *Collecting Samples in Deep Water*

You may want to collect ocean samples from boats or off piers/bridges, or in a deep stream. Some people use a special sampling device called a Niskin sampler (cost - \$360). The Niskin sampler is attached to a rope or cable and is lowered into the waterbody being sampled. This device is equipped with a messenger (weight) that triggers the Niskin sampler to close at a specific depth. A much cheaper alternative is to get a bucket and rope (\$5) or attach a bottle to a pole. In each case, make sure you rinse out the container three times with the sample water before taking a sample. Toss the bucket off the boat/bridge; let it sink and fill. Haul it up; swirl it around; spill it out; toss the bucket back again. Now you can take a sample with your prepared bottle. When you rinse the sample bottle with water from a bucket it's important to keep swirling the water in the bucket so that particles do not settle to the bottom and you have a representative sample. Again, rinse the bottle three times first.

*Individual parameters sampling protocol (pH, turbidity, salinity, dissolved oxygen, temperature):* **Each test should be measured twice (two replicates) by two different volunteers.**

*Dissolved Oxygen (Titrimetric method: Hach OX-2P dissolved oxygen test kit; cost – \$49.50, about 100 tests):*

1. Fill the Dissolved Oxygen Bottle (round bottle with glass stopper) with sample water by allowing the sample water to overflow bottle for 2-3 minutes. Avoid turbulence and bubbles in the sample while filling.
2. Incline the bottle slightly and insert the stopper with a quick thrust to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.
3. Remove the stopper and add the contents of one (1) each: (use nail clippers to open pillow) Dissolved Oxygen 1 Reagent Powder Pillow, Dissolved Oxygen 2 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.
4. Shake the bottle vigorously to mix (keep hand over stopper). Flocculent (floc) precipitate will form. Brownish-orange precipitate indicates oxygen is present.



5. Wait for floc to settle to approximately half the bottle volume. Floc will not settle if high concentrations of chloride are present. In this case, wait 4-5 minutes before proceeding.
6. Shake the bottle vigorously again. Wait for floc to settle halfway. Floc will not settle if high concentrations of chloride are present. In this case, wait 4-5 minutes before proceeding.
7. Remove the stopper and add the contents of one Dissolved Oxygen 3 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.
8. Shake the bottle vigorously to mix. Floc will dissolve and the sample will turn yellow if oxygen is present.
9. Fill the plastic tube (to the top) with prepared sample.
10. Pour the contents of the tube into a square mixing bottle.
11. Add Sodium Thiosulfate Standard Solution one drop at a time to the mixing bottle. **Count each drop!** Swirl to mix after each drop. Add drops until the sample becomes colorless.
12. The total number of drops of titrant used in Step 11 equals the total mg/L Dissolved Oxygen.  $\text{Mg/L Dissolved Oxygen} = \text{number of drops}$ . Record this information on the Data Sheet.



*Dissolved oxygen and temperature (Polarographic method: YSI 55 Dissolved Oxygen Meter; Cost: \$665-\$759 depending on cable length)*

*Calibrating the DO Meter* –If you are sampling in a lagoon or in the ocean, take a salinity measure first. You will need this value to calibrate the DO meter. Because DO can be affected by altitude, you must calibrate the DO meter to reflect the altitude of each site. See the meter manual for detailed calibration instructions.

*Testing Procedure*

Remove the probe from the calibration chamber. Lower the probe in the water halfway between the surface and the bottom of the water column. Be careful not to let the probe hit the bottom.

1. If the water is fairly still, move the probe tip through the water at a rate of one foot per second by creating circles in the water (try to keep your circles the same size and move your probe at a consistent speed).
2. Once the meter stabilizes, you will record three things:
  - Dissolved oxygen measured in mg/L
  - Dissolved oxygen measured in % saturation
  - Temperature measured in °C
 Use the “mode” button to switch between % saturation and mg/L.
3. Repeat steps 1-3 two more times, in two different areas of the stream or coastal area. In the end, you should have taken 3 different readings 3 times. To calculate percent saturation of the sample:
  - Find the temperature of your water sample as measured in the field.
  - Find the maximum concentration of your sample at that temperature as given in Table WQ.1.

- Calculate the percent saturation, by dividing your actual dissolved oxygen by the maximum concentration at the sample temperature.

**TABLE WQ 1: MAXIMUM DISSOLVED OXYGEN CONCENTRATES  
VARY WITH TEMPERATURE**

Temp (°C)	DO (mg/L)	Temp (°C)	DO (mg/L)	Temp (°C)	DO (mg/L)
0	14.60	16	9.85	32	7.28
1	14.19	17	9.65	33	7.16
2	13.81	18	9.45	34	7.16
3	13.44	19	9.26	35	6.93
4	13.09	20	9.07	36	6.82
5	12.75	21	8.90	37	6.71
6	12.43	22	8.72	38	6.61
7	12.12	23	8.56	39	6.51
8	11.83	24	8.40	40	6.41
9	11.55	25	8.24	41	6.41
10	11.27	26	8.09	42	6.22
11	11.01	27	7.95	43	6.13
12	10.76	28	7.81	44	6.04
13	10.52	29	7.67	45	5.95
14	10.29	30	7.54		
15	10.07	31	7.41		

**pH (Colorimeter: Hach 17-N wide range (4-10) pH test kit; Cost-\$6.50 for 100 tests):**

1. Fill a viewing tube to the first (5-mL) line with sample water. This is the blank.
2. Place this tube in the top left opening of the color comparator.
3. Fill another viewing tube to the first (5-mL) line with sample water.
4. Add six drops of Wide Range 4 pH Indicator Solution to the second tube. Swirl to mix.
5. Place the second tube in the top right opening of the color comparator.
6. Hold comparator up to a light source such as the sky, a window or a lamp. Look through the openings in front.
7. Rotate the color disc until the color matches in the two openings. Read the pH in the scale window.



**pH (pH meter: Oakton Waterproof pH 300 meter; Cost-\$435):**

*Calibrating the pH meter: Check that the pH meter is calibrated correctly before each use according to equipment instructions.*

#### Testing Procedure

1. Turn the pH Tester 2 meter on by pressing the ON/OFF button.
2. Dip the pH meter directly into the water, and let the meter stabilize.
3. Record the pH reading on the field sheet.
4. Repeat steps 2-3 two more times in different parts of the water. In the end, you should have 3 separate pH readings.





Photo by Jeff Zimpfer

5. Turn off the meter by pressing the ON/OFF button.
6. Rinse the electrode with distilled water.

**Salinity (Refractometer: Aquatic Eco-systems salinity refractometer; cost-\$42 to \$109).** See instrument manual for calibration instructions.

*Testing procedure:*

1. Because this test is temperature sensitive, try to keep the refractometer as close as possible to room temperature. Keep the refractometer out of the sun, and do not hold it in your hand when not in use.
2. Close the daylight plate gently.
3. Open the daylight plate and apply 1 or 2 drops of the water sample onto the prism surface.
4. The water sample solution will spread into a thin film between the daylight plate and prism. The sample should be spread completely over the prism surface with no bubbles. If not, repeat steps 2 and 3 with more of the water sample.
5. Hold the refractometer with the daylight plate upwards and observe the field of view through the eyepiece. If the field of view is not clear, adjust it by turning the cross strip portion on the eyepiece either clockwise or counter-clockwise.
6. Read the scale where the boundary line of the blue and white fields cross the scale.
7. The value of the scale to the right of the field of view is the salinity in parts per thousand.
8. Open the daylight plate and rinse the prism with deionized water.
9. Lightly dab (not wipe) the prism with a Kimwipe to dry.

**Temperature (Fisherbrand 14-985 mercury thermometer or Fisherbrand 15-021B pocket field thermometer or other thermometer; cost-\$6-\$15)**

1. Lower thermometer three inches below the water surface. Pick a site out of direct sunlight.
2. Keep the thermometer below the water surface for about 2 minutes to ensure a constant reading.
3. Read the thermometer while it is still in the water.
4. To measure air temperature, pick a site out of direct sunlight, hold the thermometer by the top (not the bulb end) and read the air temperature after 3 minutes.
5. Be careful not to break the thermometer. If a mercury thermometer breaks, collect all spilled mercury and the pieces of the thermometer into a sampling container for special disposal at the University of Hawai'i or a designated toxic waste disposal site.

**Turbidity (Nephelometer/turbidimeter: Using a Lamotte Portable Turbidimeter, model 2020; Cost-\$800)**

*Testing Procedure*

1. Rinse two empty turbidity tubes and caps with sample water three times. Shake out excess water.
2. Fill both turbidity tubes to the neck so that there are no air bubbles. Make sure to take the “cleanest” sample you can, by going upstream of any other team members that might be clouding the water.
3. Cap the tubes and wipe them dry. Make sure they are dry and clean – no fingerprints!
4. Hold one tube upside-down before inserting it into the meter. Be careful not to create bubbles.
5. Open the meter lid. Align the indexing arrow on the tube with the indexing arrow on the meter. Insert the turbidity tube into the chamber.
6. Close the lid. Push the READ button. The turbidity in NTU units will be displayed within 5 seconds.
7. Repeat steps 4-6 two more times with the first tube. Then repeat steps 4-6 three times with the second tube. In the end, you should have a total of 6 turbidity readings (3 for each tube).
8. To turn the meter off, hold the READ button down for several seconds until the display says “off”.

You may want to use a multi-parameter meter such as the **Hach Senslon 156 (cost ~ \$1,350 + accessories as needed)** which measures **pH, dissolved oxygen, and conductivity**. For calibration of the instrument, follow manual instructions. It differs for each parameter.

*Taking a measurement:*

1. Turn the meter on and off with the I/O/EXIT key.
2. To review a calibration, press the REVIEW key.
3. When using the dissolved oxygen probe, polarize the probe by plugging it into the meter before attempting a calibration or measurement. The length of time required for polarization depends on how long the electrode has been unplugged. It can vary from 60 minutes (for a new probe) to a few seconds (if you momentarily disconnect the probe). If the CAL and ? icons flash after calibrating the DO probe, the probe is not polarized.
4. Connect the pH electrode to the black connector, and the DO or conductivity electrodes to the blue connector.
5. If the meter is not in reading mode, it may take a few key presses to turn the meter off.
6. If the readings do not change when you move an electrode to a new sample, the meter probably has the Display Lock set to ON for the parameter you are reading. If the Lock Icon appears in the lower left portion of the display, the setting is on. To change the setting, use setup number 5. Or, press READ to initiate a new reading.
7. When calibrating pH or dissolved oxygen, make sure that the instrument is



displaying readings to the correct number of decimal places for your needs. This will assure that your calibration is sufficiently precise. To change the setting, use setup number 6.

You can buy a docking station and software which automatically downloads the information to a computer. The cheaper method is to record the information on a form (see Appendix C for some sample forms).



### **Pros**

1. Using electronic equipment is faster and provides more accurate readings in the field.
2. The manual method is better for when you have several different groups going out monitoring water quality in different areas at the same time. This is because the electronic equipment is costly.
3. Because a set of protocols is developed, with a long term plan, this method will provide more reliable and stringent results that could be used by others in analyzing water quality.
4. The collaborative approach of working with community volunteers, scientists, landowners and government agencies increases the rapport among all.
5. Volunteer groups can be coordinated as part of a larger scale effort to determine spatial or temporal trends relating to a range of water quality parameters.



### **Cons**

1. Is more time consuming, due to setup, organizing and training of volunteers, development of protocols or a quality assurance project plan, and analysis of data.
2. Finding funding for a long-term monitoring project is difficult.
3. Many people are not interested in just monitoring for the five parameters and thus it is difficult to maintain a volunteer base unless you add other parameters such as bacteria and nutrients or stream/reef monitoring activities.
4. Utilizing Hach kits is a tedious and time consuming processing of samples, and produce lower quality data.



### **Tips**

- Make sure you adequately reward your volunteers, with t-shirts, hats, certificates or a community barbeque.
- Start small. A pilot project that serves to test out methods, training sessions,

and organizational skills can keep you from being overwhelmed and allows you to evaluate and refine your project before moving on to more ambitious efforts.

- Keep your goals--and those of your volunteers--realistic. Chances are slim that your data will ever be used in court to stop a polluter. Data collected for such regulatory purposes requires a very high degree of quality assurance. Most volunteer data is used to educate the community and to screen for potential problems.
- Planning pays off. Beware of collecting a year's worth of data and then finding that you have no idea how to analyze it, that the methods you used are not considered valid, or that you sampled sites in the wrong locations.
- Make connections. The more people you talk to in your community and within local and state agencies, the more friends and supporters your program will have. Include potential data users in all phases of your project's development.
- Develop volunteer leadership. Volunteer leaders within a project provide the vision for setting goals and the commitment to achieve them. They also enable a project to develop and grow without stagnating. Build into your monitoring project plenty of opportunities for volunteers to develop as leaders.
- Use your data. Report findings to volunteers and to the community. Help volunteers present monitoring results at fairs and town meetings. Send your findings to your contacts in state and local government. Create a newsletter and a data report and distribute via email or on your website. If the volunteers feel that the data they've collected is being used, they are more likely to continue.
- There are numerous resources on how to get your group started. Check out the water quality section in Appendix D for some resources.
- Hold training workshops to educate community members on the basics of water chemistry, aquatic ecology, watersheds, potential sources of pollution, roles and responsibilities of regulators and environmental management agencies. Ask kupuna to talk about the history of the area.
- Involve local landowners, Hawaiian civic groups and local farmers in the establishment and subsequent phases of the project.
- Find out what others are doing. Subscribe to EPA's volunteer monitoring listserv (<http://www.epa.gov/owow/monitoring/volunteer/listinstruct.html>) to get advice and information from others conducting programs around the country.
- Funding for long term monitoring can be difficult to maintain; try connecting the monitoring with other projects in the area, such as restoration, youth group stewardship projects, fishpond restoration, etc.



Photo provided by Carl Berg, Hanalei Watershed Hui

#### **FOR MORE INFO**

##### *Related Activities*

Snapshot days, marine debris retrieval, beach cleanups

##### *Additional Resources*

A Guide to Volunteer water quality monitoring for Hawaii, UH Sea Grant, also see Appendix D for water quality references





##### *Case Studies*


None

##### *Contact*

N/A



BASIC PROJECT NEEDS	
Number of people required:	 to as many as you want
Amount of funds required:	
Amount of training required:	
Tools required:	



## Checklist

**Sampling Materials (needed for all testing methods):**

- Cooler
- Blue ice
- Whirlpak sample bags
- Sharpie pen for writing site locations
- Name on sample bottle/whirl-pack
- Sample sheet and pen
- Tide book

### WATER QUALITY MONITORING PROTOCOL #3 (MONITORING FOR BACTERIA AND NUTRIENTS)

#### Overview

Surfrider’s Blue Water Task Force was established in 1991, designed to take advantage of the daily presence of its members at the beach and on the water, who serve as coastal watchdogs. The Task Force collects data that gives beachgoers information about whether an area is safe to swim or surf in. Government agencies have limited resources, and when they do test, it is usually at hotspots or where point sources occur, such as at an outfall pipe. The Task Force hopes to be able to alert authorities to possible pollution problems and help to clean up the area.

As mentioned in WQ #2, the UH Sea Grant program also developed a volunteer monitoring manual, and included protocols for orthophosphates and Nitrate-nitrite.

See Appendix C for sample data collection and data entry forms.

#### Bacteria Method

If you’ve followed the steps above, you know where the source of pollution is. In addition to the above general consideration, determine where the water should be tested. Where is pollution entering the ocean? Visit potential sites and check out the condition at the mouth of the stream. Is the water stagnant, with green and pink algae floating on the top? Locate storm drain outlets, as these are usually where the most polluted spots area. Pollutants from a discharging storm drain tend to stay near the outlet. Find out where surfers, windsurfers, kite boarders, snorkelers, divers, swimmers, and paddlers are reporting the most illnesses.

There are several options for testing the water quality of the area you’ve identified. The cost for the equipment used below is around \$6,300.

#### General Sampling Steps

Preparing reusable sampling container: **Wear latex gloves!**

Method (Monitoring for nitrates and phosphorus)

- Wash each sample bottle or glassware piece with a brush and phosphate free detergent.
- Rinse three times with cold tap water.
- Rinse with 10 percent hydrochloric acid.
- Rinse three times with deionized water.

#### How to Collect Samples

See methods in WQ #2. In addition to the steps listed in WQ method #2, make sure that the sample is placed in a cooler. The bacteria samples should be tested within six hours of taking the sample.

#### LABORATORY STEPS

Generally, the samples are diluted and then incubated for 18-24 hours (depending on what you are testing for). The approved methods for testing



marine and estuarine waters are Colilert-18 and Enterolert.

Refer to the methods found in Surfrider's "Standard Operating Procedure for Bacteriological Analysis of Marine Waters Most Probable Number Method Utilizing Colilert – 18 and Enterolert Media". Check it out on Surfrider's website: [http://www.surfrider.org/bwtf/BWTF\\_manual\\_June2003.pdf](http://www.surfrider.org/bwtf/BWTF_manual_June2003.pdf)

If you have the funds, you may also send your samples to a professional lab. Make sure that the lab has been approved by the state and follows established quality assurance and control protocols. Cost ranges between \$45-110 per sample, depending on the number of samples submitted (quantity discounts offered), form of parameter (i.e. Total coliforms, Enterococcus), and/or method used. Contact laboratories for up to date information.

### Nutrients Method

Monitoring for nutrients can be costly, especially if you send the samples out to a commercial lab. But for better results and if you are adhering to EPA standards, you should send samples to a lab. The manual method listed below is a good teaching instrument and can alert officials to potential problems if the area is sampled on a regular basis. UH researchers found that the Nitrate-nitrite method using the low cost kits provided a reasonable low resolution estimate for nitrate nitrogen. They found that the orthophosphate kits, however, provided a poor estimate of concentrations of this material and thus will not be listed here.

Check to see whether other organizations such as the University of Hawai'i, US Geological Survey, or EPA are conducting monitoring in the area.

### Nitrate-Nitrite (Cadmium reduction method: Hach NI-14 low range nitrate test kit, Cost - \$32)

Test procedure for 0-1 mg/L Nitrate +Nitrite Nitrogen (Cadmium reduction method)

1. Rinse Tube A with the stream sample 3 times, then fill it to the bottom line (the 5 ml mark).
2. Add the contents of one Nitraver® 6 Reagent Powder Pillow into tube A.
3. Stopper Tube A and shake for 3 minutes.
4. Allow the sample to stand undisturbed for another 30 seconds. This allows any unoxidized particles of cadmium to settle to the bottom of Tube A.
5. Carefully pour the treated sample from tube A into tube B so that the cadmium particles remain in Tube A. Leave the last drop of liquid behind in tube A even if you don't see any particles.
6. Rinse out the cadmium particles in Tube A into the Cadmium waster container.
7. Add the contents of Nitriver® 3 Nitrite Reagent Powder Pillow into Tube B.
8. Stopper Tube B and shake vigorously for 30 seconds.
9. Insert Tube B into opening B on the color comparator.
10. Allow at least 10 minutes, but no more than 20 minutes, for full color developments. A red color will develop if nitrate is present.
11. While waiting for color development, fill tube A with the original water sample to the top line and insert into opening A.



## Checklist

### Nutrients Sampling Checklist:

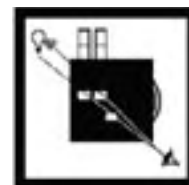
- Whirlpak sample bags
- Hach NI-14 low range nitrate test kit
- Distilled water
- Cooler
- Blue ice
- Whirl-pak sample bags or prepared bottles
- Sharpie pen for writing site location name on sample bottle/whirl-pak
- Sample sheet and pen



Steps 2 & 3



Steps 7 & 8



Step 12



Step 13





## Checklist

### Test-tube Method Lab

#### Materials:

- Whirlpak sample bags
- 35 degrees Celsius Incubator
- 365nm UV Lamp
- Test tube rack
- Sterile pipettes
- Pipette Pump
- 10 ml test tubes (non-fluorescing) with caps
- Sterile deionized or distilled water
- Colilert-18 Presence/Absence packets
- Antibacterial Hand Soap
- Laboratory Notebook
- Disinfectant spray for counter tops



## Checklist

### Quanti-tray Sealer Method

#### Lab Materials:

- 35 degree Celsius Incubator
- UV Lamp
- Sterile pipettes
- Pipette Pump
- Sterile plastic bottles
- Sterile deionized or distilled water
- Colilert-18 reagent
- Enterolert reagent
- Quanti-tray sealer trays
- 115V Model 2X Quanti-tray Sealer
- Colilert Comparator
- 97-well rubber insert for Sealer
- Antibacterial Hand Soap

12. Hold the color comparator up to a light source such as the sky and view the openings on the front.
13. Rotate the color disk to obtain a combined color and density match.
14. Read the mg/L nitrate nitrogen on the color wheel through the scale window of the color comparator. Note: if the nitrate + nitrite nitrogen levels exceed the scale on the color wheel, repeat the test using the 0-10 mg/l nitrate + nitrite nitrogen test procedures below. Results are reported as nitrate + nitrite nitrogen.
15. Pour the wastes of tube B into the Cadmium waste container.
16. Pour the wastes of tube A into the waste container.
17. Rinse both tubes thoroughly with deionized water.

#### Test procedure for 0-10 mg/L Nitrate + Nitrite Nitrogen (Cadmium reduction method)

1. Rinse the dropper with stream sample.
2. Rinse tube A 3 times with the stream sample.
3. Fill the dropper to the 0.5 mL mark.
4. Add the contents of the dropper to Tube A.
5. Fill tube A with distilled water to the bottom line (5 ml mark)
6. Follow steps 2-14 in the procedures for the 0-1 mg/L nitrate + nitrite nitrogen test.
7. Multiply the number on the color wheel by 44 to obtain the results as mg/L nitrate-nitrite.
8. Pour the wastes of Tube B into the Cadmium waste container.
9. Pour the wastes of tube A into the waste container.
10. Rinse both tubes thoroughly with deionized water.

If funding is available, find a certified laboratory. Cost ranges between \$25 - 70 per sample, depending on the number of samples submitted (quantity discounts offered), form of parameter (i.e. nitrite + nitrogen, total nitrogen) and/or method used. Contact laboratories for up to date information. Utilize the sample bottles provided by the laboratory you've contracted with and follow the how to take a sample in WQ #2 above.

#### Orthophosphates (send sample to certified lab)

For more accurate data, find a certified laboratory. Cost ranges between \$45-70 per sample for Total Phosphorus, depending on the number of samples submitted (quantity discounts offered). Contact laboratories for up to date information.

Utilize the sample bottles provided by the laboratory you've contracted with and follow the how to take a sample in WQ #2 above.



## Pros

1. Uses protocols certified by the EPA, thus results are more likely to be taken seriously by agencies.
2. Electronic equipment is quicker, with more precision and can be taken immediately.
3. The manual, but less costly alternatives can be used where there are multiple teams sampling at the same time.
4. Nutrients and bacteria are of more interest to volunteers – they can connect their actions more directly with the impacts on water quality.



## Cons

1. More costly to start-up due to investment in equipment.
2. Electronic equipment requires additional maintenance and care, and may require costly repairs.
3. The use of Hach kits for nitrate nitrogen and orthophosphates are best used as a teaching instrument rather than for determining concentrations of materials in streams as they have been shown not to be accurate. For accurate results, send the samples to a lab.



## Tips

- Contact other organizations before starting a program. See what they are doing and see if they will help you with training.
- Read the numerous free manuals available from volunteer organizations, the EPA, University of Hawai'i Sea Grant to see more details about starting a program.
- Sign up for the EPA's Volunteer Listserve "Volmonitor" at [https://lists.epa.gov/read/all\\_forums/](https://lists.epa.gov/read/all_forums/) to ask questions from others around the United States on their programs.

### OTHER WATER QUALITY PARAMETERS

Depending on funds, you may find that you will need to for monitor for other parameters (i.e. The water body is listed as impaired for particular parameters, like mercury). Check out the Department of Health's Water Quality management program for a complete list of impaired water bodies: <http://www.hawaii.gov/health/environmental/env-planning/wqm/env-planning/wqm/wqm.html>

**What is stream flow/prevaling currents and why is it important?** Stream flow or discharge is the volume of water that moves over a set point over a fixed point

### FOR MORE INFO

#### *Related Activities*

Snapshot days, marine debris retrieval, beach cleanups

#### *Additional Resources*

A Guide to Volunteer water quality monitoring for Hawaii, UH Sea Grant, Surfrider Blue Water Task Force. Also see Appendix D for water quality references

#### *Case Studies*

None

#### *Contact*

N/A



*Consult the references listed in this section for protocols on these other parameters*

in time. It is usually expressed in cubic feet per second (ft<sup>3</sup>/sec) and is directly related to the amount of water moving off the watershed. It is affected by weather, such as during storms as well as by seasons. Summer months flow is typically slower than winter months. It is a function of water volume and velocity. Water withdrawals for irrigation and dams can also impact stream flow. Stream velocity increases as volume increases and can affect the type of organisms that live in the stream. It can also impact how much sediment and silt is carried by the stream and where it settles. Smaller streams may have less capacity than larger, faster moving streams to dilute and degrade pollutants. If you are measuring turbidity, you may want to measure stream flow as well.

If you are surveying a coral reef area, you may want to measure the currents in your study site. The direction and velocity of currents in your area are important for larval transport as well as sediments and other pollutants.

***What are benthic invertebrates and how do they help to provide a measure of water quality?*** Benthic macroinvertebrates (BMI) are organisms large enough to be seen with the naked eye and do not have a backbone (vertebrate). BMI surveying is increasingly used to provide an indication of the health of a stream. BMI's cycle energy and matter in a stream ecosystem and provide food for aquatic organisms. Some macroinvertebrates are more sensitive to pollution than others. A stream reach that is found to be low in BMI diversity, reflects poor water quality and habitat conditions. Low levels of pollutants and high BMI diversity is usually found in the upper portions of a stream, which has less urban impacts.

***What are chemical contaminants and why are they important?*** Chemical contaminants, like pesticides, herbicides and hydrocarbons, can be extremely toxic to aquatic organisms. Detection of such chemicals could indicate misapplication, leakage or spillage upstream of the monitoring point.

***What are metals and why are they important?*** Metals such as zinc, chromium lead etc. are natural elements used in industrial processes which can be toxic to aquatic life. Groundwater and wastewater treatment plants are required to monitor metals regularly to indicate possible contamination in the watershed. Some metals such as mercury or lead can bioaccumulate (net accumulation of contaminants from air, water and solids) in the fish that humans eat.

***What is total suspended solids/sediment and why are they important?*** Total suspended solids (TSS) refers to material suspended in water, and total suspended sediment refers to just the inorganic portion. Suspended sediment can adversely impact fish by damaging their gills, or can smother benthic organisms and change substrate habitats. An increase in suspended solids concentration can reduce the amount of light infiltrating the water, slowing the rate of photosynthesis and reducing dissolved oxygen levels. Pollutants such as bacteria and pesticides can attach to clay particles and re-suspend in the water column when disturbed by a storm event.

SECTION 3D

*Other Ways  
To Get Involved*

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## ALIEN ALGAE REMOVAL

### What is alien algae removal?

Alien algae removal utilizes dozens of volunteers, including SCUBA divers, snorkelers, boogie boarders, and a chain of volunteers on the beach to remove invasive algae, such as *Gracilaria salicornia* from reefs.

### Why use alien algae removal?

Invasive species are nonnative species whose introduction “causes or is likely to cause economic or environmental harm, or harm to human health.” Alien algae crowd out native species of algae which many Native Hawaiians use on a daily basis in foods and medicines. They also take over coral reefs, killing the coral and disturbing the entire ecosystem. This event is also a good way to educate people about invasive species and their impacts on Hawaii’s marine ecosystems.

### Overview

This is an event which requires many volunteers. SCUBA divers will remove algae from sunken bins with floats, fill up a burlap sack, and hand off to a snorkeler. There should be two snorkelers to each diver. The snorkeler gives the diver an empty sack, and hands off the full bag to a boogie boarder. The boogie boarder hands the sack to someone on a surfboard or in a small dinghy. Volunteers on the beach form a chain to hand the bags off to limu sorters. Limu sorters sort the algae into native and nonnative piles, and are instructed by limu experts. The nonnative species is dumped into a bucket, where it is taken to be recycled. The sorters also remove small critters, and these along with the native limu are taken back to the ocean. When the divers return to switch tanks, they are provided with snacks and provided a break. The previous cycle continues.



Example from the field: A'ohe Limu'e: Cleanup events in Waikiki at Sans Souci Beach Park. Contact Signe Opheim, UH Marine Option Program

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Burlap bags
- Dinghies, surfboard
- Large container for alien algae
- Tables
- Gloves
- Buckets
- Tarps
- Water and food



**FOR MORE INFO**

*Related Activities*

Education/outreach,  
marine debris removal,  
beach cleanups

*Additional Resources*

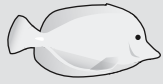
See Appendix D-invasive  
species

*Case Studies*

Reef Check

*Contact*

Signe Opheim, University  
of Hawaii



**Pros**

1. Another great way to get people involved in cleaning up our nearshore resources.
2. Educates people on how to identify native vs nonnative species of algae.



**Cons**

1. Must be conducted continuously in order to keep an area clear of invasive algae. May be more effective if done in conjunction with limu restoration.
2. Takes a good deal of coordination and cooperation of individuals with the variety of tasks being performed.
3. Obtaining donation for the container in which the alien algae is dumped is very difficult.



**Tips**

- Experts are needed to help sort through the algae.
- Send out flyers to local environmental groups and UH groups to get volunteers. Also try advertising in local newspapers and periodicals, especially in the event calendars.
- When obtaining donations, use different people/organizations so as not to wear them out.
- Ask volunteers to show up a half hour early to help set up so that you aren't stuck setting up by yourself.
- A'ohe Limu'e uses UH scientific divers but depending on the area you may be able to use other divers or snorkelers.
- Have educational materials available to better inform the public about the alien algae problem.



## BEACH CLEANUPS/RECYCLING AND TRASH BINS

### What is a beach cleanup?

A beach cleanup utilizes volunteers to collect trash from their beach. This can be an organized effort on a monthly or other time period or simply asking residents to pick up trash on their daily walks.

### Why use beach cleanup?

Not only is trash unsightly on our beaches, they can harm our reefs and wildlife. Birds and turtles are known to mistake trash like cigarette butts and plastic bags for their usual food sources and die from malnutrition. Or they may become entangled in the plastic six pack rings or discarded fishing gear. People playing on a beach may also cut themselves on broken glass. Many areas do not have trash cans, are knocked over by birds and other animals or are blown over by the wind. Trash can also end up on our coral reefs, become entangled and break off coral heads.

### Overview

Some cities/counties have local adopt a beach programs and provide necessary equipment (trash bags, gloves) and garbage pickup. You can also get involved with the Ocean Conservancy's International Coastal Cleanup day ([www.coastalcleanup.org](http://www.coastalcleanup.org)). The University of Hawai'i Sea Grant office coordinates the local event, "Get the drift and bag it". Use flyers, newsletters, websites, email lists to advertise your event. Have a table staffed with volunteers to recruit volunteers, water and food, and prizes for different categories (i.e. most unusual garbage item).

If you'd like to install a recycling station or trash can at your local beach, check with the landowner- the local parks department or State parks and recreation department or private landowner. Adopt a Beach Hawai'i is working to install recycling stations on beaches and parks in Hawai'i. The local or state parks department may be willing to talk to you about a pilot project proposal for your site.



### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Garbage bags
- Gloves
- Sunscreen and hat
- Water and food
- Camera to record unusual items
- Pickup service, if large items are involved



**FOR MORE INFO****Related Activities**

Snapshot days, marine debris removal

**Additional Resources**

City of Honolulu recycling and waste disposal, Adopt-a-Beach, Mau'i Recycling Service

**Case Studies**

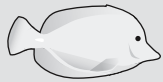
None

**Contact**

Get the drift and bag it, Christine Woolaway

Clean Water Honolulu (CWH-City and County of Honolulu) sponsors a Clean-a-Reef program that coordinates with dive clubs and other volunteers to collect garbage from the reef throughout the year. CWH also sponsors an Adopt-a-Stream program to work with communities to keep their local streams free from garbage. Groups are required to conduct clean-ups four times a year and a sign is installed indicating their support. They receive training, materials and other resources to assist in the quarterly cleanups.

The City of Honolulu offers non-profit organizations carts for bottle and can redemption. The City will lend organizations up to 30 recycling carts. These 96-gallon, wheeled carts come with labels for plastic, glass, aluminum or "mixed beverage containers." Non-profits can set up the carts at events, and then take the filled carts to a recycling center to collect the container deposit refund. The carts must be returned to the City's Refuse Division. Contact Eileen Helmstetter at (808) 692-5422 or [mhelmsetter@honolulu.gov](mailto:mhelmsetter@honolulu.gov) for more information.

**Pros**

1. Easy and low cost way to get people to come out and help clean up the environment.

**Cons**

1. Without an island wide or state-wide home recycling service, it may be difficult to install a recycling bin unless you take it to recycling yourself.
2. Trash needs to be picked up regularly-it's an endless task.

**Tips**

- Set up a table in front of your cleanup site. Have small displays about the impacts that litter can have on the environment. A seal with a net wrapped around its neck can be very powerful to someone who is not aware what is occurring in the ocean.
- Ask people to pick up litter while they walk their dogs, go for a walk or play in the water.
- Have a contest to see who can bring in the most unusual piece of litter.
- Stay away from large drums or five-gallon buckets. Report their location to the cleanup coordinator or proper authorities.
- Wear gloves to collect the debris.
- Be careful of glass, syringes or other sharp objects.
- Stay out of dune areas.
- Watch for wildlife.
- Don't lift anything heavy.

## FISHPOND RESTORATION

### What is a fishpond restoration?

Fishponds were an integral part of the ahupua'a concept in ancient Hawai'i, the area from the mountains to the sea. They were created to cultivate fish stocks for communities, created out of rocks and boulders, usually with a makaha (sluice gate). The makaha allows for small fish to come in with the current, but prevents the larger fish from leaving. There are four types of fishponds and one fishtrap in Hawai'i. The Hawaiians studied the moon, sun and the tides to determine the best placement for the fishpond. As focus fell on agricultural cash crops, fishponds became neglected as well contaminated by polluted runoff from agriculture, overgrazing and development. Many individuals and communities are seeking to restore these fishponds for educational purposes, restore cultural traditions and to replenish fish stocks.

### Why use a fishpond restoration?

Restoration of fishponds can help to revitalize native Hawaiian traditions, and provide a base for education and food production (fish, shellfish and limu). This can lead to providing a venue for future employment and economic gains, as well as creating awareness that culture is important in today's world. Fishponds also help to strengthen core values of a subsistence lifestyle. Fishpond restoration is an art and needs to be coordinated with restoration experts. In addition, at most sites fishpond restoration requires obtaining a set of permits before restoration efforts can begin.

### Overview

Restoration of a fishpond can involve hundreds of volunteers utilizing traditional methods or can use mechanical methods as well. In most cases, a rock wall needs to be rebuilt. In the case of the Kahinapohaku Fishpond, stones were excavated inside and outside the pond, stacked in a dry-stack fashion within the original rock wall footprint. Large stones were placed by hand and o'o spade, interlocked to form the inner and outer wall. Smaller rocks were used as fill between the walls for strengthening purposes. The original wall rocks used were retrieved from the pond using a barge constructed of plywood and 55 gallon drums (Pacific American Foundation, 2003).

In addition to restoration of the fishpond, a traditional hale was built for workers and visitors to the site. The volunteers, or Moloka'i fishpond trainees were not only trained in the traditional dry stack rock wall technique, but archaeological mapping of the wall remains, underwater survey methods, water quality monitoring procedures and



### BASIC PROJECT NEEDS

Number of people required:



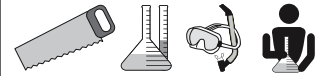
Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Permits!
- Building material-rocks
- Water quality monitoring equipment

**FOR MORE INFO****Related Activities**

Stream/wetland restoration, Integrating traditional knowledge, interpretive center, water quality monitoring, fish monitoring, limu restoration

**Additional Resources**

Project Loko I'a (Moloka'i), Mau'i Fishpond Association

**Case Studies**

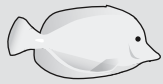
None

**Contact**

N/A

health and safety procedures. A work plan was initially developed prior to the restoration and training activities, which included training in modern and traditional aquaculture techniques. Due to changes in concept of land and water resource management today, many steps must be taken to restore a fishpond. There are many other conditions within the permitting process which can take a lot of time, due to the various federal, state and local agencies involved.

**Example from the field: Project Loko I'a (Moloka'i)** – Project Loko I'a is a grass roots initiated, community-based project committed to the restoration and reuse of traditional Hawaiian fishponds *loko i'a* for educational, cultural and commercial purposes. The goal of this project was to build capacity on-island to restore and reuse traditional fishponds on Moloka'i. They also sought to disseminate the knowledge gained and collaborate with other fishpond restoration projects around the state. In addition to training their youth on traditional fishpond techniques, they also simplified the permitting process and produced several documents to assist other fishpond restoration projects.

**Pros**

1. Actively engages community members to become stewards of the land and sea through on-site visits, hands-on restoration of the fishpond, education and outreach and training programs.
2. Teaches the community about the historical and cultural aspects of fishponds.
3. The restoration of fishponds can provide a source of food for subsistence as well as a source of economic benefits.

**Cons**

1. The permitting process can take a long time, with the numerous agencies involved.
2. Can be a costly process, and even after a fishpond has been restored, a storm can destroy efforts.
3. Water quality is a big issue, and the fishpond design and water monitoring must be incorporated into the restoration plans.

**Tips**

- Contact fishpond restoration experts before starting a project.
- Build relationships with the community and permitting agencies, through on-site visits, workshops, newspaper articles, etc.
- Establish a restoration committee to complete a plan and coordinate the work.

## LIMU RESTORATION

### What is limu restoration?

Limu, or seaweed is a type of marine algae that grows in both shallow tide pools or on deep coral reefs in salt or fresh water. It is used in a variety of food dishes, as well as for medicinal purposes.

### Why use limu restoration?

Due to over harvesting, invasive algae, and poor water quality conditions due to polluted runoff, the limu population is in decline.

### Overview

There are different methods for limu restoration. A simple method that keiki can use is to affix cages to the reef and seed it with limu. In another method, small limu clumps are placed between separated strands of rope. Rocks are used to anchor 50- to 100-foot rope lengths interspersed with the limu seedlings along the ocean floor. Or the rope is twisted into a circle, like a hair bun; then it is anchored with a rock on the ocean bottom. To seed limu, you find limu with seeds- little reproductive nodes on the surface, tear the limu into pieces and spread it in the ocean.



### Pros

1. Engages the community in restoring a resource that has been heavily depleted.
2. Educates youth about the importance of limu for cultural use as well as in marine ecosystems.
3. May be more effective when combined with an alien algae removal project.



### Cons

1. Must be managed and watched carefully to prevent poachers from stealing your hard earned work.
2. The area for restoration must be carefully selected, as limu needs clean water and freshwater inputs in order to thrive.

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Limu
- Cages
- Heavy blocks
- Rope



**FOR MORE INFO**

*Related Activities*

Fishpond restoration, alien algae removal

*Additional Resources*

Project Ho'olokahi-Kaiser High School

*Case Studies*

None

*Contact*

N/A



**Tips**

- Conduct a limu restoration in conjunction with an alien algae removal project to help prevent the spread of invasive algae.
- In addition to monitoring limu growth, take advantage of the opportunity to monitor water quality to determine the impacts that polluted runoff can have on limu growth and reproduction.

## MARINE DEBRIS RETRIEVAL

### What is marine debris retrieval?

Marine debris is any type of manufactured or manmade material that enters the coastal or marine environment via a stream, outfalls, tossed by beachgoers, or lost by boats at sea. There are four types of marine debris: derelict fishing gear, plastics, derelict vessels and glass, metal and rubber materials. Sources of debris include fishing vessels, offshore oil and gas platforms, cargo ships and vessels, littering and dumping, storm water discharges, and natural events such as floods, hurricanes and tsunamis. Large marine debris removal from coral reefs utilizes trained divers to carefully remove fishing gear and other hazardous items from the reef.

### Why use marine debris retrieval?

Derelict gear can severely damage a reef and entangle whales, dolphins, Hawaiian monk seals and sea turtles. Humans swimming, snorkeling or diving can also become entangled in the gear. Many marine species including birds, turtles and seals mistake litter for food, and end up starving due to lack of proper nutrition. Some litter such as syringes pose as a human health hazard if stepped on.

### Overview

Large entanglements of fishing gear and other large marine debris retrieval from reefs is conducted by trained and skilled divers. The NOAA Marine Debris Program is a national and international effort focusing on identifying, removing, reducing, and preventing debris in the marine environment. There are a variety of projects in areas around the nation, and include partnering with other organizations such as Sea Grant, the Ocean Conservancy, and NOAA National Marine Sanctuary Program. Check out <http://marinedebris.noaa.gov/welcome.html> for more information.

Photo by Carey Morishige



### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Area map
- Camera
- Clipboard or notebook, pens
- Data cards for recording information
- Rope for measuring length of survey area
- Wooden stakes (used as non-permanent markers during survey)
- Surveyors tape (to mark survey area)
- Tide chart
- Trash bags
- Gloves
- Volunteer handbooks (provided by Ocean Conservancy)
- Hat, sunglasses, sunscreen, water



**FOR MORE INFO****Related Activities**

Beach cleanups, snapshot days, activity weeks

**Additional Resources**

[www.marinedebris.noaa.gov](http://www.marinedebris.noaa.gov)

**Case Studies**

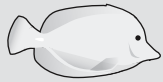
N/A

**Contact**

Ocean Conservancy  
Christine Woolaway  
Pacific Region coordinator  
(808) 753-3311  
[cwoolaway@hawaii.rr.com](mailto:cwoolaway@hawaii.rr.com)  
P.O. Box 25008  
Honolulu, HI 96825  
  
Hawai'i Wildlife Fund  
Bill Gilmartin  
PO Box 70, Volcano, HI 96785

The Ocean Conservancy and EPA conduct a National Marine Debris Monitoring Program (NMDMP), using volunteers, to determine the status and trend of marine debris pollution. The United States has been divided into nine regions (Hawai'i is region 9) with 20 survey sites within each region. In Hawai'i, sites are located at: Baldwin Beach, (Mau'i); Chun's Reef, Kahuku Point Area, Kalaeloa CDD (Barber's Point) Makua Beach, Malaekahana Beach, Mokuleia Beach Park, Waihe'e Beach Park (O'ahu); Kini Kini Ditch, Pacific Missile Range Facility North (Kaua'i).

The Hawai'i Wildlife Fund has been conducting a community marine debris cleanup since 2003 on the island of Hawai'i. Individuals and community groups come out to pick up trash, which includes fishing ropes, nets and buoys, thousands of pieces of plastic, rubber, styrofoam, aluminum cans, and even anchors. The nets and ropes are collected separately and shipped via a donated Matson container to Honolulu for burning in the H-waste plant. In 2003, over 50 tons of debris were collected by 150 people. Contact Bill Gilmartin of the Hawai'i Wildlife Fund at PO Box 70, Volcano, HI 96785.

**Pros**

1. Keeps the ocean and reefs free from debris which can break off and kill large sections of coral. Many marine species, including birds, turtles and seals mistake litter for food.
2. Helps to identify the primary sources of marine debris which can assist in education efforts and prevention measures.

**Cons**

1. Can be difficult to maintain consistent volunteers and new volunteers must be recruited and trained.
2. Requires a long-term time commitment.
3. Coordination of people, transportation and hauling of debris takes time.

**Tips**

- Enlist volunteers from local groups, such as scouts, university natural resource departments, civic clubs.
- Plan well in advance; work with agencies and companies that can provide services for free.



## DAY USE MOORING BUOYS

### What is a day use mooring buoy?

A day use mooring buoy provides a convenient place for a boater to secure their boat without having to drop an anchor. They have a time limit of 2.5 hours and overnight mooring is not allowed.

### Why use a day use mooring buoy?

Day use mooring buoys help to reduce damage to corals by eliminating the need to drop an anchor. Anchor damage is one of the top physical threats to corals, due to anchors dropping on corals and chains dragging on the bottom.

### Overview

Please contact your local island coordinator if you are interested in installing day-use mooring buoys in your area. Permits are required before these moorings can be installed, and the permit process takes a while. If permits are not obtained, the moorings will be considered illegal. The local island coordinators know which sites have been permitted, or have the training and the means to obtain the permits necessary for installation. Local stakeholders should also be consulted, not limited to boaters and dive/snorkeling companies, but others such as surfers or beach goers who could be impacted by the presence of both the mooring buoys and boats in the area.

Overall, the mooring consists of a 5/8 inch stainless steel eye bolt about 18 inches long that is cemented into a one-inch hole drilled in the reef substrate.

After the cement has hardened, the mooring buoy (placed 10 feet below the surface) and tackle is attached to the eye bolt or pin. The work crew for installing the mooring buoys ideally consists of at least six people: boat driver, supervisor who is experienced in diving and installing the mooring buoys, two installation teams consisting of at least two people each—one team remains on deck, while the other is diving and drilling underwater. Records are kept of the installation, including site description, site coordinates, buoy parts and other installation data.



### Example from the field

Malama Kai Foundation partners with the DLNR and the National Fish and Wildlife Foundation to install mooring buoys around the state. Activities include: obtaining accurate GPS coordinates for each of the mooring buoys within the system; preparing charts and documents for each main Hawaiian

### BASIC PROJECT NEEDS

Number of people required:



Amount of funds required:



Amount of training required:



Tools required:



### Checklist

- Buoys
- Ground tackle
- Hydraulic drill
- Permit

**FOR MORE INFO**

*Related Activities*

Awareness/outreach

*Additional Resources*

Boatmoorings.com, Project AWARE, Maui Reef fund, Big Island Reef Fund

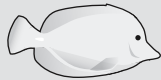
*Case Studies*

None

*Contact*

Malama Kai Foundation

Island as to the location of each mooring buoy; continuing mooring buoy maintenance and replacement; conducting individual island community workshops to identify additional priority sites and provide training for buoy installation; working with partners to obtain necessary new permits and/or renew current permits; and developing publishable graphic materials to facilitate public awareness and education about the Mooring Buoy System and reduction of impacts on coral reefs.



**Pros**

1. Protects sensitive habitat from anchor damage.
2. Can actively engage the tour operators in protecting resources by getting them involved with installation and maintenance.
3. Shows community and visitors that the agency is actively involved in management and protection of the resources.



**Cons**

1. Can attract more use and thus resulting degradation of habitat if users are not properly educated about proper use of snorkeling or diving equipment.
2. Lack of funding for maintenance of buoys can lead to boaters going elsewhere and dropping anchor.
3. It is difficult to get funds for continual operations. Look into user fees or other type of concession fees for maintenance.



**Tips**

- Prepare a thorough budget. Separate start-up (installing buoys) costs from continual maintenance expenses.
- Engage the community in the selection of mooring buoy sites.

## WATERSHED RESTORATION

### What is watershed restoration?

Watershed restoration can involve restoring habitat to a natural state by removing invasive vegetation and planting with native vegetation, stabilizing stream banks to reduce erosion in the stream, promoting sustainable land use practices, installing storm water management devices or removing manmade structures.

### Why use watershed restoration?

Invasive plants often crowd out native species, and may uptake more water, deposit toxins in the water or increase the fire risk in the area. Native species have adapted to conditions and provide more shade for cooler water temperatures and erosion control to reduce sediment input in the streams and into the ocean. Excessive sediment can kill corals by smothering them or reducing the amount of light they need for growth and reproduction. Stream banks can be stabilized with new plantings or other biotechnical measures (other than rock walls or cement). Concrete channels may facilitate the flow of flood waters to the ocean, but also reduce the quality of habitat for aquatic life, and don't allow water to seep naturally into the groundwater.

### Overview

Before embarking on a restoration project, you must check with the landowner first. Many restoration efforts are the results of grassroots watershed organizations. Check to see if there is a watershed group in your area; if you are looking at a full scale restoration, you might want to look into forming a group yourself.

Within a watershed group, restoration projects can evolve from a watershed plan, or a landowner's desire to improve stream or wetland habitat. State, federal or other local agencies may have conducted studies in your watershed and have recommended particular projects. Do some research, both in the library and on the internet. Many of these documents are only available through a government agency. If you've invited the agency to join your watershed group, it is that much easier to gain access to these documents.

After identifying a restoration project and receiving landowner permission, obtaining funding is the next step. You may want to utilize a nonprofit organization to help you obtain and manage the project. In Hawai'i, contact the Natural Resources Conservation Service (NRCS) for assistance.

Permits may be needed, depending on the type of restoration project. Contacts include State Department of Land and Natural Resources, US Fish and Wildlife Service, US Army Corp of Engineers and the State Board of Health. Counties may require permits as well.



*Restoration along Waikoloa Stream, Island of Hawai'i*

### BASIC PROJECT NEEDS

Number of people required:



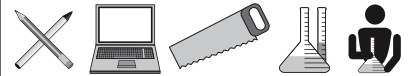
Amount of funds required:



Amount of training required:



Tools required:



**FOR MORE INFO****Related Activities**

Snapshot days, marine debris removal, workshops

**Additional Resources**

Hawai'i Sea Grant

**Case Studies**

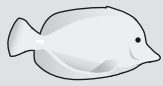
None

**Contact**

NRCS

A dune restoration is another type of coast related restoration activity. Sand dunes are an important part of the ecosystem and trap windblown sand, store excess beach sand and serve as natural erosion buffers protecting beach-front property and structures during storms and high-wave events. The Hawai'i Sea Grant program is involved with dune restoration and recruits volunteers to help plant native species like ohai, and maintain the dunes by watering.

Storm water best management practices help to filter polluted runoff before it enters streams and finally the ocean. These may include prevention of sediment runoff from construction sites, installing bioswales (lined with grass or native vegetation), or installing pervious pavement.

**Pros**

1. Great way to get people involved in a project that can visibly help the environment.
2. Community support is key; educate the public first about the problems in the area and how the project will benefit them. For example, restoring native vegetation can reduce erosion, which will lessen the impacts on the coral reefs that fish depend on.

**Cons**

1. Can be a very costly and time consuming process, due to planning, permitting, expert consultations, design and implementation.
2. The public may need to be educated about the benefits of stream/wetland restoration for erosion control, water quality and healthy marine ecosystems. Convincing people about flood control measures other than concreting streams may be difficult.

**Tips**

- Form a watershed group (does not need to be recognized as a 501c3 organization at first), and obtain the services of a local nonprofit, Sea Grant extension agent or NRCS. Get everyone at the table who may be involved in your projects – community members, businesses, local, state and federal resource agencies, environmental groups, farmers, kupuna, fishers, etc. This is the group that formulates a plan for the area, and each group can help support each other for projects. A nonprofit group that serves as a coordinator can serve as the project manager and recipient for many grants.
- Get students involved in hands-on restoration. This teaches them about how a healthy stream can improve the health of our reefs.
- Education of local agencies about best management practices may be needed in order to utilize more environmentally friendly techniques.

SECTION 3E

*Documenting  
Traditional Knowledge*



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## DOCUMENTING TRADITIONAL KNOWLEDGE

### What is documenting traditional knowledge?

Historically, the Hawaiian people depended entirely on the production of their environment for sustenance. As a result, a system of careful resource utilization was developed based on close observation of the natural ecological dynamics and biological cycles of important species. A strict system of resource regulation (*kapu* system) helped to enforce the proper resource utilization and ensure sustainability. This knowledge was passed on to the next generations by village elders (*kupuna*) through youth observation and participation in resource utilization and management. Youth would join their family in such marine related activities as tending particular species, fishing, and harvesting. As youth grew, they gained an understanding of the natural patterns and fluxes that exist in the marine environment and came to recognize the importance of caring for this environment which in turn cared for them by providing abundant resources.

Today documenting traditional knowledge involves the recording of this information by conducting oral history interviews or engaging youth in the documentation using multi-media and modern technology like cameras and video recorders.

### Why document traditional knowledge?

Presently, one major concern within communities is the breakdown of the communication vector between youth and *kupuna* for the transfer of traditional knowledge. This traditional knowledge could be incorporated into contemporary resource management plans to increase the possibility of sustainable harvesting and replenishment of important species. One example of a practical application of traditional knowledge is the development of a Hawaiian Fishing Calendar (see Appendix A: Mo'omomi case study). As *kupuna* pass without conveying their knowledge of traditional and cultural marine resource management, this valuable information is lost forever.

### Overview

There are two methods for collecting traditional knowledge: 1) Have a professional cultural historian conduct oral history interviews and 2) Engage community youth in the documentation and sharing of traditional knowledge by using multi-media and technology. After reviewing the advantages and disadvantages of each method, you can decide which program will be best for your project.

**Professional Historian** – A professional historian is a person whose job is to discover, exchange, interpret, preserve and present information about the past. Historians depend on the collection and preservation of historical documents, artifacts, and knowledge in a variety of institutional settings including libraries, archives, museums government agencies, and private organizations. Historians are committed to protecting significant historical evidence wherever it resides. Scholarship likewise depends on the open dissemination of historical knowledge via many different channels of communication: books, articles,

### BASIC PROJECT NEEDS

#### Number of people required:



#### Amount of funds required:



#### Amount of training required:



#### Tools required:



**RECOMMENDED CULTURAL HISTORIANS**

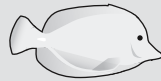
*Kumu Pono Associates LLC*  
Kepa Maly, Cultural Historian  
& Resource Specialist

Onaona Pomroy-Maly,  
Archival Researcher & Project  
Assistant

*Center for Oral History at the  
University of Hawai'i-Manoa*  
Warren Nishimoto

**Contact**  
N/A

classrooms, exhibits, films, historic sites, museums, legal memoranda, testimony, and many other ways. The free exchange of information about the past is important to historians.



**Pros**

1. The production of a formal report with full transcription of interviews.
2. The cultural historian has extensive interview experience will be able to interact with the interviewee, ask pertinent questions, and 'probe' for answers.
3. The historian can ensure a level of consistency among interviews, allowing for comparison of information.
4. Historians usually have a formalized system for the preservation and storage of the knowledge that the document.
5. They can complement the interviews with historical research to validate / qualify information.



**Cons**

1. Knowledgeable community members may not be as willing to share information with an 'outsider' as with someone from within the community.
2. Intellectual property rights may be an issue.
3. Information is documented but not necessarily passed on to the youth of the community.
4. Requires funding to contract historian.



**Involving Youth** – As youth are the future of each community, it is essential that they inherit both the natural and cultural resource knowledge of their local environment. Historically, *kupuna* and other knowledgeable community members would pass along their knowledge to the youth by actively engaging them in fishing and harvesting activities and explaining how biological cycles related to the management system. Today, this exchange has been largely eliminated due to alternate activities such as sports, television, video games, and drugs. Multi-media and technology, such as video cameras and computers, is a fun and interesting method to re-engage youth in acquiring traditional knowledge. Most youth already have experience using computers and other technology and can be quickly trained in interview techniques and video production.

**Example from the Field**

At a 2-day October workshop in Ewa Beach, approximately 80 people from 12 different communities were trained in the inquiry-based approach to the collection of traditional knowledge for the use in marine management. The objective to this approach is two-fold and based on the belief that youth in Hawai'i will be most successful in affecting long-term change if they start by first understanding the past condition of marine areas and the management techniques that communities used for sustainable management of these resources. With this base of knowledge, youth will then learn how their elders suggest marine resources should be managed today, how to assess the current condition of marine resources in their areas, and how to shape management strategies and activities that will help to ensure that these resources are well managed in the long-term. It may be best to prepare youth in advance with specific questions or worksheets that may guide the interviews and help obtain more specific information.



*Miloli`i Youth Recording Traditional Knowledge*

**FOR MORE INFO****Related Activities**

Awareness/outreach, limu restoration, fishpond restoration

**Additional Resources**

See Appendix D-Traditional Knowledge

**Case Studies**

Hui Malama o Mo'omomi

**Contact**

Community Conservation Network

**Pros**

1. Bridges the generation gap between the youth and the *kupuna*.
2. Youth will learn valuable technological and life skills.
3. Youth will learn which marine species are important to their community from both a natural and cultural resource perspective.
4. Kupuna may be more likely to pass along information that is intended to stay within the community.
5. Youth can create traditional fishing/harvesting calendars with information obtained from kupuna.
6. Enhances the direct management of marine resources through the development of 'Best Practices.' The community can suggest that these practices be followed when people are fishing or harvesting in their community waters.
7. Not only can youth learn about traditional practices, but they can also learn about the past condition of the resources, thus addressing the issue of shifting-baselines.
8. This program can be integrated into a school curriculum thus affected a large number youth on a continuous basis.
9. Enhance youth understanding of the biological cycles of marine resources and the importance of proper management to ensure sustainability. Youth can obtain the knowledge necessary to be the marine resource stewards of the future.

**Cons**

1. Youth are inexperienced with the interview process and may be intimidated by their kupuna.
2. Youth may not know enough about marine resources to ask pertinent or 'informed' questions.
3. There may not be a formal storage system for information.
4. Interviews may not be formally transcribed to create permanent records.
5. Requires video equipment and computers.
6. Requires adult supervision and follow-up with the youth.



## SECTION FOUR

# *Appendices*

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## HUI MALAMA O MO'OMOMI TRADITIONAL FISHERY MANAGEMENT

### Overview of Program

#### *How it got started*

In 1924, a community of native Hawaiians established the second homestead under the Federal Hawaiian Homes Commission Act of 1921. The community is comprised of 5,500 hectares of land supporting a population of about 1,000. In the 1980's, intensive commercial harvest of important resource species by a few community members, as well as fishers from other locations on Moloka'i and O'ahu, led to local depletion of these resources. This deviation from traditional fishing practices and resource conservation norms motivated some Ho'olehua homesteaders to form Hui Malama o Mo'omomi (Hui Malama o Mo'omomi 1995).

Access to Mo'omomi Bay is through Hawaiian Home Lands and encompasses some of the least accessible coastline in Hawai'i. Greater exposure to fishermen from other parts of Moloka'i and from other islands has introduced standards of behavior and perceptions of marine resources that deviate from traditional fishing practices and resource conservation norms.

#### *Goals/Objectives*

The community's long-term goal is to bring fishery resource management in the coastal areas in and around Mo'omomi Bay down to the level of the users who have the most detailed understanding of the resources and the greatest long-term interest in their sustainable use. There were three main project objectives: 1) To establish a marine resources monitoring program that integrates traditional observational methods and understanding, with science-based technical data; 2) To establish a code of conduct (how fishing should be conducted in the area) in order to restore community values and stewardship and to demonstrate the community's commitment and ability for self-management and 3) To revitalize a locally-sanctioned code of fishing conduct, and to make a cooperative agreement with the State of Hawai'i, providing for community-based management of shoreline and nearshore fisheries, in and around Mo'omomi Bay. (Pacific American Foundation and Hui Malama o Mo'omomi, 2001)

### Project Overview

The Hui Malama o Mo'omomi self-management project is strengthening community influence and accountability for the health and long-term sustainability of their marine resources through revitalization of local traditions and resource knowledge. Community self-management of inshore fisheries in and around Mo'omomi Bay is a contemporary version of the traditional *konohiki* system in which these overseers enforced the fishing closure, or *kapu*, or behalf of the chiefs (*ali'i*). Local resource monitors are creating a predictive management tool based loosely on the Hawaiian moon calendar to guide responsible fishing practices. Community-sanctioned norms for fishing conduct are being reinforced through continual feedback based on local resource monitoring, education, moral suasion, and family and social pressure.

The Hui continues informal management through internal cultural norms and values that guide and instruct the behavior of the community and that encourage responsible fishing based on individual conscience, social and family pressure and the training of youth to become 'good marine citizens.' An unwritten 'code of conduct' focuses on how fishing should be practiced in and around Mo'omomi Bay to maintain regular biological renewal processes rather than on how much fish should be harvested (Pacific American Foundation/Hui Malama o Mo'omomi 2001).

#### **Key Points**

**Location** – The Hui Malama o Mo'omomi is located in the Ho'olehu Hawaiian Homesteads on the island of Moloka'i.

**Initial organizers** – Members of the Hui Malama o Mo'omomi.

**Who is involved** – The project is supported by one caretaker (*haku'ili*), 2-4 local resource monitors, 3-5 people providing off-site support, 2-3 people developing school curriculum, and 6-8 members on the Hui's governing board.

**Annual costs/Funding sources** – The U.S. Department of Commerce, U.S. Administration for Native Americans and U.S. Department of Education have provided funding support. The Pacific American Foundation provided administrative and management support. The Hawai'i Community Foundation's Natural Resources Conservation

Program assisted Hui Malama o Mo'omomi in acquiring a small vessel that has greatly extended the range of community resource monitoring.

**Type of projects** – Integrating traditional knowledge, observation and voluntary compliance, awareness/outreach.

**Contact information** – Paul Bartram, pbartram@tripleb.com.

**Other References** – Poepoe et al. 2005, Friedlander et al. 2002 and Pacific American Foundation and Hui Malama o Mo'omomi 2001

**Keys to consider/Lessons learned:**

- Fishers have responsibilities in the use of marine resources.
- Understanding basic processes of renewal and conducting harvest practices so as not to disrupt these processes is one of the fundamental tenets of traditional resource management.
- To be effective, fisheries conservation must function within a specific local context. Communities and their individual members must exercise control over local inshore marine resource use and be accountable for the health and productivity of local resources.
- Emphasis should be on how fishing is conducted, not the quantity of fish harvested.
- The time dimension of “sustainable use” should be inter-generational, not the 4-year time cycle between political elections and agendas.
- Sustainable yield does not mean maintaining resource abundance at a fixed level or an unexploited level. Fishing should be modulated in response to changing rhythms of resource abundance and productivity.
- Community participation and involvement has clearly enhanced the role of the Hui Malama o Mo'omomi in local marine resource management and conservation. This was possible because of the emphasis on revitalizing Hawaiian cultural protocol in the use of marine resources.
- Cultural protocol communicates a code of behavior in respect to places, people and other living things (Edith Kanaka'ole Foundation 1995). The use of cultural protocol within the framework of the traditional Hawaiian moon calendar provided a highly credible basis for self-management of fishing conduct within the community.

**Obstacles**

- Fishing effort information proved difficult to obtain due to size and ruggedness of the coast, offshore fishing boats, and the privacy of those fishing.

**Methods**

*Traditional resource monitoring*

*Mapping the area* –To facilitate on-site monitoring, recent color aerial photographs of the project area were obtained and spliced into a photo mosaic. The coastline was sectioned into sub-areas, usually individual reef benches (*papa*). Wherever possible, Hawaiian names were verified and used to refer to localities within the project area. Two full-time monitors from the Ho'olehua Homesteads were recruited and trained for responsibilities as monitors and caretakers.

*Hiring monitors and caretakers* – Two full-time contractors from the Ho'olehua Homesteads were recruited and trained for responsibilities as monitors and caretakers. Community resource monitors were taught traditional Hawaiian observational methods of monitoring marine resources by an expert fisherman - Kelson “Mac” Poepoe, the senior caretaker (*haku'ili*) of the Hui Malama o Mo'omomi.

In ancient Hawai'i, a fisherman was recognized as an expert only after years of training to observe and understand the life cycle, diet, daily and seasonal feeding habits, the preferred habitat and growing conditions and the appropriate season, time of month, time of day, and method for harvesting many species of fish, invertebrates, and seaweeds. The resource monitors focus on acquiring and applying knowledge about the habitats, natural resource rhythms, spawning and feeding patterns of shoreline and inshore food species. These observations, recorded in daily journals, become the raw material to help develop mental models of resource rhythms and processes and to develop a calendar of resource dynamics patterned after the traditional moon calendar. As resource monitors develop a sophisticated understanding of local resources, they look for anomalies, such as resources expected to be present that are not, and potential reasons for their absence.

*Utilization of scientists* – Four visiting scientists who advised the project also trained the monitors in science-

based methods. The monitors collected scientific data using visual fish transects and tagging resource species, made repeat underwater photographic surveys at specific sites and recorded their observations and perceptions of marine resources in their journals. In year two, the monitors were certified in SCUBA diving to facilitate monitoring of deeper areas via underwater photography and with more quantitative survey methods.

*Overview of traditional practices* – Many natural processes that affect fish distribution are monitored by the community but the most important of these are seasons and moon phase. The moon calendar is a tool that Hawaiians of old developed for holistic understanding of marine and terrestrial environments. The moon calendar emphasizes certain repetitive biological and ecological processes (e.g., fish spawning, aggregation, and feeding habits) that can be validated by fishermen's own observations. By identifying peak spawning periods for important resource species, traditional closures or *kapus* can be applied so as not to disturb the natural rhythms of these species. By observing spawning behavior and gonads, community monitors were able to develop a calendar identifying the spawning periods for the major resource species in Mo'omomi Bay during the 2000 calendar year. The moon calendar is a predictive tool based on awareness of natural cycles and their relationship to fishing and farming success.

A deeper understanding of the moon calendar provides the biological and ecological context for proper harvesting. Natural rhythms and effects on marine resource dynamics occur at several levels that are considered in the moon calendar: seasonal changes, monthly changes, daily changes. During the wet season (*ho'oilo*), minus tides occur at night but during the dry season (*ka'u*), they occur during daylight. The change of seasons (*huli*) has a dramatic effect on the behavior and availability of many species. Exposure during minus tides at night darkness is not as stressful for *limu* as exposure during daylight. The dry season, therefore, creates environmental conditions less favorable for *limu* growth. Shallow-water growths that are exposed during the day become dehydrated and sunburned, then die out. The dry season also brings longer days, which triggers spawning in some reef fish species and stimulates the sub-tidal growth of *limu*.

The project area is exposed to winter swells that erode sand from the shoreline and adjacent benches (*papa*). Sand removed by winter surf moves back onshore during the summer months. Inshore and offshore sand movement influences the distribution and availability of some important marine resources, especially *aholehole* and *limu*. Stakes were driven at beach locations inland of Mo'omomi and Kawa'aloa Bays to establish benchmarks where sand accretion and erosion could be regularly monitored and compared to fish movements.

Three phases of the moon generate different tidal patterns and other environmental cues on a monthly basis: (1) Full moon - fish sensitive to light remain hidden while fish that favor light are in the open. The greater visibility of some prey species results in a greater activity of predators during this lunar phase. Extreme tidal fluctuations and currents occur at this time of the month. (2) Half moon - tide fluctuations not extreme (*kai mau mau*). Good time for fishing. (3) New moon - extreme tidal fluctuations. Negative tides allow for exploring shallow reef benches normally submerged.

Other daily environmental influences, especially rainfall, trade wind velocity, and North Pacific swells, combine with seasonal and monthly effects to influence the day-to-day dynamics and availability of marine resources. Understanding of these subtleties is what distinguishes the master Hawaiian fisherman from others.

Due to the local importance of *aholehole*, *moi*, and the red seaweed *limu kohu* (*Asparagopsis taxiformis*) as food items in the Ho'olehua community, these species were examined closely and written conservation principles were derived from Mac Poepoe's and other community monitors' "mental models" of resource dynamics.

#### **Reef Monitoring**

Benthic habitat cover was monitored at several sites in the project area using photo transect methods to generate permanent records. The monitors selected and staked several locations where they used underwater photography to check for changes in live coral condition. Damage to live coral was observed in areas where spiny lobsters were harvested with tangle nets after the season opened on September 1, 1999. Photographs of habitat damage caused

by lobster netting were used to bring attention to this harmful fishing practice. These sites were a focus of coral monitoring before and after the spiny lobster season opened September 1, 2000.

#### **Limu Surveys**

Resource monitors included *limu* in their regular on-site observations and made detailed surveys of *limu* composition and abundance along 30 m transects at four reef benches (*papa*). Monitors recorded observations about the ecology of important edible species, particularly *limu kohu* and *limu lipe'epe'e* (*Laurencia succisa*) over a 12-month period to document seasonal changes in distribution, abundance, and reproductive condition at a major harvest site. Contents of the stomachs of seaweed-eating fish were examined after capture to identify *limu* that are major dietary components for food fishes.

#### **Fishing Effort Surveys**

The resource monitors attempted to collect information on the amount and types of fishing effort and the species, sizes and quantities of fish harvested. However, this information proved difficult to obtain due to size and ruggedness of the coast, offshore fishing boats, and the privacy of those fishing. Interpretation of the detailed resource information recorded in the monitors' daily journals provides the basis for understanding local fisheries' dynamics and adjusting fishing effort so that resources are not harvested at the wrong times and places.

#### **Observation and Voluntary Compliance**

**Developing and enforcing a code of fishing conduct** –The written history of the project area was reviewed by eight *kupuna* (elders) and master fishermen from the Ho'olehua Homestead. The information obtained through cultural research was synthesized with widely accepted Hawaiian

cultural values to define community-sanctioned norms that can be used to govern marine resource use in the project area. These norms were validated by selected community representatives, primarily the board of directors of the Hui Malama o Mo'omomi. The code of conduct was designed to be true to Hawaiian values, to consider the community's culture, and be biologically sound for resource sustainability.

*Rule 1. Take only what you need* – Share the catch with the *kupuna* [elders] and underprivileged families.

*Rule 2. Reserve inshore areas for children and novice swimmers and fishermen* – Not for commercial purposes.

*Rule 3. Education* – Utilize traditional practices and science-based methods. Harvest resources in proper biological and ecological context.

*Rule 4. Community governing board* – Responsible for creating, implementing, judging, and seeing that guidelines are carried out correctly.

*Rule 5. Malama* – *Malama ka aina; malama na po'e malama na mea nai ka aina a me ke ka'i* "Care for the land; care for the people; care for all things; understand the land with the ocean".

The most effective means of eliciting proper conduct of fishing is through education of young people in the community and on the island of Moloka'i as a whole to become good Hawaiian citizens, who understand that they have responsibilities, as well as rights, for marine resource use. Young practitioners can influence their elders, bringing shame to those who deviate from proper conduct of fishing. When fishermen use the access road through Hawaiian Home Lands they tacitly agree to abide by the community-sanctioned code of fishing conduct.



## KAPOHO REEF WATCH, WAI'OPAE TIDE POOLS, HAWAI'I

### Overview of Program

#### *How It Got Started*

The project was started by the community association in response to the Division of Aquatic Resources (DAR) encouraging the local community to assist them to implement the new Marine Life Conservation District (MLCD) that became effective in June 2003. DLNR-DAR informed the community that the tide pools would likely receive increasing visitor use due to the MLCD status yet there would be no increase in State funds to manage public use, enforce the rules, install public restrooms or remove garbage. The community believed that increasing public use without adequate on-site management posed a threat to the reef due to coral breakage, human waste, litter, chronic oil pollution, and erosion of the cinder waterfront street that is tidally flooded >200 times each year. The County of Hawai'i designated the area a "critical wastewater disposal area" in 1992 due to the contamination of the coastal water. Therefore, increasing visitors without any public restrooms poses a risk of further reduction in coastal water quality.

Surveys conducted since 1987 by DAR and UH-Hilo have documented the Wai'Opae tide pools as having rich coral growth with high coral and fish diversity, including an unusually high density of juvenile fish.

This MLCD prohibits all fishing and commercial activities in a substantial portion of the Wai'Opae tide pools due to two reasons: 1) the importance of the area as a nursery for nearshore fish and 2) the high risk of damage to the coral reef due to easy year-round access and deep enough to swim in but shallow enough to trample the diverse and abundant coral. Common fishing methods include lay nets, throw nets, spear guns, Hawaiian slings, rod and reel, and hand nets. Night spear fishing and gathering is common.

### Goals/Objectives

**Biological** – To provide DAR with additional monitoring data, identify location of invasive species, and provide fish population data for species surveyed in the West Hawai'i Fish Replenishment Areas to compare species population trends under different management regimes.

**Educational** – To educate the general public and fishers about importance of the area as a nursery area and etiquette with regards to coral reefs.

**Project overview** –The project utilizes UH-Hilo students to conduct monitoring of fish species abundance and length/size class distribution, and coral diversity, abundance and health based on DLNR-DAR methods. Water quality sampling for *Enterococci* bacteria as well as other parameters was also conducted the first year. Reef stewards conduct human use surveys, pick up trash, provide awareness and outreach to visitors and report fishing violations.

### Key Points

**Location** – Wai'Opae Tidepools MLCD.

**Initial organizers** – Vacationland Hawai'i Community Association in 2003 and continues under the auspices of the non-profit Cape Kumukahi Foundation.

**Who is involved** – Marine science or aquaculture students from the University of Hawai'i at Hilo (UHH) were compensated for their work monitoring aquatic resources, water quality and human use patterns. Initially, DLNR-DAR's Hilo Aquatic Biologist and Marine Protected Areas Coordinator, three marine science professors at UHH, the Director of AECOS Laboratory of Hawai'i, and Project Manager Kirk Flanders provided technical assistance and supervision. Community volunteers continue to provide litter pickup and observation/compliance issues.

**Annual costs/Funding sources** – The project costs approximately \$50,000 a year. It is primarily funded by grants from the Hawai'i Community Foundation and National Fish and Wildlife Foundation, as well as contributions to the Cape Kumukahi Foundation from private individuals, the Vacationland Hawai'i Community Association and the Kapoho Kai Water Association.

**Type of projects** – Awareness/outreach, Observation and voluntary compliance, Human use surveys, Reef and fish monitoring, water quality monitoring, beach cleanups, visitor outreach.

**Contact information** – The key contact is Kirk Flanders, phone (808) 965-8020, e-mail:capekumukahi@yahoo.com.

### Keys to Consider/Lessons Learned

- The presence of Reef Stewards at the tide pools every weekend and federal holidays has reduced illegal fishing and the accumulation of litter and marine debris.
- The Reef Stewards have helped to educate the general



public and fishers of the importance of the tide pools as a fish nursery, of not littering or damaging coral, and of complying with the statewide fishing rules and MLCD rules.

- The project is the only source of data on the level of visitors to the MLCD.
- It is safer and more effective to have a team of two reef stewards working during the busiest times, instead of a single person. Reef stewards should wear clothing with a “Kapoho Reef Watch” logo and be equipped with cell phones and VHF radios in order to be able to immediately notify the state’s Division of Conservation and Resources Enforcement (DOCARE) officers of fishing and MLCD violations in progress.
- The development of a partnership with DOCARE has allowed the reef stewards to serve as inexpensive “eyes and ears” for DOCARE and for the officers to be able to time their visits to Wai’Opae more effectively.
- The biological surveys may also identify the location of invasive species and will improve information about the abundance and diversity of common species and their recruitment timing, which will contribute to a better understanding of the ecological value of the Wai’Opae tide pools.
- Providing DLNR-DAR with fish population data for species also surveyed in West Hawai’i Fish Replenishment Areas, where only the collection of aquarium fish is prohibited, will enable DLNR-DAR to compare species’ population trends under different management regimes and refine marine protected area management.

### Obstacles

- Lack of consistent funding.
- Reef stewards are recruited outside the community due to the seasonal nature of the Vacationland tenants.

### Methods

**Overview** – The project monitors coral, fish, invertebrates, algae, water quality, and human use patterns. All sites are located in areas regularly used by the public and the biological data can be compared to the human use and water quality data. See Appendix C for the data entry forms used in this project.

#### Reef monitoring

The biological surveys occur on twelve 25-m long by 4 m

wide transects. These transects were randomly selected and are stratified by management regime (inside vs. outside MLCD) and by habitat zone (inner brackish pools with low coral cover vs. outer more saline pools with more coral). There are three 25-m fish transects in each strata and these are further subdivided into shorter transects to survey invertebrates, algae and coral. Two snorkelers, trained through the UHH course in Quantitative Underwater Estimation Techniques (QUEST) conduct the monitoring.

To determine fish species abundance and length/size class distribution, the snorkelers use the visual strip-transect search method, where the snorkelers swim side by side down each side of the transect to count all fish species observed within 2m of each 25m transect and visually estimate their size. For composition and structure of community, the two snorkelers inventory all fish and invertebrate species to determine species richness, dominance, diversity and relative abundance and to detect invasive species. Coral diversity, abundance and health is measured with % cover of coral by species once a year and monitors record observations of breakage, bleaching, algal infestations, tumors, white or black bands, feeding scars, stress, or entanglement in fishing net or line using UHH/DAR protocols. Photographs of transects are also taken in areas too shallow to snorkel.

#### Water quality monitoring

During the first year, water was sampled to quantify levels of *Enterococci* bacteria at five tide pools inside and five outside the MLCD. Data was collected during three different months using the Hawai’i Department of Health standard protocols. During the second year, water quality was sampled for *Enterococcus*, *E. coliform* and total coliform bacteria once a month during a Monday low tide at the four sites with the highest levels of *Enterococcus*. Salinity, temperature, and dissolved oxygen are taken using an YSI Model 85 Oxygen, Conductivity, Salinity, Temperature meter. Data will help explain the biological data, locate human waste input points, and hopefully help cesspool owners understand and do their part to improve water quality in the Wai’Opae tide pools.

#### Human Use Monitoring

Reef Stewards count numbers of people fishing by gear type (lay net, throw net, spear/sling, pole, hand net, hand

gathering), non-consumptive users by type of activity (snorkel, kayak, beach, other) and total number of visitor cars within 14 discrete use zones that were delineated based on observed patterns of human use. The “Other” category is defined in the comments section using the following codes: scuba diving (D) (note if diver is fishing in the comments section); camping (C); fires (F); boogie boards (B); surfing (S); and inner tubes/blow-up boats (I).

Data was collected on all weekends and federal holidays in year one and also on four weekday afternoons each week during the summer in year two. Two-hour sampling periods are used due to the average visitor turnover rate (i.e., typical visitor leaves after about two hours due to lack of shade, comfortable spots, and facilities). Data is recorded on a standard data form (see Appendix C) for each sub-zone within a 2-hr period.

An estimate of annual visitor use to the area or particular zones or sub zones can be calculated by determining the average number of visitors by type of day (e.g., peak use periods vs. low use periods) and then multiplying the average visitors by the number of each type of day in the year. Using this approach, the first year of data from Wai’Opae tide pools allowed an estimate of 46,000 visitors and 12,820 vehicles.

#### ***Awareness/Outreach***

Trash left by users of the tide pools and marine debris is picked up daily by local volunteers and by the Reef Stewards when they work. The Vacationland Hawai’i Community Association pays to have the collected garbage hauled away to a county landfill every Monday. Vehicles are encouraged to not drive or park on the waterfront cinder rock road due to issues of sedimentation, oil and lead pollution as the road floods during higher high tides more than 200 times per year. Reef Stewards also educate the public about the resource values of the tide pools and the importance of protecting these resources, using brochures provided by various organizations.

#### ***Observation and Voluntary Compliance***

Local volunteers and the Reef Stewards have been trained by DLNR-DOCARE to accurately document violations of the MLCD and statewide fishing rules and to contact them as soon as possible so they can try to catch the violators in action. The Kapoho Reef Watch project worked with DLNR-DOCARE to develop a standard report form for citizens and the Reef Stewards to use to document and report violations (Appendix C). In addition, local volunteers and the Reef Stewards either talk to those violating the rules or put notices on their vehicles that summarize the rules and let them know people are watching.



## KAUA'I MONK SEAL WATCH PROGRAM

### Overview of Program

How it got started: Kaua'i Monk Seal Watch Program (KM-SWP) was formed in the mid-1990s for the purposes of protecting Hawaiian Monk Seals (HMS) on Kaua'i and providing education to the public to enhance their survival. It was structured as a non-profit organization and funded through the Hawai'i Wildlife Fund. Following the first birth of an HMS on a high-use public beach at Poip'u in July 2000, many volunteers joined the effort. In 2003, members voted to restructure the group as a 501(c)(3) organization.

### Goals/Objectives

To protect Hawaiian Monk Seals on Kaua'i and provide education to the public to enhance their survival.

### Project overview

Volunteers try to respond to reported HMS haul-outs on Kaua'i beaches, particularly those with high human/seal interaction potential. When a volunteer is notified and available, they go to the haul-out site to establish a perimeter around the seal with ropes, stakes, and signage to keep people at an appropriate distance. The volunteer also answers questions about the seals and their conservation. Lifeguards at county beach parks and security staffs at major beachfront hotels also contribute heavily to this effort.

### Key Points

**Location** – Kaua'i

**Initial organizers** – The first organizers of KMSWP in the early 1990s were some DLNR staff and local veterinarians. As the group became more active and organized after the Poip'u seal birth in 2000, the group filed for a 501(c)(3) recognition.

**Who is involved** – Variable. There are 10-15 regular volunteers. Numbers rise measurably during high-use beach birth events. Five volunteers staff the school program.

**Annual costs/Funding Sources** – Negligible. Time and transportation is volunteered. Signage is provided by the federal government. The school education program costs about \$350 annually, mostly for materials. The website initially cost \$250, with a small annual webmaster fee. Printing for placement of information in rental units is about \$200. That amount covered the initial mailings, printing, samples, and postage. Media support was free from Garden Island (local newspaper), Kaua'i Visitors Bureau, and Poip'u Beach

Resort Association. Properties are asked to donate printing and placement costs.

**Type of projects** – Marine mammal monitoring, Awareness/outreach

**Contact information** – The key contact is: Millie Johnston, President, P.O. Box 1898, Koloa, HI 96756.

**Other References** – Watchable wildlife guidelines: <http://www.nmfs.noaa.gov/pr/MMWatch/hawaii.htm>

### Keys to Consider/Lessons Learned

- Placement of brochures only likely to work with Hawaiian Monk Seal subject and perhaps only on Kaua'i due to the number of HMS haul-outs. Hotel management is generally reluctant to place non-essential non-commercial information in their rooms. With the frequent interaction between humans and such a critically endangered animal right on the beaches, the situation is rather unique. Most managers see the importance of providing a heads-up on this issue, for both their visitors' and the seals' safety. However, activity desks and rack card displays in hotels are other possible locations for visitor information.
- Establish a mission for your project.
- Make sure you have a person(s) willing to undertake all the actual work of filing for nonprofit recognition – i.e. writing bylaws, finding a lawyer or accountant, and going through all the paperwork. The lesson learned was that it was not all that easy!

### Obstacles

- Takes time to develop brochures, as various federal and state biologists as well as resource managers needed to be consulted on the appropriate message.
- Initially, only two or three of the group wanted to become a legally recognized 501(c)(3) group. They needed to convince the majority of those voting on the issue, which took a year – many conversations, many meetings. The main selling point was that a structure would always be there for others to step into in the future.

### Methods

**Hawaiian Monk Seal monitoring** – Volunteers are provided a general training by qualified federal/state government biologists. On-site experience and mentoring by seasoned volunteers compliments the training. KMSWP's structure includes a volunteer coordinator, whose responsibilities

include maintaining phone tree lists and providing haul-out response as quickly as possible.

**Awareness/Outreach**

**In school education** – In the spring of 2001, the project initiated a public school education program focusing on Kauai’s public school fourth graders. Volunteers provide a comprehensive fifty minute presentation about Hawai’i monk seals to each class room and allow time for questions and shared experiences. Private schools were added a year later.

**Website** – A website ([www.kauaimonkseal.com](http://www.kauaimonkseal.com)) was created as a follow-up for students and teachers in the classroom, to help train potential new volunteers, and to give further information to people we have encountered at beach events.

**In-room (hotel/condominium/vacation rental) placement of behavioral guidelines for visitors encountering Hawaiian monk seals (HMS) on Kaua’i** – This project was designed to further protect HMS by making behavioral guidelines available for visitors in their quarters. It is a one-page listing of ten guidelines – essentially do’s and don’ts. Most participating properties place the information in their room compendiums with their own logos and a support statement for KMSWP. Four local tourist publications also print the same guidelines on a donated, space-available basis. Currently, the information is placed in approximately 2,000 units, including all the major beachfront properties in the Poip’u Beach vicinity.



## MILOLI'I COAST WATCH

### Overview of Program

*How it got started* – Long-term residents of Miloli'i were concerned about the depletion of their fishery and the lack of enforcement in Hawaiian waters. The Coast Watch Program, a volunteer community watch program, started because people were simply “taking too much, more than they need to eat,” according to Uncle Walter Paulo, and the fishery was declining. They began a program where the community could articulate its own goals for marine resource management and share the results with State agencies and neighbor communities.

### Goals/Objectives:

*Goal* – To replenish and sustain the marine resources and ecosystems in Miloli'i.

### Objectives

1. To increase the knowledge of 20 -30 youth relating to traditional values, Hawaiian culture and marine ecosystems a yearly basis.
2. To enhance the knowledge of 5 -10 adults in traditional practices, Hawaiian culture, and marine ecosystems and increase their involvement in marine resource management on a yearly basis.
3. To reduce over-harvesting within Miloli'i coastal waters by 25% each year for the next 5 years through 'pono practices', increased rule awareness, and community outreach.
4. To increase compliance with current rules and regulations with a reduction in observed infractions of 25% per year for 5 years.
5. To have a fully functioning community based volunteer neighborhood watch program for the ocean (Makai Watch), with regular involvement of 5-10 community members by 2007.
6. Establish widespread reputation in western Hawai'i, that Miloli'i near-shore waters are safeguarded against illegal activities through regular patrolling and constant presence of Makai Watch by 2007.
7. To decrease 'legal' over-harvesting by 25% per year for 5 years.
8. To pass new legislation declaring the Miloli'i FRA as a Community-based Subsistence Fishery Area by August 2005.
9. To develop a list of 'pono' practices through recommendations of *kupuna* and other knowledgeable community members by August 2005.
10. To garner community support of Miloli'i Subsistence Fishery Area and proposed regulations by December 2005.
11. To develop, by January 2006, rules and regulations that will sufficiently protect Miloli'i's marine resources.

### Project Overview

The community patrols are designed to educate ocean users about resource regulations and discourage illegal activity or taking too much. The program trained six community members in resources regulations and how to approach ocean users in a friendly/positive but firm way. After approximately one year, Coast Watch has the potential to reduce over-exploitation and encourage ocean users to use marine resources in a respectful legal manner.

Biological monitoring has also begun in an effort to understand what the status of the resource is, to encourage stewardship in the future and to provide the State with scientific evidence that will address concerns about the status of the fishery. Two community members are leading the biological monitoring effort and worked in the summer of 2004 to recruit and train other community members, especially youth.

### Key Points

*Location* – The Miloli'i Coast Watch project is located in the community of Miloli'i on the southwest coast of Hawai'i Island.

*Initial organizers* – The initial organizers were members of the Miloli'i non-profit non-government organization Pa'a Pono Miloli'i, with assistance from several interested community members, Community Conservation Network, and The Nature Conservancy.

*Who is involved* – Several community members volunteer to conduct the Coast Watch patrols and biological monitoring and to document the traditional knowledge of the elders (*kupuna*).

*Annual costs/Funding sources* – The annual costs of the project have varied based on the availability of funds. On average, approximately \$25,000 per year has been spent on direct costs in the field, while another \$25,000 has been spent on staff costs at CCN and other

organizations to support the project.

**Type of projects** – Observation and voluntary compliance, reef and fish monitoring, integrating traditional knowledge.

**Contact information** – The project is led by Uncle Walter Paulo and Gil Kahele. Gil can be reached at 808-328-8520 or by e-mail at paapono80@hotmail.com.

**Other References** – *Managing Better Together: A Network of Communities Working Together to Malama Marine Resources in the Hawaiian Islands, June 20, 2004*, Community Conservation Network (included with permission of Gil Kahele.)

### Keys to Consider

- It is absolutely critical to work with as broad a range of community stakeholders as possible.
- Youth are often a key to getting adults involved in marine management. The education program at Miloli'i has done a great deal to help encourage the involvement of community members in the marine management effort.
- Having an existing marine designation provides a framework for creating a protection program and adding new rules. The Miloli'i area is already a Fisheries Replenishment Area (FRA) thus providing a solid framework for additional marine management.
- It is extremely important to have motivated community members to start up the program, organize community volunteers, work with the support of NGOs and DLNR to identify the program goals, threats, and strategies to address those threats, and raise funds to support the program.
- It is extremely important to have broad community support and volunteers.
- It is important to have one or more community coordinators that are paid to organize events, organize Makai Watch patrols etc. Without this it is very difficult to maintain volunteer and community involvement.

### Obstacles

- Need a paid community coordinator to work at least half time.
- Other issues that some community members feel are more important than marine management. This includes the following issues: drugs, unemployment, health, and education. Some community members are not participating because they are involved in working

on these issues, while others are simply not able to participate because of busy work schedules and other challenges. They are working to overcome this challenge by focusing on youth and by incorporating community development programs into the activities of the project. For example, they are now considering the development of a community center and of economic development programs to help address some of these other issues.

- It has been difficult to recruit volunteers into the project. While there is a very dedicated core team of about eight individuals, attracting others to volunteer their time has been very difficult. They feel that some sort of hourly pay schedule for Makai Watch patrols and other project activities will be necessary in order to retain participation.

### Methods

#### Overview

There are numerous activities ongoing in Miloli'i. The project is attempting to be comprehensive and as a result is incorporating the following: biological monitoring, human use monitoring, education and awareness raising, observation and compliance, collection and use of traditional knowledge and teaching of traditional fishing, community planning, and the development of new regulations.

#### Community based marine monitoring

Community members conduct fish counts using snorkeling equipment along established transects approximately once a month, weather permitting. Target fish are counted along the 50m transects long to a distance of 2 meters wide on each side. There are currently 2 transects in Honomalino Bay and Miloli'i Bay. Each transect is followed by a 10 minute timed swim to record additional fish within the area that may not be represented on the transect line. No benthic surveys are currently conducted by the community.

#### Human-use Surveys

The community is currently conducting human-use surveys for Honomalino Bay, Miloli'i Bay and the new sub-division. The number of vehicles present in the county park parking lot is also recorded.

### ***Makai Awareness Raising, Watch Observation, and Compliance***

The Makai Watch Program at Miloli'i is focused on informing ocean users of the existing marine regulations in the area and appropriate behaviors that community members request they follow. By raising the awareness of ocean users the program is cutting down on violations and behaviors that impact marine life. In addition, the Makai Watch Coordinator is trained to observe and report on severe violations to DOCARE. If a violation occurs, the Coordinator records evidence to make a case against the violator and calls DOCARE. Fortunately the presence of the Makai Watch Coordinator on patrol has nearly eliminated violations of local fisheries regulations. The key now to fully restoring the fishery is to develop other needed rules that will enable the fishery to recover.

### ***Education***

A yearly Summer Fun program is held annually within the community. There are approximately 30 youth (ages 6 – 16) who regularly participate in Summer Fun activities which focus on marine resource management and traditional and cultural practices. These activities continue throughout the year during school intercessions including Christmas and Spring Breaks.

### ***Community Planning***

Several Miloli'i community members have also expressed concern that the current sets of regulations that govern marine resources in the area do not seem sufficient to

ensure a sustainable fishery. As a result, they are regularly meeting to discuss what they feel is the best approach to restoring the local fishery. They have developed an initial set of pono practice that they feel if followed will help to rebuild the local fishery for the benefit of community members and visitors. Community members get together approximately once per month to discuss both specific activities that they are working on and the development of new approaches such as pono practices that will help to rebuild the fishery.

### ***Traditional Fishing Program***

Several community members are concerned that one of the main reasons for declines in the local fishery is the decline in traditional approaches to fisheries management. These approaches focused on fishing for species in ways that support their natural biological rhythms thus letting them reproduce and maintain the local fishery. To the extent possible, local community members are trying to record and restore some key fishing traditions that once helped to maintain a sustainable fishery. These include fishing opelu in the traditional manner. The project is supporting this effort to teach young people how to fish in traditional and sustainable ways.



## REEF CHECK HAWAI'I

The Reef Check Hawai'i project focuses on volunteer monitoring of coral reef ecosystems using the international Reef Check methodology adapted for Hawai'i.

### Overview of Program

**How it got started** – The first Reef Check surveys, organized by Save our Seas (nonprofit organization located on Kaua'i), were conducted as part of the International Year of the Reef event called Clean Oceans 97. These surveys were held at the Princeville Hotel, located in Hanalei, Kaua'i from June 13-15, 1997, involving over 100 divers and supported by dive companies, the University of Hawai'i Marine Option Program, Sierra Club and the Hanalei Canoe Club. Since then Reef Check Hawai'i has spread to the other islands. It was started in an attempt to assist state agencies monitor reefs, gather baseline information, and bridge the gap between the scientific community and the people using the reef.

### Goals/Objectives

Reef Check has two primary purposes: 1) to raise public awareness about the value of coral reefs, threats to their health and solutions to these problems and 2) to obtain and share sufficiently high quality data on coral reef status to promote their conservation and restoration on a local, national, and regional scale.

### Project Overview

Surveys are generally scheduled on a Saturday or Sunday following the training, with onsite and in water training provided as needed. Dive teams are made up of one experienced Reef Check volunteer and a new trainee.

A typical Reef Check survey will involve the Volunteer Coordinator, a Team Scientist (generally a marine scientist at the Master's level of education or higher or with comparable practical experience), a volunteer Team Leader, and a volunteer survey team typically consisting of a minimum of six persons. Most surveys are done using snorkel equipment, but some scuba surveys are done in cooperation with participating dive operators such as Island Divers Hawai'i. Some volunteers are dedicated to surveying and protecting specific sites or regions, e.g. North Shore O'ahu. There is also a core group of regular volunteers who survey different areas.

### Key Points

**Location** – Kaua'i, Mau'i, O'ahu. This project description highlights Reef Check on O'ahu and Kaua'i for the year 2004.

**Initial organizers** – Dave Raney, Reef Check Hawai'i.

**Who is involved** – On Kaua'i, volunteers, including members of the Kaua'i Group of the Sierra Club, have adopted Anini Beach as an area to be protected and restored. Prior Reef Check activities on Kaua'i have included cooperative efforts with the Hui Maka'Ainana o Makana at Limahuli Gardens, Malama Maha'ulepu, The Hanalei Heritage River Program, Waipa Foundation, and Save Our Seas Foundation. The Kaua'i Reef Check volunteers have been supported in part from O'ahu, with occasional visits from the Reef Check Community Outreach Coordinator, and with visits from Dr. Stephen Thompson.

On Mau'i, Reef Check is conducted in conjunction with R.E.E.F. surveys, funded in part from a NOAA/CZM grant to Project S.E.A.-Link. Reef Check has performed surveys on the Big Island, but is not currently active there.

**Annual costs/Funding sources** – Most of the work is done by volunteers. There is no paid full-time staff, but grants cover the direct costs of Team Scientists, Volunteer Coordinators, and the overall Coordinator for coordinating volunteers, conducting trainings and surveys and reporting findings. Much of the work done by these individuals is also time donated as in-kind services. The Community Outreach Coordinator position at this time is partially funded.

Reef Check activities on O'ahu and Kaua'i are funded in part by a \$20,382 grant from the National Oceanic and Atmospheric Agency (NOAA) and the State of Hawai'i Coastal Zone Management Program (CZM). This grant requires matching funds, which are in the form of "in-kind" services provided by volunteers. The Reef Check Hawai'i work on Kaua'i is also supported in part by a grant of \$3,131 from the Kilauea Point Natural History Association received in the year 2001.

**Type of projects** – Reef monitoring, awareness/outreach, alien algae removal, alien algae monitoring, observation and voluntary compliance.

**Contact information** – The key contact is Melissa Mac Garrett, Reef Check Hawai'i Community



Outreach Coordinator. Phone: 808-392-0509, email: Melissa@reefcheck.org. General inquiries to Reef Check Hawai'i should be emailed to reefcheck@islanddivershawaii.com

**Other References** – Website: www.reefcheck.org

### Keys to Consider/Lessons Learned

- Have a core team and institutional framework in place to maintain efforts over time.
- Established linkages and partnerships with institutions as well as individuals - e.g. operating under the umbrella of the Reef Check program headquartered in California and with local partnerships including those with the University of Hawai'i Marine Option Program, Hawai'i Pacific University, Chaminade University, Mau'i Community College, Waikiki Aquarium, the State of Hawai'i Division of Aquatic Resources, and others.
- Sought private sector partnerships and funding for at least a part-time coordinator.
- Established Reef Check Hawai'i as a local 501 (c) (3) non-profit organization with a board of directors.

### Obstacles

- Consistent funding. Grants for community based efforts tend to be for one or two year time horizons, and are often viewed as “seed moneys” to initiate projects that are expected to become self-sufficient over time. Some “seeds” will take hold, others will wither away after the seed money runs out.
- Continuity in leadership.

### Methods

**Reef monitoring** – The project uses the standard Reef Check methodology adapted for Hawaiian species. A detailed description of these methods is available from the Reef Check website, <http://www.reefcheck.org/methods/instructions.asp>. Please contact the Reef Check coordinator if you are interested in becoming involved with Reef Check. A summary is given below.

**Selecting a site** – Site selection is important to determine the geographic distribution of human impacts on reefs. For this reason, Reef Check teams that can only survey one site are asked to survey the “best” site they have access to in terms of least likely to have been affected by human impacts, fishing, pollution etc. with high living

hard coral cover and dense fish and mobile invertebrate populations. For groups willing and able to survey multiple sites, then they should choose two or more additional sites representative of moderate and heavy human impacts. By describing these sites in the Site Description sheet, similar habitats can be compared with different levels of perceived human impacts. To standardize comparisons, surveys of reefs predominantly located in caves or underhangs are not accepted. Reef sites should be moderately to fully exposed reefs with a reef crest and outer slope with transects placed seaward of the reef crest on the outer slope.

**Selecting transect areas** – The goal is to survey two depth contours, 3 m and 10 m below chart datum (lowest low water). However, on many reefs, the highest coral cover will not be found at these exact depths. A single 100 m fiberglass measuring tape available from hardware and survey equipment supply stores is recommended.

**Data forms** – There are three field data sheets for the core protocols, the Site Description, Line Transect and Belt Transect sheets. The Belt Transect sheets are divided into a section for invertebrates and a section for fish. Teams may use either underwater paper or a plastic writing slate. Photos of the indicators can be downloaded from the Reef Check website and printed in color and either laminated or placed inside a plastic “zip-lock” bag and then carried underwater for reference. See Appendix C for standard data entry forms. The three transect surveys will be made along the same transect line:

**Pre-dive training** – The pre-dive training needed for each team will depend on their experience and knowledge. A half-day training on land prior to the dive day is recommended so that the training can be absorbed and there is sufficient time for questions and discussion. This can be supplemented with a brief review on the dive day.

**Day of monitoring protocols** – The fish belt transect survey is conducted first, followed by the invertebrate belt transect and line transect (for substrate). Each group documents the transect location with photos and videography on both land and water.

**Post Dive Tasks** – The Team Scientist is responsible for gathering the slates and data together as soon as the survey is completed and reviewing them immediately

with the team members. The purpose is to make a quick assessment of the data to determine if some error has been made that can be corrected while the team is still on site, and the transect is in place. Typical errors that could be corrected would be “double-counting” of fish, misidentification of organisms or mislabeling the slate. When an error is suspected, a re-survey should be made to check or to correct it. Before departing from the site, the team scientist is responsible for ensuring that all required data have been collected and that the slates have been filled out properly and each individual’s work identified. As soon as possible after the dive, the data should be entered into the automated Excel Spreadsheets which have been sent to all participants, and these spreadsheets emailed to Reef Check headquarters at [rcdata@ucla.edu](mailto:rcdata@ucla.edu).

**Alien Algae monitoring** – Data collection has been augmented to include tracking of the five major alien algae species and sea turtle abundance and habits. Survey results are showing significant differences in the health of near shore coral reefs on O’ahu versus the Neighbor Islands, especially in the amount of fleshy seaweeds. They also are seeking to document perceived as well as verifiable threats for each survey site. In consultation with marine scientists and governmental agencies, they are determining what protection actions are appropriate for each site. The major decision to be determined is whether or not prevention of damage to the site or restoration of the site is necessary and feasible. If the answer is no, then the site will be monitored periodically to look for changes in threats or opportunities. If the answer is yes, then efforts will be made to implement a prevention or restoration project. Two examples of the latter are 1) the alien algae control project at Waikiki (restoration) and 2) a proposed project to monitor the coral reef ecosystem at Lanika’i (prevention), through a Beachcomber Patrol, to detect and eradicate invasive algae species.

**Alien Algae removal** - Reef Check supervises volunteers in the alien algae control project at Waikiki and intends to

assist in tracking the extent of invasive algae statewide and helping to prevent or control the further spread of invasive algae. The first survey on O’ahu was at Waikiki on the shallow reef makai of the Waikiki Aquarium. This survey documented extensive coverage by the alien algae *Gracilaria salicornia* and reported it to Dr. Cindy Hunter of the Aquarium. Reef Check has collaborated with the Waikiki Aquarium and others to attempt to control the alien algae, primarily by providing volunteer snorkelers to assist in algae removal and land support. Dr. Hunter and others obtained a grant through the Hawai’i Coral Reef Initiative program for alien algae control, which led to the highly successful A’ohe Limu E project at Waikiki. See the section on Alien Algae Removal for more information. The Nature Conservancy of Hawai’i, Island Divers Hawai’i, and Reef Check were among the major non-governmental agencies collaborating on this project, which received a national Coastal America award in 2003. As of June 5, 2004, 67 tons of *Gracilaria salicornia* has been removed from two Waikiki sites.

**Education Outreach** – On O’ahu, Reef Check conducts training sessions and performs Reef Check and R.E.E.F. surveys island-wide. A class in “Introduction to Coral Reef Ecology” has been added for volunteers lacking a marine science education.

**Observation and Voluntary Compliance** – Reef Check volunteers called attention to sedimentation runoff from a construction project at Velzyland on Oahu’s North Shore and from illegal land clearing and grading at Pila’a on Kaua’i. Reef Check’s efforts to identify threats from potential polluted runoff have been augmented recently by the Sierra Club’s Blue Water Campaign, and by legal actions taken by Earthjustice. Reef Check volunteers also reported illegal fishing at Waikiki Marine Life Conservation District to DLNR-DAR.



## REEF ENVIRONMENTAL EDUCATION FOUNDATION (REEF)

### Overview of Program

**How it got started** – REEF (Reef Environmental Education Foundation) was founded in 1990 out of growing concern about the health of the marine environment and the desire to provide the SCUBA diving community a way to contribute to the understanding and protection of marine populations. REEF achieves this goal primarily through its volunteer fish monitoring program, the REEF Fish Survey Project. Participants in the project not only learn about the environment they are diving in, but they also produce valuable information. Scientists, resource managers, and the general public use the data that are collected by REEF volunteers. REEF has over 20,000 members worldwide, and nearly 90,000 surveys have been submitted to the database.

In Hawai'i, the project started in 1999 when individuals from nonprofit organizations, Maui Community College, DLNR-DAR and REEF came together to develop the Hawai'i-based survey materials. The Hawai'i REEF program debuted in February 2001. REEF events occur on an ongoing basis, and REEF's major annual event, "The Great Annual Fish Count" has been conducted every July in Hawai'i since the REEF program debut.

### Goals/Objectives

The goal was to involve the community in collecting data about Hawaii's fish populations in order to increase the public's awareness and concern for the reefs and to increase the amount of data available to managers.

### Project Overview

The REEF Fish Survey Project allows volunteer SCUBA divers and snorkelers to collect and report information on marine fish populations at any time. The data are collected using a fun and easy standardized method, and are housed in a publicly-accessible database on REEF's Website. Since 2001, a total of over 3,700 surveys have been conducted at 365 sites in Hawai'i and 736 REEF members are based in Hawai'i. The materials were developed using common names of fishes, thus making the method more user-friendly to the average recreational diver or snorkeler. However, Hawaiian and Scientific names are also referenced on materials.

After receiving training, volunteers continue to conduct surveys on their own. The standardized nature of the program allows volunteers to progress through five levels

of expertise, and after a requisite number of surveys and scores on quizzes, they may be considered "Expert" surveyors. Experts' data may be analyzed distinctly from Novices', thus providing more confidence in the data submitted by volunteers.

### Key Points

**Location** – Maui, Hawai'i, Kaua'i, O'ahu

**Initial organizers** – On Maui, Donna Brown of Maui Community College's Marine Option Program, Liz Foote of Project S.E.A.-Link and Robin Newbold of Maui Coral Reef Network worked with Skippy Hau of the State of Hawai'i Department of Land and Natural Resources-Division of Aquatic Resources and Christy Pattengill-Semmens and Laddie Akins at REEF Headquarters.

**Who is involved** – There are about 500 volunteers who have conducted surveys in Hawai'i. Volunteers have ranged from local residents to visitors from 26 different states and several countries, of varying ages and physical abilities. In Hawai'i, REEF has been very successful at involving the community. The survey effort in Hawai'i has increased 50% over the last few years.

The following organizations and businesses are now considered "local partners" of REEF, and several (marked with an \*) are further designated as Field Stations. An up to date list of REEF Field Stations can be found at <http://www.reef.org/member/fieldstations.htm>

#### Hawai'i

- Teri Leicher,\* Jack's Diving Locker

#### Kaua'i

- Paul Clark, Save Our Seas
- Mary Neudorffer, 652-1337, medneu2@earthlink.net

#### Maui

- Hawaiian Islands Humpback Whale National Marine Sanctuary\*
- Hannah Bernard, Hawai'i Wildlife Fund
- Donna Brown, Maui Community College Marine Option Program
- Liz Foote,\* Project S.E.A.-Link
- Robin Newbold, Maui Coral Reef Network
- Joylynn Oliveira,\* Ao'ao O Na Loko I'a O Maui (Association of the Fishponds of Maui)

- Teri Stewart, Maui Dreams Dive Company

#### *O'ahu*

- Wild Side Specialty Tours\*
- Island Divers Hawai'i\*
- Dave Raney, Sierra Club

**Annual costs/Funding sources** – The development of the Hawai'i-based REEF materials was supported by grants to Project S.E.A.-Link from Hawai'i Coastal Zone Management and the PADI Project AWARE Foundation from 2000-2001. In 2003-04, Project S.E.A.-Link received additional funding from Hawai'i Coastal Zone Management and the National Fish and Wildlife Foundation. The cost per year is around \$10,000 for one monthly survey and one monthly workshop, including workshop instructors, coordination and supplies. Much of the support has been in the form of extensive in-kind support by local businesses such as dive shops and recreational tour operators that sponsor surveyors aboard their vessels or provide special promotions to volunteers. In addition, REEF is a PADI Specialty and can be offered by dive shops and independent SCUBA instructors

**Type of projects** – Reef and fish monitoring, awareness/ outreach

**Contact information** – See partners under “who is involved”

**Other References** – [www.reef.org](http://www.reef.org); general email: [reefhq@reef.org](mailto:reefhq@reef.org).

#### **Keys to Consider**

- The Hawai'i REEF program has been particularly successful in Hawai'i due to ongoing funding which allows for training and survey events to be held on a regular basis. During the time period when Project S.E.A.-Link had funding from Hawai'i Coastal Zone Management and the National Fish and Wildlife Foundation, the number of surveys conducted in Hawai'i by new members was more than twice that of any other REEF geographic area during REEF's history.
- REEF is a volunteer program and surveys can be conducted via snorkeling or SCUBA diving. The coordinating agency should be responsible for addressing liability concerns and should provide a waiver for volunteers to sign before participating in Field Surveys.

#### **Obstacles**

There have been concerns raised about the publicly-accessible database in terms of aquarium collecting in Hawai'i, but the database is formatted so that an exact location of a reported species cannot be determined, and data for targeted species is protected.

#### **Methods**

**Overview** – REEF is a volunteer organization that conducts a fish survey method called the “Roving Diver Technique”. Standardized training in fish identification has been developed, and Novice as well as Advanced workshops are offered to the community. Field surveys mobilize volunteers at a survey site and incorporate hands-on training in the method. An “Adopt-a-REEF” approach can further increase participation and stewardship by volunteers. “Train-the-trainer” efforts have also resulted in many new organizations and businesses adopting the method and offering REEF events of their own.

**Fish monitoring** – To collect data for the Project, REEF volunteers can conduct surveys anytime and anywhere in Hawai'i using the Roving Diver Technique (RDT). This is a visual survey method specifically designed for volunteer data. The only materials needed are an underwater slate and pencil, a scantron form available at no charge from REEF, and a good reference book. Scanforms are available free through REEF's website or through Field Stations and local partners. The national website features training materials including image galleries and a quiz to help volunteers learn to identify species.

During RDT surveys, divers swim freely throughout a dive site and record every observed fish species that can be positively identified. The search for fishes begins as soon as the diver enters the water. The goal is to find as many species as possible so divers are encouraged to look under ledges and up in the water column. Any sea turtle species seen during your dive should also be marked.

Following the dive, each surveyor records the species data along with survey time, depth, temperature, and other environmental information on the REEF scansheet specific for the region the survey was conducted in. Completed scansheets are returned to REEF HQ, at P.O. Box 246, Key Largo, FL 33037, USA. The REEF staff conducts data entry and

analysis. Data summaries are available to everyone via the national website, including geographic summaries, species distribution reports and personal sightings summaries.

More information and resources can be found at [www.reef.org](http://www.reef.org). A detailed Hawai'i-focused, on-line tutorial of the REEF method developed by Project S.E.A.-Link can be found at [http://projectsealink.org/pages/programs/reef\\_tutorial.html](http://projectsealink.org/pages/programs/reef_tutorial.html)

**Awareness/Outreach** – REEF has established an Educators Advisory Committee and is developing curricular materials for the high school level. Locally, Project S.E.A.-Link is developing a version of the training for primary grade levels called “REEF Kids,” and is working with the Mau'i Digital Bus to develop additional materials for use within the Mau'i Ocean Center and other Hawai'i-based aquariums.

## WEST HAWAI'I SEA GRANT PROGRAM

### Overview of Program

*How it got started* – The University of Hawaii's Sea Grant Program started ReefTalk, ReefWatchers and ReefTeach in West Hawai'i over the past 4-7 years. ReefTalk started about 12 years ago to give community members an opportunity to educate themselves about marine and coastal ecosystem issues both in Hawai'i and throughout the world. The Reef-Watchers program was developed to engage the community members in an active way and to help develop baseline data that did not exist. The ReefTeacher Program was developed to help stem the coral trampling occurring at Kahalu'u Bay.

### Goals/Objectives

The goal of the program is to build community knowledge and consensus to manage marine ecosystems in a sustainable manner.

### Project Overview

The foundation of a successful education program is providing balanced information over time. In West Hawai'i, University of Hawai'i Sea Grant has been providing free public education lectures by researchers and experts on ocean and marine resource related issues (ReefTalk) for ten years.

To accomplish a multi-level approach to education and outreach, several programs were developed to involve or capture the attention of community members:

- ReefTalk was produced by volunteers and have aired on a public television channel six times per topic;
- ReefWatchers is a volunteer monitoring program made available to schools and adults, provides fish counts and intertidal characterization data;
- ReefTeach is a volunteer program wherein Girl Scouts, high school students and adults talk to snorkelers and swimmers encouraging low impact reef visiting; and Aloha Kai involves high school students trained to teach elementary students about the importance of the marine ecosystems in Hawai'i.

### Key Points

**Location** – West Hawai'i

**Initial organizers** – West Hawai'i Sea Grant, Sara Peck

**Who is involved** – West Hawai'i Sea Grant, Girl Scouts, High school students, community members, grade school students.

**Annual costs/Funding sources** – ReefTalk costs about \$1,000 a year to run. Sea Grant initially funded the advertising by paying for mailing fliers (\$1,200). ReefWatchers costs about \$2,000 annually for materials and supplies, not including trainer time. ReefTeachers costs about \$1,000 annually for materials and supplies, not including trainer time. All of these programs have been funded through a number of grants over the years including Hawai'i Coral Reef Initiative, Department of Business Economic Development and Tourism/Coastal Zone Management, Harold Castle Foundation, Hawai'i Community Foundation, The Atherton Foundation, National Oceanic and Atmospheric Administration, National Fish and Wildlife Foundation and the National Science Foundation.

**Type of projects** – Coral reef and fish monitoring, tidepool monitoring, human use surveys, water quality monitoring, awareness/outreach-lectures/talks.

**Contact information** – The key contact is Sara Peck, Sea Grant Extension Agent.

### Keys to Consider/Lessons Learned

- Communities cannot help resource managers make informed decisions unless they have educated themselves with current information and research. Education is the key to all progress toward community supported natural resource management issues.
- Working with communities to form functioning groups takes time and money, probably 2-3 years on the average, to enable a room of people with diverse interests, stakeholders, to learn to listen to each other respectfully and to consider decisions based on not only their own interests and those of their constituents, but on research, common sense, and a stewardship ethic.
- The success of a volunteer sampling program is dependent upon two primary factors: 1) The selected protocol(s) must provide data that is useful to resource managers in that it provides information such as fish and/or invertebrate species frequency, abundance, or trends in numbers. 2) The selected protocol(s) must be simple and enjoyable enough that the volunteer(s) will continue to gather data over an extended period of time, as frequently as possible or convenient. Volunteer efforts, because they are long term, can provide information



that most agency or university studies cannot, because funding determines how long a study will run.

- Surveys to detect changes in numbers of fish over time require more structure than those designed to detect changes in species occurrence. Not only must the site, habitat type, and amount of effort (time spent surveying) be consistent from survey to survey, but the amount of area examined must be the same, though not exact. (This is not true for species with no or very limited mobility, where the exact same survey should be conducted each time.)

### Obstacles

Working with state agencies, a lack of will on the part of legislators and policy makers and agency people, funding, and training are some difficulties to overcome. If the change agent has years and years to spend working toward a goal, and hundreds and hundreds of community members to support the ideas or changes, then change can occur.

### Methods

See Appendix C for field data forms and contact Sara Peck for possible updates to the forms.

### REEFWATCHERS

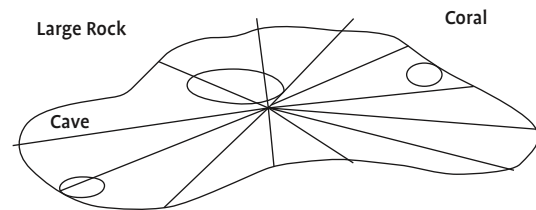
#### *Volunteer Tide Pool Monitoring – March 2003*

This protocol is designed to describe the occurrence and distribution of marine life in West Hawaii's intertidal areas and to record fish association with types of substrate. It was constructed as an open-ended survey to allow flexibility in data gathering. This type of data gathering, however, presents a real challenge to those who are creating the database for tide pool monitoring.

This type of survey can be done any time of day and any place you favor for shoreline visitation. Here are some tips for setting up tide pool monitoring:

- Choose one or more tide pools to survey as frequently as possible. Twice a month is very helpful, once a month is acceptable. The reason for a more frequent survey in tide pools is because some fish species, such as manini (convict tangs) spend their first few weeks after settling out of the plankton in tide pools, then they leave for deeper water. We would like to have documentation of that cycle from a number of tide pools along the West Hawai'i shoreline.

- Select tide pools that, at medium low tides, are safe for you to monitor and at low tide will trap the fishes within them so they can't bail when they see you next to their tide pool. Some blennies may jump out anyway.
- Map the tidepool at both high and low tides due to fluctuations in depth and size at high and low tides. Map the features and size. An easy way to map is shown below, and may take two people.
  - o On graph paper, make a rough sketch of your tide pool.
  - o Determine where the water is with a tape measure or string upon which you have marked increments of centimeters.
  - o One person stands in whatever you determine is the center of the tide pool (make sure you do not step on corals or other living organisms!).



With a compass, and using the line or tape to circumscribe the tide pool perimeter, measure the distance from the center of the tide pool at increments of degrees, 0° to 360° (as often as you think necessary).

- o Mark these lengths and degrees from the center to the pool perimeter on the graph paper over your sketch.
- o The boxes on your graph paper can then represent 'x' number of centimeters, and later, if you really want to be exact, adjust the pool sketch to fit your graph paper as you see fit. You can also draw the irregularities of the tide pool's edge between the marked increments.
- o As you take the measure of each line length from the center to the perimeter of the pool, you will also need to record depth at regular points along the line. Note special features in your pool, such as live coral, rubble areas, sand areas, hard basalt areas.
- o You can also photograph the pool using a known measure (meter stick, for example) to further define your pool.



- o Once you have a diagram/map of your tide pool, we can reduce it to fit in the area indicating “Map” on your data sheet so you can use it to locate specific animals’ positions if you wish, to compare from visit to visit. This may turn up some interesting trends.

#### *Tidepool data collecting*

*Water quality measurements* – Each visit to your tide pool, you should take a thermometer to test the temperature and a tool to measure salinity, hydrometer or specific gravity meter (See the Water Quality Monitoring section for more information). You will need a clipboard for your waterproof (or regular paper) Field Data Recording sheet, rubber bands to hold it in place at the bottom, and a pencil.

#### *Tidepool survey*

1. Approach your tide pool slowly, then sit quietly until the inhabitants swim out from their hiding places.
2. Begin taking data, recording what you see on the Field Data Record.
3. Note on the Field Data Recording sheet a section to describe substrate.
4. Indicate the sizes of fish. If you have more than one goby, then you count them and estimate the minimum size and the maximum size. If you have just one individual, please use the ‘individual size’ column.
5. Throughout the year, try to visit your tide pool at various times of day and moon phases. You will be somewhat limited by overall weather conditions.
  - a. Using a calendar that shows moon phases, note the phase your data was taken and write the number of days before or after the phase up to the numbers 4 or beyond that jump to the next moon phase.
6. After collecting long-term data, look for trends. For example, are there trends showing how long certain juvenile manini and butterfly fishes stay in tide pools before they leave for deeper water?

#### *Volunteer Fish Monitoring*

Volunteers can look for CHANGE OVER TIME, an extremely valuable contribution – If successful, the following questions can be answered: Is the species composition of an area changing? Is the population size of one or more species of fish changing? Working with DLNR-DAR, two types of fish counting protocols were developed. Volunteers should survey their sites at least once a month using the same pro-

tolocol each time. There are a few ways to create a data slate for your water or tide pool work. You can use a professional plexiglass clipboard (expensive) or make your own.

#### *Non-linear Swim Protocol*

This Random Swim Protocol in which you survey without establishing linear transects is useful where permanent transect pins cannot be established for environmental or logistical reasons, or when it’s difficult to swim a delineated transect because of waves or currents.

#### *Setting up the area:*

1. Start by defining an area, measuring the perimeter using a compass, and mapping the identifying features so you and anyone else can survey that area.
2. Draw a map of the area, including compass headings and underwater and surface features useful for establishing where you want to be.
3. Within the survey area you have mapped, work out a general pattern of surveys that you repeat each time and conduct for about the same amount of time. Define these patterns in some way (mauka side, makai side, middle or north, south, and middle...A, B, C, etc.) Include these survey paths on your map of the survey area when you describe your particular protocol so that someone else can survey the same site.
4. For this method to be valid, the surveyor must be able to identify all of the fish seen during a survey OR must limit he/her survey to selected species. Limit yourself to the Basic Fish List initially and expand to include other species later. Conduct at least 5 or 6 practices and when you are confident, then begin taking data for real. It is more important to count the number of each species you know than trying to identify all the fishes you see.

#### *Beltless Transect Protocol/Point-to-Point Survey*

The objective of this method is to establish a baseline for fish numbers and species in a specific linear area. Belt transects must be conducted along the same depth profile, generally parallel to the shore. Normally a belt transect will be done using a 25 meter line strung from one permanent pin to another. A ‘beltless’ transect, which takes surveyors from one point underwater to another point, is used to avoid impacting the reef with more permanent pins.

1. Locate an area where you want to survey, and create an



- invisible transect line from one identifiable underwater feature point to another, approximately 25 meters long.
2. Map your transect, describe the substrate, and any triangulation points you use at the surface to locate the start and end points. It's also helpful to use a compass for the transect description. These transects should follow the same depth profile, and generally run parallel to shore. Snorkelers should confine their surveys to a depth of 15ft and shallower to ensure identification accuracy. SCUBA divers should confine their surveys to 60 ft. or shallower and conduct a no-decompression dive.
  3. Snorkelers: Before you begin your actual transect count, swim the length of the transect to make a "Long View" sweep of the area to pick up any fishes that may leave the area because you are there. You are looking at the water column from the surface to the substrate.
    - a. Wait 5 minutes for fishes to come out of hiding and then begin your transect count.
    - b. If you are by yourself, you will use a two-meter wide visually estimated view from your right to your left side (one meter on a side) to the extent of your peripheral vision (about 45° angle) and focus your forward view two meters out in front, at about a 45° angle. You will swim down the center of the invisible transect line from one end point to the other.
    - c. If you are with a buddy, you will each take a side of the invisible line, and count fish in an area two meters from each side of the invisible transect line, or four meters across. You should try to swim at the same rate together, not one ahead of the other.

*Survey focus range for snorkelers below: Look down 1 meter to each side.*



*Side view of snorkeler at surface looking down. Look ahead no more than 45 degrees*



4. SCUBA divers – You will work in buddy teams swim at the same speed. Take a 'Long View' of the invisible transect looking at the water from the surface down to the substrate for larger fish that will move away when they see you. Wait 5 minutes.
  - a. Together, swimming at the same speed, begin your transect count with one of you on each side of the invisible line, looking at an area visually estimated two meters wide (one meter on each side of you) to the extent of your peripheral vision (about 45° angle) on both sides of the invisible transect line.
  - b. Focus your forward view 3-4 meters ahead, looking at approximately four meters from the substrate up into the water column. Your forward view should be about 3-4 meters at a 45° angle. You are looking at a rectangular tunnel 4m high from substrate up X 2m wide, one meter on each side of you. Combined with your buddy, you are covering twice that area.

*Survey focus range for SCUBA divers below:*

*Side view of survey area for diver swimming 4 meters above the substrate.*



*Survey width and length for diver.*



Area is 1 meter on each side and 3-4 meters ahead. If two divers are doing a transect, they each take 1 meter next to the transect and 1 meter outside of that. Two divers will cover a 4 meter area, but each will record their 2 meter area only.

*Transferring data from the wet slate to the field data form*  
 After completing your counts of fishes, you should immediately transfer the data to regular paper field sheets, before you forget the details. This is a good time to check your fish books to confirm identification.

Noting juveniles and other sizes of fishes after you have mastered the basic survey – It is important to record

juveniles so that you can learn about the patterns of recruitment of new fish to the reef. Some fishes are colored and even shaped differently as juveniles compared to their adult coloration. Some fishes start life as females and turn to males as they mature, but not always (wrasses, parrotfishes are two examples); some can change back and forth but may not be outwardly dimorphic (groupers). All this changing leads to great confusion for fish watchers until they learn the juvenile stages and the adult male and female stages. To complicate your work even more, some fish settle out as juveniles very, very small, while others settle out of the plankton rather large.

**Human Use Survey** – Human activity is also documented on the field data form. Note the number of people and what they are doing as you are transferring your water data to the Field Data Report. Also note number of boats, kayaks, canoes, and if these are anchored or moored or drifting/underway. Use the first two letters of the activity per examples: 5 sn = 5 snorkelers, 5sc= 5 scuba divers, 5sb=5 sun bathers, 5pn= 5 picnic, 5 sw= 5 swimmers, 1bo,dr = 1 boat drifting, 1bo,an= 1 boat anchored (as opposed to moored on a day use mooring buoy), 1ky,uw = 1 kayak underway, etc. If you run into some unusual activities or combinations, explain to the data input person in writing.

## AWARENESS/OUTREACH

### ReefTalks

ReefTalks are free monthly public education presentations given by experts in various fields or on issues related to marine and coastal ecosystems. Speakers volunteer their time to prepare and give these talks, and volunteer videographers give of their time to tape, edit and produce ReefTalk presentations for public TV. VHS and DVD copies are available for reproduction by libraries and schools.

### ReefTeach

ReefTeach developed as a way to teach visitors at Kahalu'u Beach Park the importance of corals, what they look like, and why one should avoid touching, standing and trampling corals. There is a small amount of data comparing the people who have been taught to those who have not, and there appears to be a significant difference in snorkeler/swimmer behavior. People who have had the ReefTeach talk spend very few seconds trampling live coral while those not taught stand on coral heads with abandon.





**CONTACT INFORMATION****NONPROFIT ORGANIZATIONS*****Ao'ao O Na Loko I'a O Mau'i (Association of the Fishponds of Mau'i)***

Contact: Joylynn Oliveira  
 Email: joylynn@mauifishpond.com

***Bishop Museum***

1525 Bernice Street,  
 Honolulu, HI 96817  
 Phone: (808) 847-3511  
 Fax: (808) 841-8968

***Community Conservation Network***

PO Box 4674  
 Honolulu, HI 96812  
 Phone: (808) 528-3700  
 Fax: (808) 528-3701  
 Email: info@conservationpractice.org  
<http://conservationpractice.org/>

***The Coral Reef Alliance (CORAL)***

Contact: Rick Macpherson  
 417 Montgomery Street, Suite 205  
 San Francisco, CA 94104  
 Phone: (415) 834-0900 ext. 302  
 Fax: (415) 834-0099  
 Email: rmacpherson@coral.org  
<http://www.coralreefalliance.org/>

***Environment Hawai'i***

72 Kapi`olani Street  
 Hilo, HI 96720  
 Phone: (808) 934-0115  
 Fax: (808) 934-8321  
 Email: pattum@aloha.net  
<http://www.environment-hawaii.org/>

***Friends of Sharks Cove***

P. O. BOX 301  
 Haleiwa, HI 96712  
 Email: info@friendsofsharkscove.org  
<http://www.savesharkscove.org/>

***Friends of Honolulu Parks and Recreation***

Makiki District Park  
 1527 Keeaumoku St.  
 Honolulu, HI 96822  
 Contact: Christine Woolaway  
 Phone: (808) 753-3311  
 Email: cwoolaway@hawaii.rr.com

***Hanalei Watershed Hui***

Post Office Box 1285  
 Hanalei, HI 96714  
 Phone: (808) 826-1985  
 Fax: (808) 826-1012  
 Email: hanaleiriver@hawaiian.net  
<http://www.hanaleiwatershedhui.org/>

***Hawai'i Audubon Society***

Contact: Ellyn Tong  
 4935 Mana Place  
 Honolulu, HI 96816  
 Phone: (808) 739-1782  
 Fax: (808) 537-5294  
 Email: hiaudsoc@pixi.com  
<http://www.hawaiiiaudubon.com/>

***The Hawai'i Wildlife Fund***

Contact: Hannah Bernard  
 PO Box 790637  
 Paia, HI 96779  
 Phone: (808) 579-9138  
 Email: wild@aloha.net  
<http://www.wildhawaii.org/>

***Kahea***

P.O. Box 27112  
 Honolulu, HI 96827-0112  
 Email: kahea-alliance@hawaii.rr.com  
<http://www.kahea.org/>

***Kai Makana***

P.O. Box 22719  
 Honolulu HI 96823  
 Phone: (808) 261-8939  
 Email: info@kaimakana.org  
<http://www.kaimakana.org/>



***Kaua'i Children's Discovery Museum***

Contact: Frank Reilly  
 Kapa'a, HI 96746  
 Phone: (808) 823-8222  
<http://www.kcdm.org/>

***Kaua'i Monk Seal Watch***

Contact: Millie Johnston  
 P.O. Box 1898  
 Koloa, HI 96756  
 Phone: (808) 742-4752  
<http://www.kauaimonkseal.com/Home.html>

***Kula Nai`a Foundation***

P.O. Box 6870  
 Kamuela, HI 96743  
 Contact: Jan Ostman-Lind, Ph.D.  
 Email: [kulanaia@aol.com](mailto:kulanaia@aol.com)

***Malama Kai Foundation***

P.O. Box 6882  
 Kamuela, HI 96743 USA  
 Phone: (808) 885-6354  
 Fax: (808) 885-6474  
 Email: [info@malama-kai.org](mailto:info@malama-kai.org)  
<http://www.malama-kai.org/>

***Marine Awareness, Research, and Education (MARE)***

Robin Newbold,  
 Education and Research Director  
 Phone: (808) 875-7661  
 Email: [mauirobin@aol.com](mailto:mauirobin@aol.com)

***The Nature Conservancy***

923 Nu'uuanu Avenue  
 Honolulu, HI 96817  
 Phone: (808) 537-4508  
 Fax: (808) 545-2019  
 E-mail: [hawaii@tnc.org](mailto:hawaii@tnc.org)  
<http://www.nature.org/wherework/northamerica/states/hawaii/>

***Oceanic Institute***

Contact: Alan Friedlander Ph.D.  
 41-202 Kalaniana'ole Hwy.  
 Waimanalo, HI 96795  
 Phone: (808) 259-7951  
 Fax: (808) 259-5971  
<http://www.oceanicinstitute.org/nav.php>

***Pacific Whale Foundation***

101 N. Kihei Road  
 Kihei, HI 96753  
 Marine education programs: [education@pacificwhale.org](mailto:education@pacificwhale.org)  
 Marketing and graphics: [irene@pacificwhale.org](mailto:irene@pacificwhale.org)  
 Phone: (808) 879-8811, (800) WHALE-1-1 (942-5311)  
 Fax: (808) 879-2615  
<http://www.pacificwhale.org/>

***Polynesian Voyaging Society***

Pier 7  
 191 Ala Moana Blvd.  
 Honolulu, HI 96813  
 Phone: (808) 536-8405  
 Fax: (808) 536-1519  
<http://www.pvs-hawaii.com/>

***Project S.E.A.-Link***

Contact: Liz Foote  
 37 Kuaiwa Way unit 20-A  
 Wailuku, HI 96763  
 Phone/Fax: (808) 669-9062  
 Email: [lfoote@hawaii.rr.com](mailto:lfoote@hawaii.rr.com)  
<http://www.projectsealink.org/index.html>

***Reef Check Hawai'i***

Contact: Melissa Mac Garrett  
 Phone: (808) 392-0509  
 Email: [melissa@reefcheck.org](mailto:melissa@reefcheck.org)  
 General website: <http://www.reefcheck.org/>

***Reef Environmental Education Foundation (REEF)***

See Appendix A, REEF case study for field station contacts  
<http://www.reef.org/>  
 REEF week: <http://www.reef.org/member/hawaii.htm>

***Save our Seas***

Contact: Paul Clark  
 P.O. Box 813  
 Hanalei, HI 96714  
 Phone: (808) 651-3452  
 Email: [paul@saveourseas.org](mailto:paul@saveourseas.org)  
<http://www.saveourseas.org/>

**Sierra Club- Blue Water Campaign**

P.O. Box 2577  
 Honolulu, HI 96803  
 Phone: (808) 537-9019  
 Email: [bluewatercampaign@verizon.net](mailto:bluewatercampaign@verizon.net)  
<http://www.hi.sierraclub.org/bluewater/>

**Waipa Foundation**

P.O. Box 1816  
 Hanalei, HI 96714  
 Phone: (808) 826-9969  
 Fax: (808) 826-1478  
 Email: [waipa\\_foundation@yahoo.com](mailto:waipa_foundation@yahoo.com)  
<http://www.waipafoundation.org/index.html>

**LOCAL GOVERNMENT AGENCIES****Coastal Zone Management Program**

Contact: Lynn Nakagawa  
 P.O. Box 2359  
 Honolulu, HI 96804  
 Phone: (808) 587-2846  
 Fax: (808) 587-2899  
 Email: [lnakagaw@dbedt.hawaii.gov](mailto:lnakagaw@dbedt.hawaii.gov)

**Department of Health, Clean Water Branch**

Environmental Management Division  
 State Department of Health  
 P.O. Box 3378  
 Honolulu, HI 96801-3378  
 Phone: (808) 586-4309  
 Fax: (808) 586-4352  
 Email: [CleanWaterBranch@eha.health.state.hi.us](mailto:CleanWaterBranch@eha.health.state.hi.us)  
<http://www.hawaii.gov/health/environmental/water/cleanwater/index.html>

**Department of Land and Natural Resources****Division of Aquatics**

Contact: Athline Clark  
 1151 Punchbowl Street #330,  
 Honolulu, HI 96813  
 Phone: (808) 587-0099  
 Fax: (808) 587-0115  
 Email: [Athline.M.Clark@hawaii.gov](mailto:Athline.M.Clark@hawaii.gov)  
<http://www.hawaii.gov/dlnr/dar/index.html>

**Division of Boating and Ocean Recreation**

Main Office  
 333 Queen Street, Suite 300  
 Honolulu, HI 96813  
 Phone: (808) 587-1966  
 Fax: (808) 587-1977  
<http://www.hawaii.gov/dlnr/dbor/dbor.html>

**Division of Conservation and Resource Enforcement**

1151 Punchbowl Street, Room 311  
 Honolulu, HI 96813  
**DOCARE contact numbers:**  
 24 hour, Statewide toll-free: 643-DLNR (3567)  
 Hawai'i, Hilo: (808) 974-6208  
 Hawai'i, Waimea: (808) 887-6196  
 Hawai'i, Kailua-Kona: (808) 327-4961  
 Hawai'i, Captain Cook: (808) 323-3141  
 Kaua'i: (808) 274-3521  
 Mau'i: (808) 984-8110  
 Moloka'i: (808) 553-5190  
 Lana'i: (808) 565-7916  
 O'ahu: (808) 587-0077  
<http://www.hawaii.gov/dlnr/dcre/dcre.html>

**Division of Forestry and Wildlife**

2135 Makiki Heights Drive  
 Honolulu, HI 96822  
 Phone: (808) 973-9778;  
 Fax: (808) 973-9781  
<http://www.dofaw.net/>

**Natural Area Reserves System**

1151 Punchbowl Street, Room 325  
 Honolulu, HI 96816  
 Phone: (808) 587-0063  
<http://www.dofaw.net/nars/>



***Hawai'i Coral Reef Initiative***

University of Hawai'i at Manoa  
 Social Science Research Institute  
 Contact: Kristine Davidson  
 2424 Maile Way, #704  
 Honolulu, HI 96822  
 Phone: (808) 956-7479  
 Fax: (808) 956-2884  
<http://www.hawaii.edu/ssri/hcri/>

***University of Hawai'i, Hawai'i Institute of Marine Biology***

Contact: Manning S. Tate III  
 P.O. Box 1346  
 Kane'ohe, HI 96744  
 Phone: (808)236-7422; (808)398-2088  
 Email: [taite@hawaii.edu](mailto:taite@hawaii.edu)

University of Hawai'i, Marine Option Program  
 (all contacts: <http://www.hawaii.edu/mop/moplins.html>)

Jeff Kuwabara, UH-Manoa Coordinator  
 2450 Campus Road, Dean Hall 105A  
 Honolulu, Hawaii 96822  
 Phone: (808) 956-8433  
 Fax: (808) 956-2417  
 Email: [manoamop@hawaii.edu](mailto:manoamop@hawaii.edu)  
<http://www.hawaii.edu/mop/>

***Alien Algae removal:***

Contact: Signe Opheim  
[opheim@hawaii.edu](mailto:opheim@hawaii.edu)

Donna Brown

***Mau'i Community College***

310 Kaahumanu Avenue  
 Kahului, HI 96732  
 Email: [Donnabro@hawaii.edu](mailto:Donnabro@hawaii.edu)

***University of Hawai'i Sea Grant***

Link to University of Hawai'i Sea Grant Staff Directory:  
<http://www.soest.hawaii.edu/seagrant/directory/directory.php#ext>

***West Hawai'i Sea Grant***

Sara Peck  
 Natural Energy Laboratory of Hawai'i  
 P.O. Box 489  
 Kailua-Kona, HI 96745  
 Phone: (808) 329-2861  
 Fax: (808) 329-6998  
 Email: [peck@hawaii.edu](mailto:peck@hawaii.edu)

***Kaua'i Sea Grant***

Adam Asquith, Ph.D.  
 Kaua'i Agricultural Research Station  
 7370-A Kuamoo Road  
 Kapa'a, HI 96766  
 Phone: (808) 822-4984 ext. 235  
 Fax: (808) 822-2190  
 Email: [adam\\_asquith@yahoo.com](mailto:adam_asquith@yahoo.com)

***O'ahu Sea Grant***

2525 Correa Road, HIG 238  
 Honolulu, HI 96822  
 Phone: (808) 956-7031  
 Fax: (808) 956-2858

***Hawai'i Natural Heritage Program***

Hawai'i Marine Gap Analysis  
 Contact: Noelani Puniwai  
 677 Ala Moana Blvd #705  
 Honolulu, HI 96813  
 Phone: (808) 587-8593  
 Email: [npuniwai@hawaii.edu](mailto:npuniwai@hawaii.edu)  
<http://www.hinhp.org/mgap/>



**LOCAL MARINE EDUCATION PROGRAMS*****Hanauma Bay Education Program***

100 Hanauma Bay Road  
 Honolulu, HI 96825  
 Phone: (808) 397-5840  
 E-mail: hanauma@hawaii.edu  
<http://www2.hawaii.edu/~hanauma/about.htm>

***Mau'i Ocean Center***

Contact: Education Director  
 192 Ma'alaea Road  
 Ma'alaea, HI 96793  
 Phone: (808) 270-7085  
 Fax: (808) 270-7070  
<http://www.mauioceancenter.com>

***Ocean Science Discovery Center***

300 Maalaea Drive, Suite 211  
 Wailuku, HI 96793  
 Phone: 1-800-942-5311  
 Email: info@osdcmaui.org  
<http://www.osdcmaui.org/>

***Waikiki Aquarium***

Contact: Mark Heckman  
 2777 Kalakaua Ave  
 Honolulu, HI 96815-4027  
 Phone: (808) 923-9741  
 Fax: (808) 923-1771  
 Email: mheckman@waquarium.org  
<http://www.waquarium.org/>

**FEDERAL AGENCIES*****Environmental Protection Agency***

Contact: Wendy Wiltse  
 300 Ala Moana Blvd.  
 Box 50003  
 Room 5-152  
 Honolulu, HI 96850  
 Phone: (808) 541-2752  
 Fax: (808) 541-2712  
<http://www.epa.gov/Region9/index.html>

***Hawaiian Islands Humpback Whale National Marine Sanctuary***

<http://hawaiihumpbackwhale.noaa.gov/Welcome.html>  
 Email: hihumpbackwhale@noaa.gov

***Kaua'i Office***

Kukui Grove Executive Center  
 4370 Kukui Grove Street, Suite 206  
 Lihu'e, HI 96766

Phone: (808) 246-2860

Fax: (808) 246-2862

***Mau'i Office***

726 Kihei Road  
 Kihei, HI 96753  
 Phone: (808) 879-2818, (800) 831-4888  
 Fax: (808) 874-3815

***O'ahu Office***

Contact: Naomi McIntosh  
 6600 Kalaniana'ole Highway, Suite 301  
 Honolulu, HI 96825

Phone: (808) 397-2651

Fax: (808) 397-2650

***Natural Resources Conservation Service (NRCS)***

USDA NRCS Hawai'i State Office  
 P.O. Box 50004

Honolulu, Hawai'i 96850-0050

Phone: (808) 541-2600

Fax: (808) 541-1335 or 541-2652

<http://www.hi.nrcs.usda.gov/>

***NOAA Fisheries, Pacific Islands Regional Office***

Contact: Alan Everson  
 1601 Kapiolani Boulevard, Suite 1110  
 Honolulu, HI 96814

Phone: 808-973-2937

Fax: 808-973-2941

***Northwestern Hawaiian Islands Marine National Monument***

Contact: Andy Collins  
 6600 Kalaniana'ole Highway, Suite 300  
 Honolulu, HI 96825

Phone: (808) 398-3660

<http://www.hawaiireef.noaa.gov/>



***US Fish and Wildlife Service***

Contact: Barbara Maxfield  
300 Ala Moana Blvd., Room 3-122  
Honolulu, HI 96850  
Phone: (808) 541-2749  
Fax: (808) 541-2756  
Email: barbara\_maxfield@fws.gov

***US Geological Services, Pacific Islands Water Science Center***

677 Ala Moana Blvd., Suite 415  
Honolulu, HI 96813  
Phone: (808) 587-2400  
Fax: (808) 587-2401  
<http://hi.water.usgs.gov/>

***Western Pacific Fishery Management Council***

Contact: Sylvia Spalding  
1164 Bishop Street, Suite 1400  
Honolulu, Hawai'i 96813  
Phone: (808) 522-5341  
Fax: (808) 522-8226  
<http://www.wpcouncil.org/index.htm>

**LOCAL BUSINESSES (CASE STUDY REFERENCES)**

***Island Divers Hawai'i***

Phone: (888) 844-3483  
<http://www.oahuscubadiving.com/>

***Jack's Diving Locker***

Contact: Teri Leicher  
Email: [dive@jacksdivinglocker.com](mailto:dive@jacksdivinglocker.com)  
<http://www.jacksdivinglocker.com>

***Mau'i Dreams Dive Company***

Contact: Teri Stewart  
Email: [teridiver@hawaii.rr.com](mailto:teridiver@hawaii.rr.com),  
<http://www.mauidreamsdiveco.com>

***Wild Side Specialty Tours***

Phone: (808) 306-7273  
<http://sailhawaii.com/>

### SUSPECT, WEAPON AND VEHICLE DESCRIPTION

(Please circle or check appropriate response)

TIME \_\_\_\_\_ DATE: \_\_\_\_\_ POLICE REPORT NO. \_\_\_\_\_

SEX  Male  Female  Transvestite

AGE  Under 15  15-17  18-20  Early  Late  20's  30's  40's  50's  60's

HEIGHT  Under 5' 0"  5'0"  -2"  -4"  -6"  -8"  -10"  6'0"  -2"  4"

WEIGHT  Under 100lbs  100  120  140  160  180  200  220  240  over 250

BUILD  Thin  Slim  Medium Avg  Heavy  Husky  Muscular  Fat

HAIR: Color  Black  Brown  Blond  Dirty Blond  Red  Gray  White

Style  Straight  Curly  Wavy  Afro  Tied  Neat  Wig

Length  Crew cut  Neck  Shoulder length  Long

EYES: Color  Black  Brown  Blue  Green  Hazel  Gray

Glasses  Sunglasses  Prescription  Wire Frame  Plastic frame  Rimless

Frames  Clear  Brown  Black  Gold  Silver  Other:

COMPLEXION Pale / Fair / Medium / Ruddy / Tanned / Brown / Black / Clear / Acne / Pock-marked

FACIAL HAIR  Mustache  Beard  Goatee

Color  Black  Brown  Blond  Red  Gray  White

PECULARITIES  Walk  Mannerisms  Speech  Accent  Tattoos  Scars

Injuries  Jewelry  Other: \_\_\_\_\_

CLOTHING

HAT  Baseball cap  Lauhala hat  Other \_\_\_\_\_

Color  Blue  Red  Yellow  Brown  Black  Green  Other

Designs  Patches  Feathers  Ornamentation

SHIRT/BLOUSE  Pullover  T-shirt  Aloha Shirt  Sport Shirt  Dress shirt  Tank top

Other: \_\_\_\_\_

Sleeve length  Short sleeve  Long sleeve  Sleeveless

Color \_\_\_\_\_ Markings/Design: \_\_\_\_\_

TROUSERS/SLACKS  Jeans  Shorts  Dress slacks  Sport slacks  Knit pants  Corduroy

Color \_\_\_\_\_ Design \_\_\_\_\_  Striped  Plaid

Other \_\_\_\_\_

SHOES  Barefoot  Slippers  Dress shoes  Work shoes  Boots  Sandals

DRESS  Short Dress  Short Muumuu  Long Muumuu  Long Dress

Color \_\_\_\_\_ Markings/design \_\_\_\_\_

WEAPON  Handgun  Revolver  Automatic pistol  Rifle  Shotgun  Knife

Other \_\_\_\_\_

Container  Bag  Paper sack  Other

VEHICLE Car/ Van / Small pickup / Truck / Motorcycle / Moped / Bicycle

Make AMC / Buick / Chevrolet / Chrysler / Datsun / Dodge / Ford / Mercury / Nissan / Oldsmobile  
Plymouth / Pontiac / Toyota / Volkswagon / Other \_\_\_\_\_

Color \_\_\_\_\_ Type: 2dr / 4dr / Station wagon / Hatchback

License Number \_\_\_\_\_ State \_\_\_\_\_ Color of plate \_\_\_\_\_

Other ID \_\_\_\_\_ Describe: Rust / Tires / Upholstery / Sunroof / Other

INFORMATION PROVIDED BY: \_\_\_\_\_

## REEF CHECK SITE DESCRIPTION SHEET

Site name: \_\_\_\_\_

### BASIC INFORMATION

Country: \_\_\_\_\_ State/Province: \_\_\_\_\_ City/town: \_\_\_\_\_  
 Date: \_\_\_\_\_ Time: Start of survey: \_\_\_\_\_ End of survey: \_\_\_\_\_  
 Latitude (deg. min. sec.): \_\_\_\_\_ Longitude (deg. min. sec): \_\_\_\_\_  
 From chart or by GPS? (If GPS, indicate units): chart \_\_\_\_\_ GPS \_\_\_\_\_ GPS units: \_\_\_\_\_  
 Orientation of transect: N-S \_\_\_\_\_ E-W \_\_\_\_\_ NE-SW \_\_\_\_\_ SE-NW \_\_\_\_\_  
 Temperature (in degrees C): air: \_\_\_\_\_C surface: \_\_\_\_\_C at 3m: \_\_\_\_\_C at 10m: \_\_\_\_\_C  
 Distance from shore (m): \_\_\_\_\_ from nearest river (km): \_\_\_\_\_  
 River mouth width: <10 m \_\_\_\_\_ 11-50 m \_\_\_\_\_ 51-100 m \_\_\_\_\_ 101-500 m \_\_\_\_\_  
 Distance to nearest population center (km): \_\_\_\_\_ Population size (x1000): \_\_\_\_\_  
 Weather: sunny \_\_\_\_\_ cloudy \_\_\_\_\_ raining \_\_\_\_\_  
 Visibility (m) : \_\_\_\_\_  
 Why is this site selected: \_\_\_\_\_ Is this best reef in the area? Yes: \_\_\_\_\_ No : \_\_\_\_\_

### IMPACTS:

Is this site:	Always sheltered: _____	Sometimes: _____	Exposed: _____
Major coral damaging storms	Yes: _____	No _____	If yes, When was last storm: _____
Overall anthropogenic impact	None: _____	Low: _____	Med: _____ High: _____
Is siltation a problem	Never: _____	Occasionally: _____	Often: _____ Always: _____
Blast fishing	None: _____	Low: _____	Med: _____ High: _____
Poison fishing	None: _____	Low: _____	Med: _____ High: _____
Aquarium fishing	None: _____	Low: _____	Med: _____ High: _____
Harvest inverts for food	None: _____	Low: _____	Med: _____ High: _____
Harvest inverts for curio sales	None: _____	Low: _____	Med: _____ High: _____
Tourist diving/snorkeling:	None: _____	Low: _____	Med: _____ High: _____
Sewage pollution (outfall or boat)	None: _____	Low: _____	Med: _____ High: _____
Industrial pollution	None: _____	Low: _____	Med: _____ High: _____
Commercial fishing (fish caught to sell for food)	None: _____	Low: _____	Med: _____ High: _____
Live food fish trade	None: _____	Low: _____	Med: _____ High: _____
Artisinal/recreational (personal consumption)	None: _____	Low: _____	Med: _____ High: _____
How many yachts are typically present within 1km of this site	None: _____	Few (1-2): _____	Med (3-5): _____ Many (>5): _____

Other impacts: \_\_\_\_\_

### PROTECTION:

Any protection (legal or other) at this site? Yes: \_\_\_\_\_ No: \_\_\_\_\_ If yes, answer questions below

Is protection enforced Yes: \_\_\_\_\_ No: \_\_\_\_\_

What is the level of poaching in protected area? None: \_\_\_\_\_ Low: \_\_\_\_\_ Med: \_\_\_\_\_ High \_\_\_\_\_

banned:

- Spearfishing \_\_\_\_\_
- Commercial fishing \_\_\_\_\_
- Recreational fishing \_\_\_\_\_
- Invertebrate or shell collecting \_\_\_\_\_
- Anchoring \_\_\_\_\_
- Diving \_\_\_\_\_
- Other (please specify) \_\_\_\_\_

Other comments \_\_\_\_\_

### TEAM INFORMATION

Submitted by \_\_\_\_\_ Regional Coordinator: \_\_\_\_\_  
 Team Leader: \_\_\_\_\_  
 Team Scientist: \_\_\_\_\_  
 Team Members: \_\_\_\_\_

## REEF CHECK BELT TRANSECT FISH AND INVERTEBRATES

**Site Name:** \_\_\_\_\_ **Country/Island:** \_\_\_\_\_  
**Depth:** \_\_\_\_\_ **TS/TL:** \_\_\_\_\_  
**Date:** \_\_\_\_\_ **Time:** \_\_\_\_\_

**Fish**

Data recorded by: \_\_\_\_\_

	0-20m	25-45m	50-70m	75-95m
<b>Butterflyfish</b>				
<b>Ta'ape</b> (Blueline snapper)				
<b>Roi</b> (Peacock grouper)				
<b>Ulua</b> (Jacks)				
<b>Goatfish</b>				
<b>Uhu</b> (Parrotfish) (count <b>ONLY &gt;20cm</b> )*				
<b>Lau'ipala</b> (Yellow tang)				
<b>Snapper</b>				
<b>Puhi</b> (Moray eel)				
<b>Umaumalei</b> (Orange spine unicornfish)				
* Give size in comments				

**Invertebrates**

Data recorded by: \_\_\_\_\_

	0-20m	25-45m	50-70m	75-95m
<b>Banded coral shrimp</b> ( <i>Stenopus hispidus</i> )				
<b>Diadema urchins</b>				
<b>Pencil urchin</b> ( <i>Heterocentrotus mammilatus</i> )				
<b>Crown-of-thorns starfish</b> ( <i>Acanthaster</i> )				
<b>Triton</b> ( <i>Charonia tritonis</i> )				
<b>Lobster</b>				
<b>Cowries</b>				
<b>Collector urchin</b> ( <i>Tripneustes</i> )				

**Coral Damage/Disease/Bleaching and Trash**

Rate the following as: None=0, Low=1, Medium=2, High=3

	0-20m	25-45m	50-70m	75-95m
Coral damage: Boat/Anchor				
Coral damage: Dynamite				
Coral damage: Other				
Trash: Fish nets				
Trash: General				
Bleaching (% of coral population)				
Bleaching (% of colony)				
<b>Fill in the following:</b>	<b>0-20m</b>	<b>25-45m</b>	<b>50-70m</b>	<b>75-95m</b>
Grouper sizes (cm):				
Coral Disease (Yes/No and %):				
Rare animals sighted (type/#):				
Other:				

## REEF CHECK LINE TRANSECT SUBSTRATE

Site name: \_\_\_\_\_ Country/Island: \_\_\_\_\_

Depth: \_\_\_\_\_ Date: \_\_\_\_\_

TS/TL: \_\_\_\_\_ Data recorded by: \_\_\_\_\_

Time: \_\_\_\_\_

**Substrate Code**

- |                              |               |                           |
|------------------------------|---------------|---------------------------|
| HC hard coral                | SC soft coral | RKC recently killed coral |
| NIA nutrient indicator algae | SP sponge     | RC rock                   |
| RB rubble                    | SD sand       | SI silt/clay              |
| OT other                     |               |                           |

*(For first segment, if start point is 0 m, last point is 19.5 m)*

SEGMENT 1			SEGMENT 2			SEGMENT 3			SEGMENT 4		
0 - 19.5 m			25 - 44.5 m			50 - 69.5 m			75 - 94.5 m		
0	10	25	35	50	60	75	85				
0.5	10.5	25.5	35.5	50.5	60.5	75.5	85.5				
1	11	26	36	51	61	76	86				
1.5	11.5	26.5	36.5	51.5	61.5	76.5	86.5				
2	12	27	37	52	62	77	87				
2.5	12.5	27.5	37.5	52.5	62.5	77.5	87.5				
3	13	28	38	53	63	78	88				
3.5	13.5	28.5	38.5	53.5	63.5	78.5	88.5				
4	14	29	39	54	64	79	89				
4.5	14.5	29.5	39.5	54.5	64.5	79.5	89.5				
5	15	30	40	55	65	80	90				
5.5	15.5	30.5	40.5	55.5	65.5	80.5	90.5				
6	16	31	41	56	66	81	91				
6.5	16.5	31.5	41.5	56.5	66.5	81.5	91.5				
7	17	32	42	57	67	82	92				
7.5	17.5	32.5	42.5	57.5	67.5	82.5	92.5				
8	18	33	43	58	68	83	93				
8.5	18.5	33.5	43.5	58.5	68.5	83.5	93.5				
9	19	34	44	59	69	84	94				
9.5	19.5	34.5	44.5	59.5	69.5	84.5	94.5				

Comments: \_\_\_\_\_

## INSTRUCTIONS TO DOCUMENT HUMAN USE OF WAI 'OPAE TIDEPOOLS

### January 2004

#### Basics

Please use the attached standard form to document all types of human-related uses of the Wai 'Opae tide pools and reef in Kapoho, Hawai'i County, Hawai'i within and outside of the Marine Life Conservation District (MLCD).

**Data on human uses should be recorded for each subzone and zone within a 2-hr period** in such a manner that:

- total human use within each zone can be estimated by adding the uses within each subzone. Subzones were delineated based on prior observations of relative levels of human activity;
- total human use within the MLCD can be **estimated** by adding up uses within each of the three zones within the MLCD (S=South, M=Mid and N=North);
- total human use within the Control Area can be **estimated** by adding up uses within each of the three zones (S = South, M=Mid and N=North); and
- total human use at Wai Opae can be estimated by adding the total activity in the MLCD and the Control Area.

A 2-hr period of data collection across the entire study area was chosen due to the observed average turnover rate of users at the tide pools.

#### Location

Each observer should document all human activities in the subzone (or zone in the case of South MLCD) based on the following description and the attached zone/subzone map.

- **South MLCD zone** is the least accessible, southern end of the MLCD beyond the inner "lagoon" and its channel to the ocean;
- **Mid MLCD zone** includes the innermost **Lagoon subzone** at south end of subdivision adjacent to lots 68-20 through 68-27; the **Channel subzone** connecting the lagoon to the ocean; and the **Reef crest subzone** where waves are breaking on the reef crest. This zone was initially called Lagoon/Channel;
- **North MLCD zone** is adjacent to the designated reef parking area (between the new reef parking area signs) near the only shoreline access corridor on Wai Opae St. (adjacent to the community's MLCD sign). It includes three **subzones**: the **Inner pools** are adjacent to lots 68-13 (vacant lot south of salmon color house on water) through 68-19; **Outer pools** just makai of the inner pools; and **Reef**

**crest** where waves break over the reef crest makai of the outer pool subzone. This zone was initially called Main Reef;

- **South Control zone** adjacent to lots 68-04 through 68-12, with **Inner pools, Outer pools, and Reef crest subzones**. This zone was initially called Mid Reef.
- **Mid Control zone** adjacent to lots 68-01 through 03 and 67-12 and 13, with **Inner pools, Outer pools and Reef crest subzones**. This zone was initially called Kaheka; and
- **North Control zone** adjacent to lots 67-01 to 67-11. This zone includes the former North Reef and Beach zones.

**Cars:** Record the total number of cars parked along the street within each zone.

**People by Activity Type:** Record the total number of people you can see within each subzone and zone by activity type. Use binoculars and estimate if there are too many to count. Photograph intensive levels of use and label your photos with date and location.

**Lay Nets:** Record the number of persons involved with fishing a stationary gill net. From one to ten persons have been observed fishing a single lay net. If there are more than one lay net at a time, note the total number in the comments.

**Spears:** Record the total number of fishers using a Hawaiian sling, spear gun, three-prong spear, or bow and arrow.

**Pole/Line:** Record the number of people fishing with either a pole or line.

**Handnet:** Record the number of people fishing for baitfish or shrimp with a hand net and bucket.

**Gathering:** Record the number of people gathering seaweeds or marine invertebrates without the use of nets, poles, lines or spears.

**Snorkel:** Record number of people observed using snorkel and mask to observe or photograph marine life but not fishing, whether or not they are wearing flippers. Record how many people appear to be on a commercially guided tour, how many of these are wearing flotation vests, and the location of the guided snorkel tour.

**Kayak:** Record number of people kayaking in the tidepools. Do not include offshore canoes or kayaks. Educate kayakers to NOT damage shallow corals with their paddles, by dragging their kayaks through shallow areas, or standing



on coral. Encourage them to find deeper locations outside of the shallow Wai “Opae tide pools to kayak due to likely damage to coral.

**Beach:** Record number of people that are enjoying the tide pool area as a picnic area or for swimming, but do not appear to be fishing, snorkeling, scuba diving, or kayaking.

**Other:** Record the number of people doing other activities in the nearshore marine area and the type of activity using the following codes: scuba diving (D) (note if diver is fishing in the comments section); camping (C); fires (F); boogie boards (B); surfing (S); and inner tubes/blow-up boats (I). Camping means the possession of a backpack, tent, blanket, tarpaulin, or other obvious camping gear any time after one hour after sundown until sunrise. Fires include open fires, barbecues, gas grills, etc.

### **Violations of Statewide Fishing Rules and Marine Life**

**Conservation District Rules:** If you observe blatant violations of the states fishing regulations, please call the state’s Conservation and Resources Enforcement (DOCARE) Officer at 974-6208 and record the details on the attached form entitled “Report of Fishing Violations. FAX this report to DOCARE at 933-0799. Also mail the violation report form to the Marine Protected Areas Coordinator at RR 2, Box 4008, Pahoia, HI 96778, or FAX it to 965-9020.

**Completed Forms:** Please return each completed data form to the Linda Shea Flanders at RR 2, Box 4025, Pahoia, HI 96778 by the end of each month. Call 808-965-8020 if you have any questions.



**KAPOHO REEF WATCH HUMAN USE FORM. OBSERVER:**

NO need to enter data into cells with "0" as Excel will sum, but good way to check your other data entry.

"Other" types: SCUBA = D; camping = C; fire = F; boogie board = B; surfer = S; inner tube = I

Date \_\_\_\_\_ Weather \_\_\_\_\_ 2hrTime \_\_\_\_\_ Zone \_\_\_\_\_ Lay/gillnet \_\_\_\_\_ Thrownet \_\_\_\_\_ Spear \_\_\_\_\_ Pole/line \_\_\_\_\_ Handnet \_\_\_\_\_ Gather \_\_\_\_\_ Total fish \_\_\_\_\_ Snorkel \_\_\_\_\_ Kayak \_\_\_\_\_ Beach \_\_\_\_\_ Other # \_\_\_\_\_ TNC use \_\_\_\_\_ Total use \_\_\_\_\_ Cars \_\_\_\_\_ Dogs \_\_\_\_\_ Other types \_\_\_\_\_

2hrTime	Zone	Lay/gillnet	Thrownet	Spear	Pole/line	Handnet	Gather	Total fish	Snorkel	Kayak	Beach	Other #	TNC use	Total use	Cars	Dogs	Other types
	SMLCD *																
	Lagoon																
	Channel																
	Reef Crest																
	MMLCD *	0	0	0	0	0	0										0
	Innepools																
	Outerpools																
	Reef Crest																
	NMLCD*	0	0	0	0	0	0										0
	TMLCD *	0	0	0	0	0	0										0
	Innepools																
	Outerpools																
	Reef Crest																
	SCONTR*	0	0	0	0	0	0										0
	Innepools																
	Outerpools																
	Reef Crest																
	MCONTR*	0	0	0	0	0	0										0
	NCONTR*	0	0	0	0	0	0										0
	TCONTR*	0	0	0	0	0	0										0
	TOTAL*	0	0	0	0	0	0										0
2hrTime	Zone	Lay/gillnet	Thrownet	Spear	Pole/line	Handnet	Gather	Total fish	Snorkel	Kayak	Beach	Other	TNC use	Total use	Cars	Dogs	Other types
	SMLCD*																
	Lagoon																
	Channel																
	Reef Crest																
	MMLCD*	0	0	0	0	0	0										0
	Innepools																
	Outerpools																
	Reef Crest																
	NMLCD*	0	0	0	0	0	0										0
	TMLCD*	0	0	0	0	0	0										0
	Innepools																
	Outerpools																
	Reef Crest																
	SCONTR*	0	0	0	0	0	0										0
	Innepools																
	Outerpools																
	Reef Crest																
	MCONTR*	0	0	0	0	0	0										0
	NCONTR*	0	0	0	0	0	0										0
	TCONTR*	0	0	0	0	0	0										0

## HUMAN USE SURVEY AT PUAKO (HUSP) PROTOCOL

The goal of this survey is to document human use along the Puako shoreline, intertidal and reef edge areas without making people uncomfortable or feeling spied upon. Many mahalos are extended to all of you who are helping with this survey.

It seems easier to start at the northern access point to find the accesses. Some are very well hidden. During any two hour time period, you can start wherever you want to start, but please be sure to survey all of the access points if you have committed to doing all points.

We are hoping that some people who live along the shoreline will also document use from their homes randomly throughout the survey months of May, June and July '05.

**Introduction** – Try not to make people uncomfortable as you survey. Sometimes it is best to make notes on a small note pad and then transfer to your data sheet rather than carry your clipboard out there to the shoreline and look all official. This should be unobtrusive documentation.

1. If you miss an access point or points, within the same time block of 2 hours, you can find it/them and document your observations.
2. People change what they are doing. If someone is sunbathing and you enter their numbers as sunbathing, then some of them start to swim, fish or whatever, you enter them in as new set of numbers for that use category. Don't make an assumption of activity. Example: SCUBA gear but not in the water!
3. If no one is visible at the access point, and there are no cars, don't spend time. In general spend 3-10 minutes at an access point unless you have lots to document. When you are ready to leave, leave no matter who is arriving.
4. Please use numerals to represent the total people doing one thing, don't use slash marks. If a double digit number, circle it so that the datamaster knows it is one number. Example: 1, 3, 13(circle the double digit), 5
5. Count people only. Make notes in comments list for dogs and etc.
6. What is a commercial boat? Try to determine commercial boats by numbers of people on the boat. If you think there are more than might be normally sailing or motoring on a private vessel, count it as commercial. Also, if you can, get the boat number or name that would be

helpful. Document those vessels underway as well as those moored.

7. Sometimes you must look carefully to see if a person has a fishing pole or hand line or a snorkeler has a spear or someone is on SCUBA rather than actually snorkeling. Some of us have better vision than others, so if you need binoculars, please do use them, and if you don't have your own, we will try to accommodate you by providing a pair.
8. Volunteers gathering data over successive two hour time periods might observe people who were documented in the previous survey. In this case, observer should document users again, as if they did not survey in the previous time period.

### Notes on Access Points (AP)

**AP1:** Walk out to the shoreline, passing the encampment site, so you can look all the way to the blue house on the north side to the point on the south side.

**AP2:** Public Access Sign. House on north is 69-1666, #20.

**AP3:** Hard to find, narrow path. House mailbox on north side is #38. High hedge.

**AP4:** Public Access Sign. House garage on south side faces access. House on north side has # 56 on a mailbox imbedded in the wall facing the street.

**AP5:** Public Access Sign. Across from Catholic Church.

**AP6:** Hard to find. Look for utility pole #123. House mailbox on makai side of road is #84

**AP7:** Public Access Sign. House mailbox to north is #100; house yard has lots junk. House across the road has a large fenced pond.

**AP8:** Hard to find. Between houses # 116 and 118 on mailboxes; asphalt road looks a lot like a driveway. House on mauka side is 69-1881

**AP9:** Public Access Sign, House to the north is #138

**AP10:** Hard to find. House to north is #152, house on mauka side is #157; this is a very narrow path.

**AP11:** Walk all the way to the end of the parking area to catch sunbathers, snorkelers, divers and spear fishers throughout that area. Spend at least 10 minutes at this site or whatever you need to get all the information.

**Notes on Fishing**

**The August 2003 Fishing Regulations state that at Puako: Prohibited to use any type of net except thrownet.**

**Thrownets** are circular monofilament gill nets with small weights fringing the entire circular edge. They are carried on the shoulders, and thrown up and out over an area. This is the only net fishing allowed in the Puako Fishery Management Area.

**Gill nets** can be different sizes, shapes and uses. They are generally used to form a barrier through which fish will try to pass and their gills are snagged on the monofilament net. Because this Puako Bay and Puako Reef area is a Fishery Management Area (FMA), no gill netting is allowed with the exception of throw netting. Throw netting is self explanatory, right? Because Puako is also a Fish Replenishment Area (FRA), no aquarium fish collecting or fish feeding is allowed. If you see rule violations, you have a number to call to report those violations. There is a specific amount of information you should have to make the report, and that is listed on the DOCARE handout you have.

**Hand nets or dip nets** are sometimes used to catch bait fish or by kids. These are illegal if you read the wording of the fishing rules, but it's done. If you see someone doing this, note it, and go on. This survey is not the time to do "educating"...that will be the next step. We need to know how frequently these illegal nets are used before we begin next steps.

**Crab nets** are like a dip net, round, but without a handle. They are baited in the middle and left for awhile and then the metal circle is lifted quickly to catch the crabs/shrimps. Again, probably not legal, but it's done.

**Pole fishing** can be done with a sturdy, long stationary pole and a system of sliding the bait down to the hook area. Pole fishing can be done using a casting method.

Pole fishing can be done with short bamboo poles for o'ama (small goatfish). Fly fishing is one example of pole fishing that might be encountered at Puako.

**Spear fishing** is allowed. Some spear fishers treat this as a sport and free dive without SCUBA. Others use SCUBA, and often at night. Some spear fishers are only out to get octopus, while others are looking for fish or both.

**Hand lines** are sometimes used. A line wound onto a hand reel or short stick.

**Trolling** is done from boats going by slowly.

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Please fill out all information on the data sheets. When you have 3 or 4, please mail them to datamaster Dane Miller, 62-2411 Kanehoa St., Kamuela HI 96743 OR you can fax your data sheets to 329-2998 (Sea Grant). We do need the original field data sheets eventually. If you are entering data using your computer, please email that data to Dane Miller at dane\_miller78@yahoo.com.

**HUS@P Staff:**

**Sara Peck**, Project Manager, UH Sea Grant College Program, PO Box 489 Kailua-Kona HI 96745  
329-2861=ph 329-6998=fx  
peck@hawaii.edu

**Kimberly New**, Project Co-coordinator; Volunteer coordinator. UH Sea Grant, PO Box 489, Kailua-Kona HI 96745  
329-2861=ph, 329-6998=fx  
peck@hawaii.edu (she uses Peck's for this)

**Dane Miller**, Project Co-coordinator; Datamaster, 62-2411 Kanehoa St., Kamuela HI 96743  
885-5418=ph, 987-7371=cell, 885-2767= fx.  
dane\_miller78@yahoo.com

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rshallenberger@tnc.org



**HUSP Stationary Observer Data Sheet D6**    Date: \_\_\_\_\_    Observer: \_\_\_\_\_    Ph: \_\_\_\_\_  
**Circle Conditions:** 1. Water Visibility: a/Clear, b/Cloudy; 2. Wave Looks: a/Ripples, b/Choppy, c/Whitecaps; 3. Wave Swell Height: a/Low, b/Medium, c/High 4. Tide: a/high, b/mid, c/low; 5. Wind: a/calm b/light breeze, c/strong breeze, d/strong wind;  
**6. Cloud cover:** a/few or no clouds, b/25%, c/50%, d/75%, e/100%

Conditions if changed	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Comments
	6-8am; 8-10am; 10-12pm, 2-4pm, 4-6pm.	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	6-8am, 8-10am, 10-12n, 12--2pm, 2-4pm, 4-6pm	
Your House #												
<b>BOATS</b>												
Recreational												
Commercial												
Kayaks												
Canoes												
Thrill												
<b>FISHING</b>												
Pole&Line												
Trolling												
Gillnetting												
Trapping												
Throw netting												
Spear Free												
Spear SCUBA												
Hand Net												
<b>DIVING</b>												
Snorkeling												
SCUBA												
<b>OTHER</b>												
Reef Walkers												
Swimmers												
Surfers												
Sunbathers												
Picnickers												

**STREAM TEAM WATER CHEMISTRY TESTING***Site Conditions Field Sheet*

Date: \_\_\_\_\_ Site Number: \_\_\_\_\_ Location: \_\_\_\_\_

Time: \_\_\_\_\_ Team (circle) 1 2 3 Recorder \_\_\_\_\_

Team members:

**Weather Conditions:**Clear  Partly Cloudy  Overcast  Showers  Rain  other \_\_\_\_\_

Wind speed and direction (est.) \_\_\_\_\_

Starting Air Temperature \_\_\_\_\_ C / F at \_\_\_\_\_ am / pm @ **start** of testingEnding Air Temperature \_\_\_\_\_ C / F at \_\_\_\_\_ am / pm @ **end** of testing

Comments:

**Type of Flow:**None  intermittent  trickle  steady  heavy  flooding 

Comments:

**PROPERTIES OF STREAM****Water Clarity:**Clear  cloudy  milky  muddy  other \_\_\_\_\_**Water Color:**Clear  red  brown  yellow  green  grey  other \_\_\_\_\_**Odors:**none  rotten eggs  sewage  chlorine  musty  ammonia  other \_\_\_\_\_**Floatables:**none  oily sheen (rainbow colored)  garbage  sewage  other \_\_\_\_\_**Biological Floatables:****algae** suspended  only on rocks  est.% coverage in stream \_\_\_\_\_ color \_\_\_\_\_**foam** color \_\_\_\_\_ height \_\_\_\_\_ %coverage \_\_\_\_\_ consistency \_\_\_\_\_

comments:

**DEBRIS**Density of Trash in general site area:None  Light  Moderate  High  Approx. # of pieces \_\_\_\_\_

Type of Trash: (% type of item)

\_\_\_\_\_ % organic (food items) \_\_\_\_\_ % plastics

\_\_\_\_\_ % Recyclables (non plastic) \_\_\_\_\_ % large items (cars, appliances, etc.)

comments:

Density of trash on stream banks or in water:None  Light  Moderate  High  Approx. # of pieces \_\_\_\_\_

Type of Trash: (% type of item)

\_\_\_\_\_ % organic (food items) \_\_\_\_\_ % plastics

\_\_\_\_\_ % Recyclables (non plastic) \_\_\_\_\_ % large items (cars, appliances, etc.)

comments:



### SANTA BARBARA CHANNELKEEPER SAMPLE SHEET

Site Name:	Sample Date:	Sample Time:
Sampler Name:	Today's Date:	Tide:
Lab Tech Name:	Score Date:	Score Time:

Login #	Sample	Temp (F)		Time	Depth	Observations	Bacterial Level: MPN Number/ (Number of Tubes or wells)		
		Water	Air				Total	<i>E Coli</i> (Fecal)	Enterococcus
						Surf: Weather: Recent Rain Y or N:	Total	<i>E Coli</i> (Fecal)	Enterococcus
						Surf: Weather: Recent Rain Y or N:	Total	<i>E Coli</i> (Fecal)	Enterococcus
						Surf: Weather: Recent Rain Y or N:	Total	<i>E Coli</i> (Fecal)	Enterococcus
						Surf: Weather: Recent Rain Y or N:	Total	<i>E Coli</i> (Fecal)	Enterococcus

Surf: wave height (approx)

Weather: Sunny, partly cloudy, overcast, fog, light rain, heavy rain, snow

Recent rain: Check yes if it has rained in the last 3 days

Total: MPN number of # of tubes or wells that are yellow

*E. Coli* or enterococcus: MPN number of # of tubes or wells that fluoresce

### STREAM TEAM WATER CHEMISTRY TESTING CHEMICALS PARAMETERS FIELD SHEET

*\*Please – All parts of data sheet must be filled out! Recorder, this is your responsibility!\**

Date: \_\_\_\_\_ Site Number: \_\_\_\_\_ Site Name: \_\_\_\_\_

Time: \_\_\_\_\_ Team:  One  Two  Three Name of Recorder: \_\_\_\_\_

List all team members: \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_

**\*\*\* For all parameters take THREE readings in different (but similar) stretches of stream \*\*\***

**Dissolved Oxygen** Calibrate to site Elevation: \_\_\_\_\_ Comments: \_\_\_\_\_

reading	Mg/L	%Saturation	Water Temp	Time	Name of Sampler
1					
2					
3					

**pH:** take 3 measurements, please from stream \_\_\_\_\_ or sample bottle \_\_\_\_\_

One \_\_\_\_\_ Two \_\_\_\_\_ Three \_\_\_\_\_ Sampler Name \_\_\_\_\_

**TURBIDITY (TSS):** \*make sure bottle is clean and aligned properly!

Fill two sample vials, take three readings each. Units are NTU

Vial #1 One \_\_\_\_\_ Two \_\_\_\_\_ Three \_\_\_\_\_ Sampler \_\_\_\_\_

Vial #2 One \_\_\_\_\_ Two \_\_\_\_\_ Three \_\_\_\_\_ Sampler \_\_\_\_\_

**CONDUCTIVITY AND TDS:** These are two different parameters with the same instrument.

\*\* Press the MODE button once to get TDS readings (ppm or ppt), and twice to get back to CONDUCTIVITY

\* If screen reads 9.99 or 99.9, etc., the instrument may not be auto adjusting the range. Try pressing “range”

Readings taken from stream \_\_\_\_\_ or sample bottle \_\_\_\_\_ Sampler \_\_\_\_\_

**Conductivity (circle):** uS mS **Water Temp:** \_\_\_\_C \_\_\_\_F **Time (circle):** am pm **TDS (circle):** ppm ppt

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

**COLLECT SAMPLE FOR NUTRIENT TESTING:** bottle# \_\_\_\_\_ time collected: \_\_\_\_\_

time put on ice: \_\_\_\_\_ Relinquished by: \_\_\_\_\_ time: \_\_\_\_\_

**COLLECT SAMPLE FOR BACTERIA:** Bottle# \_\_\_\_\_ Time collected: \_\_\_\_\_

time put on ice: \_\_\_\_\_ Relinquished by \_\_\_\_\_ time: \_\_\_\_\_

Sample bottles received by: \_\_\_\_\_ time: \_\_\_\_\_

Comments: \_\_\_\_\_



## UH Sea Grant manual Volunteer Water Quality Monitoring Manual for Streams VOLUNTEER REGISTRATION FORM

NAME \_\_\_\_\_ DATE \_\_\_\_\_

MAILING ADDRESS \_\_\_\_\_

PHONE (Home) \_\_\_\_\_ (Work) \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

CURRENT OR PAST OCCUPATION \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

WHEN ARE YOU AVAILABLE TO VOLUNTEER? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

DO YOU HAVE A CAR?     YES     NO

DO YOU HAVE A CURRENT DRIVER'S LICENSE?     YES     NO

EDUCATION AND SPECIAL SKILLS (i.e., computers, orienteering, etc.) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

IN CASE OF EMERGENCY, PLEASE NOTIFY:

NAME \_\_\_\_\_ PHONE \_\_\_\_\_ WORK PHONE \_\_\_\_\_ RELATIONSHIP \_\_\_\_\_

DO YOU HAVE ANY MEDICAL CONDITION THAT WE SHOULD BE AWARE OF?     YES     NO

If yes, please explain: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**VOLUNTEER WATER QUALITY MONITORING AND WATERSHED SURVEYING PROGRAM FOR  
WAIMANALO BAY AND KAILUA BAY**

**VOLUNTEER RESPONSIBILITIES CONSENT FORM**

*(Please initial each item and sign at the bottom of the form)*

1. Fulfill the given assignments or notify the program coordinator of any change in plans.  
-----
2. Each stream team leader and member will fulfill roles and responsibilities as established by the program.  
-----
3. Always obtain permission from landowner before entering private property. -----
4. Follow the safety guidelines for sampling and surveying, including the following:
  - Wear rubber boots, hiking boots, tabis, or similar protective footwear when conducting stream survey and sampling work. -----
  - Do not survey or take samples in or close to the stream during flooding. -----
  - Always conduct surveying or sampling field work with a partner. -----
  - Do not enter the ocean at high surf for sampling or surveying purposes. -----
  - Always wear safety glasses and protective gloves during sampling and water quality analysis. -----
  - Always carry a first aid kit while on a field survey or sampling trip. -----

NAME (Please print) -----

SIGNATURE ----- DATE -----



### KAILUA & WAIMANALO VOLUNTEER WATER QUALITY MONITORING PROGRAM

Last Name \_\_\_\_\_ First Name \_\_\_\_\_ Plot Number \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**CONTACT**

Day Phone \_\_\_\_\_ Evening \_\_\_\_\_

- I give team members permission to cross my property to access the stream with the following conditions: (Check any condition(s) you wish to impose.)
  - That the team leader contact me before the first instance of access.
  - That I know at least one day in advance of each access.
  - I also would like to add the following restriction(s) and/or comment(s)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*If permission is granted, we request that any dangerous dogs be restrained by the owner. All reasonable care will be taken by the volunteers to ensure that damage is done to the property.*

- I will not allow access to my property under any circumstances.

Signature \_\_\_\_\_ Date \_\_\_\_\_

*Please return the completed form in the enclosed envelope.*

**LAND ACCESS PERMISSION LETTER AND LANDOWNER CONSENT FORM**

From: Sea Grant Extension Service, University of Hawaii

To:

Re: Permission to access stream as part of the Kailua-Waimanalo Volunteer Water Quality Monitoring Program

Aloha,

The accompanying brochure explains the Kailua-Waimanalo Volunteer Water Quality Monitoring Program. I am writing to inform you about the program, and to ask for your cooperation (and assistance if you care to join the Stream Team) in carrying out the program.

As you own property near one of the streams, I am sure you are interested in keeping the water in the stream as clean as possible. We feel that through a collaborative program with the community, private landowners and government, we can achieve our goal toward a healthy watershed. The program is designed to assess the quality of the water in the stream and, if any source of pollution is detected, we will seek to solve the problem cooperatively.

As the volunteers begin to characterize portions of the stream and take water samples, they may require access to a part of your property in order to get to our up streams. It is our policy never to allow our volunteers to cross private land unless we have written permission from the landowner.

We only need limited access to and along the stream. All reasonable care will be taken to limit any impact on your property. In most cases, the access will be a one-time event as the volunteers walk up the stream to verify their maps showing the course of the stream. After verifying the course of the stream, the team will select 4-6 water monitoring stations. We foresee a group of 3-4 volunteers requiring access possibly 2-3 times a month to obtain water samples at these stations. All volunteers are registered and trained and have been extensive safety briefings.

The enclosed form is provided to make it easy for you to allow the team members access to your property under any limitation you feel necessary to impose. If you would like further information, you may contact me at 956-8475.

Please return the form in the enclosed envelope by \_\_\_\_\_ as we have an ambitious schedule to accomplish the task we have outlined for ourselves. We are looking forward to working with you on this important project.

### WATER QUALITY SAMPLING FORM

DATE: \_\_\_\_\_ SAMPLE SITE: \_\_\_\_\_ COLLECTION TIME: \_\_\_\_\_

SALINITY: \_\_\_\_\_ ppt pH: \_\_\_\_\_ WATER TEMP: \_\_\_\_\_ °C

WEATHER: \_\_\_\_\_ WATER COLOR: \_\_\_\_\_ AIR TEMP: \_\_\_\_\_ °C

SAMPLE COLLECTOR(S): \_\_\_\_\_

NOTES: \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

DISSOLVED OXYGEN		
Analyst(s): _____		Completion Time: _____
Replicate	# drops	(# drops)/2
1	_____	_____
2	_____	_____
		Average: _____ mg/L DO

NITRATE-NITRITE		
Analyst(s): _____		Completion Time: _____
Replicate	Color Wheel	Color Wheel x 4.4
1	_____	_____
2	_____	_____
		Average: _____ mg/L Nitrate-Nitrite

TOTAL SUSPENDED SOLIDS		
Analyst(s): _____		Completion Time: _____
Replicate	Filter #	Sample Volume
1	_____	_____ ml
2	_____	_____ ml

PHOSPHATE		
Analyst(s): _____		Completion Time: _____
Replicate	Color Wheel	Color Wheel / 50
1	_____	_____
2	_____	_____
		Average: _____ mg/L Phosphate

Volunteer Water Quality Monitoring Project for Waimanalo Bay and Kailua Bay

**KAPOHO REEF WATCH FISH SURVEY FORM FOR WAI'OPAE**

Name		Date	Time	A	B	Tidepool #	A	B	Partner
<i>A. nigrofuscus</i>									
<i>C. vanderbilti</i>									
<i>C. strigosus</i>									
<i>T. duperrey</i>									
<i>S. balteata</i>									
<i>S. fasciolatus</i>									
<b>Butterflyfishes</b>	A	B	<b>Hawkfishes</b>	A	B	<b>Triggerfishes</b>	A	B	
<i>C. lunula</i>			<i>C. fasciatus</i>			<i>R. rectangulus</i>			
<i>C. auriga</i>			<i>C. pinnulatus</i>			<i>R. aculeatus</i>			
<i>C. ornatissimus</i>			<i>P. arcatus</i>			<b>Wrasses</b>			
<i>C. quadrimac.</i>			<i>P. forsteri</i>			<i>A. cuvier</i>			
<i>C. unimac.</i>			<b>Parrotfishes</b>			<i>B. bilunulatus</i>			
<i>C. liniolatus</i>			<i>C. persp.</i>			<i>C. gaimard</i>			
<i>F. flavissimus</i>			<i>C. sord.</i>			<i>G. varius</i>			
			<i>S. dubius</i>			<i>H. ornatissimus</i>			
<b>Damselfishes</b>			<i>S. psitt.</i>			<i>L. pthiophagus</i>			
<i>A. abdominalis</i>			<i>S. rubro.</i>			<i>M. geoffroy</i>			
<i>A. sordidus</i>			<b>Pufferfishes</b>			<i>O. unifasciatus</i>			
<i>A. vagiensis</i>			<i>A. hispidus</i>			<i>P. evanidus</i>			
<i>C. ovalis</i>			<i>A. meleagris</i>			<i>P. tetrataenia</i>			
<i>D. albisella</i>			<i>C. amboinensis</i>			<i>P. octataenia</i>			
<i>P. impair.</i>			<i>C. jactator</i>						
<i>P. johnstonianus</i>			<i>O. meleagris</i>			<b>Others</b>			
			<b>Surgeonfishes</b>			<i>A. chinensis</i>			
<b>Filefishes</b>			<i>A. achilles</i>			<i>C. argus</i>			
<i>C. dumerilii</i>			<i>A. dussumieri</i>			<i>Ci. vanderbilti</i>			
			<i>A. blochii</i>			<i>F. commersonii</i>			
<b>Goatfishes</b>			<i>A. leucopareius</i>			<i>K. biggibus</i>			
<i>M. flavolineatus</i>			<i>A. nigroris</i>			<i>L. fulvus</i>			
<i>M. vanicolensis</i>			<i>A. olivaceus</i>			<i>L. kasmira</i>			
<i>P. bifasciatus</i>			<i>A. triostegus</i>			<i>N. leuciscus</i>			
<i>P. multifasciatus</i>			<i>C. hawaiiensis</i>			<i>P. argalus</i>			
<i>P. porphyreus</i>			<i>N. lituratus</i>			<i>P. goslinei</i>			
			<i>N. unicornis</i>			<i>Z. cornutus</i>			
			<i>Z. flavescens</i>						

### CITIZEN'S REPORT OF FISHING AND MPA VIOLATIONS

OBSERVER / SUBAREA \_\_\_\_\_

DATE \_\_\_\_\_

TIME OF OBSERVATION: BEGIN AT \_\_\_\_\_ END AT \_\_\_\_\_

LOCATION ON TIDEPOOLS \_\_\_\_\_

**DESCRIPTION OF PERSONS (SEX, RACE, HEIGHT, BUILD, # OF FISHERS)** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**DESCRIPTION OF VEHICLE (COLOR, MODEL, LICENSE #, ETC.)** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**DESCRIPTION OF ACTIVITIES** (SEE LATEST STATE FISHING REGULATIONS REGARDING PROTECTION OF CORAL, MINIMUM SIZES OF FISH THAT CAN BE HARVESTED, MINIMUM MESH SIZE OF GILL NETS, AND MAXIMUM TIME STATIONARY CROSS/FENCE NETS CAN BE LEFT IN THE WATER) – specify time stationary net was set, whether or not it was visually checked and undersized fish removed within 2 hours of being set, and how many hours net was in the water before it was removed.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Signature** \_\_\_\_\_ **Date** \_\_\_\_\_

Report violations to DLNR Conservation Resources and Enforcement Division.  
In East Hawai'i, call 974-6208 or FAX 933-0799. In Honokohau, call 327-4961.  
In Kamuela, call 887,6196. In Kona, call 323-3141.  
After hours, call operator and ask for Enterprise-5469.

## ADDITIONAL RESOURCES

### Coral Reef and Reef Fishes

Friedlander, A.M., G. Aeby, E. Brown, A. Clark, S. Coles, S. Dollar, C. Hunter, and P. Jokiel, J. Smith, B. Walsh, I. Williams, W. Wiltse. The State of Coral Reef Ecosystems of the Main Hawaiian Islands in The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005. pgs 222-269.  
[http://ccma.nos.noaa.gov/ecosystems/coralreef/coral\\_report\\_2005/](http://ccma.nos.noaa.gov/ecosystems/coralreef/coral_report_2005/)

Friedlander, A.M. and E.E. DeMartini. 2002. Contrasts in Density, Size, and Biomass of Reef Fishes between the Northwestern and the Main Hawaiian Islands: The Effects of Fishing Down Apex Predators. *Marine Biology Progress Series* 230:253-264.

Gulko, David. 1998. *Hawaiian Coral Reef Ecology*. Mutual Publishing, 1215 Center Street, Suite 210, Honolulu, HI 96816. 244p.

Hawai'i Coral Reef Assessment and Monitoring Program:  
<http://cramp.wcc.hawaii.edu/>

Holland, K.N. and C.G. Meyer. 2003. Human Activities in Marine Protected Area--Impact on Substrates. Final Report. Hawai'i Institute of Marine Biology. Kaneohe, HI.

Hoover, John. 1993. *Hawaii's Fishes: A Guide for Snorkelers, Divers, and Aquarists*. Mutual Publishing. 183p. Marine GAP Analysis, part of Hawai'i Natural Heritage Program: Integrating available information on Hawaiian nearshore waters to enable a comprehensive conservation planning framework for Hawai'i. <http://www.hinhp.org/mgap/index.html>

NOAA's Coral Reef Conservation Program: <http://www.coral-reef.noaa.gov/welcome.html>

Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve: <http://www.hawaiiireef.noaa.gov/>

Pattengill-Semmens, C. 2005. A summary of fish assemblage data collected as part of the Reef Environmental Education Foundation (REEF)'s fish survey project.

US Coral Reef Task Force: <http://www.coralreef.gov/>

West Hawai'i Aquarium Project: <http://www.coralreefnetwork.com/kona/default.htm>

### Collaborative Group and Community

#### Development Information

Margoluis, R and N. Salafsky. 1998. *Measures of Success: Designing, managing and monitoring conservation and development projects*. Island Press, 1718 Connecticut Ave, NW, Suite 300, Washington DC 20009. 362 p.

Wates, Nick. *The Community Planning Handbook*. 2000. Earthscan Publications, Ltd, London. 230p.

#### Displays

Nomadic Display, for portable displays at events or in facilities: <http://www.nomadicdisplay.com/>

Pro Panels, sturdy panels for indoor or outdoor use: <http://propanels.com/>

#### Education/Printed Materials

Coral Reef Outreach Network: <http://www.hawaiiireef.net/index.htm>

Hawai'i Networked Learning Communities: An online resource for educators in improving science, math and technology education in Hawaii's schools.  
<http://www.hnlc.org/home/index.php>

Surfrider's Respect the Beach program for K-12 grade levels:  
<http://www.surfrider.org/programs/respectthebeach.asp>

Various educational brochures/pamphlets, see Appendix B for contact information:

- Hawai'i Fishing Regulations (DLNR-DAR)
- Marine Life Conservation Districts ((DLNR-DAR)
- Reef Renewal: Hawaii's Unique Coral Spawning Events (DLNR-DAR, NOAA)
- Coral and live rock laws of Hawai'i (DLNR-DAR)
- Exploring Hawaii's Coral Reefs (NOAA, CZM and other organizations)
- Help Conserve Hawaii's Reefs (DLNR-DAR, NOAA, HCRI)
- KIDS AND CORAL: How Can I Keep the Reef Healthy? (DLNR-DAR, Malama Kai Foundation)
- Effects of Fishing Gear on Coral Reefs and How You Can Help (DLNR-DAR, NOAA, CZM)
- Marine Protected Areas: What Are They? (DLNR-DAR)
- Hawaiian Tidepool and Shallow Reef Identification (DLNR-DAR, Waikiki Aquarium)



- Think don't Throw (Western Pacific Regional Fishery Management Council)
- Protected Species Handling Guide (NOAA)
- Our Water Planet is Becoming Polluted with Plastic Debris (NOAA, Center for Marine Conservation)
- Hawai'i Coral Card (Hawaiian Islands Humpback Whale National Marine Sanctuary and Sierra Club)
- What You Can Do to Protect Coral Reefs (NOAA)
- Ten Ways a Diver Can Protect the Underwater Environment (PADI)
- E Malama I Na Honu – Care for the Sea Turtles (Kaloko-Honokohau National Park, Hawai'i)

### **Fishery Management**

Bartram, P.K. 1996. Kaho'olawe Island Reserve Fisheries Management Plan (unpublished draft). Prepared for Dames & Moore for Kaho'olawe Island Reserve Commission.

Department of Land and Natural Resources. 1996. Status report to the 19<sup>th</sup> Legislature Regular Session of 1997 on the subsistence fishing pilot demonstration project, Moloka'i. Honolulu.

### **Fishponds**

Farber, Joseph M. 1997. Ancient Hawaiian Fishponds: Can Restoration Succeed on Moloka'i? Neptune House Publications, Encinitas, CA 92024. Published in association with the East-West Center's Pacific Islands Development Program, Honolulu, HI 96848. 99p.

Mau'i Fishpond Association: <http://www.mauifishpond.com/about.php?title=aboutus>

Pacific American Foundation. August 2003. Project Loko I'a: Resolving water quality and permitting issues for Hawaiian fishponds. Honolulu, HI. US EPA Form SF424A. <http://www.epa.gov/region09/water/lokoia.html>

Project Loko I'a (Moloka'i): <http://www.epa.gov/region09/water/lokoia.html>

Wyban, Carol Araki. 1992. Tide and Current: Fishponds of Hawai'i. University of Hawai'i Press, Honolulu, HI. 192 p.

### **General**

Cesar, Herman, P. van Beukering, S. Pintz and J. Dierking.

2002. Economic valuation of the coral reefs of Hawai'i. Funding by NOAA to Hawai'i Coral Reef Initiative Research Program: [http://www.hawaii.edu/ssri/hcri/rp/reports\\_by\\_area\\_of\\_interest-1.htm](http://www.hawaii.edu/ssri/hcri/rp/reports_by_area_of_interest-1.htm)

Department of Business, Economic Development and Tourism, State of Hawai'i, Annual Visitor research report and other statistics: [http://www3.hawaii.gov/dbedt/index.cfm?section=statistics\\_and\\_economic\\_information378](http://www3.hawaii.gov/dbedt/index.cfm?section=statistics_and_economic_information378)

### **Hawai'i Birds, Sharks, Turtles, Invertebrates**

Fielding, A. 1985. Hawaiian reefs and tidepools. Oriental Publishing Co. Honolulu, HI. 103p.

Hawai'i Audubon Society. 2005. Hawaii's Birds. 141p.

Hoover, J. 1998. Hawaii's Sea Creatures: A guide to Hawaii's marine invertebrates. Mutual Publishing, LLC. Honolulu, HI. 376p.

Ripple, J. 1996. Sea Turtles. Voyageur Press, Stillwater, MN. 84p.

Taylor, L. 1993. Sharks of Hawai'i: Their biology and cultural significance. University of Hawai'i Press, Honolulu, HI. 176p.

### **Hawaiian Cultural Resources**

Craighill-Handy, E.S., E Green-Handy, with the collaboration of M. Kawena Pukui. Revised 1991. Native Planters in Old Hawai'i: their life, lore and environment. Bishop Museum, 1525 Bernice Street, Honolulu, HI 96817. 676p.

Titcomb, M. 1972. Native use of fish in Hawai'i. University of Hawai'i Press, Honolulu, HI. 188p.

### **Hawaiian Islands Natural History, Geology**

Hazlett, R.W. and D.W Hyndman. 1996. Roadside Geology of Hawai'i. Mountain Press Publishing Company. 304p.

Kay, Alison (ed). 1994. A Natural History of the Hawaiian Islands. Selected Readings II. University of Hawai'i Press. 520p.

Rauzon, M. 2001. Isles of Refuge: Wildlife and History of the Northwestern Hawaiian Islands. University of Hawai'i Press, Honolulu, HI 205p.

Russo, Ron. 1994. Hawaiian reefs: A natural history guide. Wavecrest Publications, San Leandro, CA. 174p.



**Invasive Species**

Alien marine algae in the Hawaiian Islands: <http://www.botany.hawaii.edu/GradStud/smith/invasive/BROCHURE.htm>

Alien and Invasive Algae in Hawai'i (Hawai'i Coral Reef Initiative): <http://www.botany.hawaii.edu/GradStud/smith/websites/ALIEN-HOME.htm>

Bishop Museum and the University of Hawai'i, Guide to introduced marine species of Hawai'i: <http://www2.bishop-museum.org/HBS/invertguide/index.htm>

Cox, G. 1999. Alien Species in North America and Hawai'i: Impacts on Natural Ecosystems. Island Press, 1718 Connecticut Ave, NW, Suite 300, Washington DC 20009. 172-187pp. 387 p.

Hawai'i Ecosystems at Risk (HEAR) project: <http://www.hear.org/AlienSpeciesInHawaii/>

National Aquatic Nuisance Task Force: <http://www.anstask-force.gov/>

National Biological Information Infrastructure Invasive species: <http://invasivespecies.nbi.gov/>

State of Hawai'i Aquatic Invasive Species Management Plan: [http://www.hawaii.gov/dlnr/dar/pubs/ais\\_mgmt\\_plan\\_final.pdf](http://www.hawaii.gov/dlnr/dar/pubs/ais_mgmt_plan_final.pdf)

University of Hawai'i, Department of Botany, Invasive algae of Hawai'i: [http://www.hawaii.edu/reefalgae/invasive\\_algae/INDEX.HTM](http://www.hawaii.edu/reefalgae/invasive_algae/INDEX.HTM)

**Limu restoration**

Abbot, Isabella Aiona, Limu An Ethnobotanical Study of some Hawaiian Seaweeds, Pacific Tropical Botanical Garden, 1996. 39 p.

Aliomanu limu restoration, Kapa'a Elementary School: <http://www.kauaiworld.com/articles/2005/05/17/news/news01.txt>

Ewa Beach limu restoration and proposed Fishery management Area: <http://www.hawaii.gov/dlnr/dar/regs/ch60.6dr.pdf>

Fortner, Heather. The Limu Eater, a cookbook of Hawaiian seaweed. UH Sea Grant, 1985. 102 p.

Magruder, W.H. and J.W Hunt. 1979. Seaweeds of Hawai'i: A photographic identification guide. Oriental Publishing Co. Honolulu, HI.

Project Ho'olokahi, Kaiser High School: <http://pikoi.hawaii.edu/pikoi4/overview.html>

**Marine Debris**

Asia Pacific Economic Cooperation, Derelict Fishing Gear and Related Marine Debris Seminar, January 13 - 16, 2004, East-West Center - University of Hawai'i, Manoa: Documents from the seminar: <http://www.wpcouncil.org/documents/APECSeminar/index.html>

EPA site on marine debris: <http://www.epa.gov/owow/oceans/debris/>

NOAA's marine debris program, with general information on marine debris: <http://marinedebris.noaa.gov/>

Ocean Conservancy, National Marine Debris Monitoring Program: [http://www.oceanconservancy.org/site/PageServer?pagename=mdm\\_debris](http://www.oceanconservancy.org/site/PageServer?pagename=mdm_debris)

**Marine Mammals**

Hawaiian Islands Humpback Whale National Marine Sanctuary, Structure of Populations, Levels of Abundance and Status of Humpbacks (SPLASH) program. [http://hawaiihumpbackwhale.noaa.gov/special\\_offerings/sp\\_off/splash/splash.html](http://hawaiihumpbackwhale.noaa.gov/special_offerings/sp_off/splash/splash.html)

Hawai'i Marine Mammal Consortium, nonprofit marine mammal research, conservation and education: <http://www.hmmc.org/>

Kaufman, G. and P. Forestell. June 1996. Hawaii's Humpback Whales. Island Heritage; 2nd edition. 176p.

Marine Protected Species information, variety of publications: [http://hawaiihumpbackwhale.noaa.gov/special\\_offerings/sp\\_off/publications](http://hawaiihumpbackwhale.noaa.gov/special_offerings/sp_off/publications)

Norris, K. 1994. B. Wrsig, R.Wells, M. Wrsig. The Hawaiian Spinner Dolphin. University of California Press. 408p.

NOAA Fisheries, Pacific Fisheries Science Center (information on coral reefs, fisheries, marine mammals, sea turtles): <http://www.nmfs.hawaii.edu/>

NOAA Fisheries, Protected Resources program: <http://www.nmfs.noaa.gov/pr/>

Pacific Islands Regional Office: <http://swr.nmfs.noaa.gov/pir/index.htm>

### **Marine Managed Areas**

Marine Protected Areas of the United States. [www.mpa.gov](http://www.mpa.gov)

State of Hawai'i, Department of Land and Natural Resources. 2005. Marine Protected Areas in Hawai'i. <http://www.hawaii.gov/dlnr/dar/pubs/MPApub.pdf>

### **Marine Resource Information**

Hawai'i Ocean User's Guide  
[http://hawaiiumpbackwhale.noaa.gov/special\\_offerings/sp\\_off/publication\\_pdfs/HawaiiOceanUsersGuide\\_2004.pdf](http://hawaiiumpbackwhale.noaa.gov/special_offerings/sp_off/publication_pdfs/HawaiiOceanUsersGuide_2004.pdf)

Ocean Atlas of Hawai'i: Description of the ocean around Hawai'i - marine climate, water properties, currents, tides, waves. <http://radlab.soest.hawaii.edu/atlas/>

### **Mooring Buoys**

Komodo National Park mooring buoy case study: <http://www.komodonationalpark.org/>

Malama Kai Foundation: [www.malamakai.org](http://www.malamakai.org)

Mooring buoys installation and equipment information: <http://www.boatmoorings.com/index.php>

Project A.W.A.R.E Mooring Buoy Planning Guide: <http://www.projectaware.org/americas/english/pdfs/moorbuoy.pdf>

### **Recycling/Trash**

Adopt-a-beach Hawai'i: <http://www.adoptabeachhawaii.com/>

Hawai'i Island recycling: <http://www.recyclehawaii.org/where.htm>

Honolulu recycling and waste disposal: <http://www.opala.org/>

Kaua'i county recycling program: <http://www.kauai.gov/Default.aspx?tabid=68>

Kaua'i recycling for the arts, transforming glass into art: <http://www.kauaiglass.org/>

Mau'i recycling service: <http://www.mauirecycles.com/>

O'ahu community recycling: <http://www.ocr2000.com/index.html>

### **Snapshot Days**

International Coastal Cleanup Day: <http://www.coastalcleanup.org/main.cfm>

Get the Drift and Bag It!, usually coincides with International Coastal Cleanup Day.

Contact: Christine Woolaway

Phone: (808) 753-3311

Email: [cwoolaway@hawaii.rr.com](mailto:cwoolaway@hawaii.rr.com)

World Water Monitoring Day: <http://www.worldwatermonitoringday.org/>

### **Signage**

Aloha Plastic Recycling, Inc., manufactures recycled plastic dimensional lumber, picnic tables, park benches, mail box posts, trash receptacles, car stops and speed bumps. <http://www.aloha-recycling.com/AlohaPlastic.html>

75 Amala Place

Kahului, Hawai'i 96732

Email: [sales@aloha-recycling.com](mailto:sales@aloha-recycling.com)

Phone: (808) 877-0822

Fax: (808) 877-2503

In Hawai'i Only: 1-800-865-2884

B&J Signs and Graphics

<http://www.bjsigns.com/index.html>

94-672 Farrington Hwy.

Waipahu, HI 96797

Phone: (808) 677-2710

Fax: (808) 677-7033

Email: [info@bjsigns.com](mailto:info@bjsigns.com)

Honolulu Sign Company  
<http://www.honolulusign.com/>  
 1353 Moonui St.  
 Honolulu, HI 96817  
 Phone: (808) 847-4047  
 Fax: (808) 842-5796  
 Email: [info@honolulusign.com](mailto:info@honolulusign.com)

Identity Signs and Graphics  
<http://www.identitysignshawaii.com/>  
 99-185 Moanalua Road. #107  
 Aiea, Hawai'i 96701  
 Phone: (808) 488-8828  
 Fax: (808) 488-8825  
 Cell: (808) "CAR-SIGN" (227-7446)  
 Email: [contact@identitysignshawaii.com](mailto:contact@identitysignshawaii.com)

Signs Hawai'i  
 2688 Kilihau St Ste D  
 Honolulu, HI 96819-2046  
 Phone: (808) 748-7263  
 Fax: (808) 841-2252

Trex has been used at Hawai'i Volcanoes NP in several applications. As sign posts, it works well for smaller signs, but deflects and will not support larger signs. Trex was also reinforced with galvanized 1" pipe for use as railing, and has been very successful. [www.trex.com](http://www.trex.com)

*Local dealers for Trex*  
 Honsador Lumber: [www.honsador.com](http://www.honsador.com)  
 HPM Building Supply: <http://www.hpm-hawaii.com/>

Buy Recycled Hawai'i directory: <http://www.state.hi.us/dbedt/ert/chc/brg02.html>

### **Traditional Knowledge**

Application of Hawaiian Traditions to Community-Based Fishery Management, Pacific American Foundation and Hui Malama O Mo'omomi. March 16, 2001. Prepared for Native Americans United States Department of Health and Human Services Grant #90NH0007/01

Dyer, C. and J.R. McGoodwin (eds). 1994. Folk management in the world's fisheries. University of Colorado Press, Niwot.

Edith Kanaka'ole Foundation. 1995. 'Aha Pawalu, a cultural protocol for Kanaloa-Kaho'olawe. Consultants to the Kaho'olawe Island Reserve Commission. 39p.

Friedlander, Alan. Kelson Poepoe, Kaipo Poepoe, K. Helm, P. Bartram. June 2001. Validating Traditional Knowledge Concerning the Harvest of Marine Resources Using the Hawaiian Moon Calendar. Building Bridges with Traditional Knowledge. Honolulu, Hawai'i.

Johannes, R.E., K. Ruddle and E. Hviding. 1993. The value today of traditional management and knowledge of coastal marine resources in Oceania. In Workshop on People, Society and Pacific Islands Fisheries Development and Management: Selected Papers, Inshore Fisheries Research Project Tech. Rept. No. 5, South Pacific Commission, Noumea.

Lim, Madeline. Designing Video Programs for Youth – Creative expression and achieving goals. Search for article title on: <http://www.techsoup.org/index.cfm>

Skouge, J.R. 2004. Pacific Voices: Integrating Multimedia, Technology, and Culture Into Education. Available at: <http://www.prel.org/index.asp>

Smith, M.K. and M. Pai. 1992. The ahupua'a concept: Re-learning coastal resource management from ancient Hawaiians. NAGA: The ICLARM Quarterly. 15 (2): 11-13.

Titcomb, M and Mary Kawena Pukui. 1972. Native use of fish in Hawai'i. University Press of Hawai'i. 175p.

### **Video Resources**

Clean Water Honolulu has several streaming videos on its website: <http://www.cleanwaterhonolulu.com/video.html>

For the Sea Productions, a company to promote environmental protection through visual experiences. See public service announcement video directed at tourists on: <http://www.forthesea.com/>

Shifting Baselines video highlights the drastic changes that have occurred over time to the world's coral reefs. Check out the videos as well as the slide show on what is a "shifting baseline". <http://www.shiftingbaselines.org/index.php>

**Volunteer Programs**

City of Honolulu, volunteer activities include: Adopt-a-block, Adopt-a-stream, Storm drain stenciling, and Clean-a-Reef: <http://www.cleanwaterhonolulu.com/reef.html>

Pono Pacific has a list of different organizations with volunteer needs: <http://www.ponopacific.com/conservation3.html>

State of Hawai'i, Department of Land and Natural Resources Volunteer Program: <http://www.hawaii.gov/dlnr/Volunteer.html>

See also Appendix B contact information, most organizations listed have volunteer programs.

**Water Quality Information**

Central Coast Monitoring Guide (California): <http://www.mbnms.nos.noaa.gov/monitoringnetwork/protocols.html>

Citizens Monitoring Bacteria: A training manual for monitoring E. Coli. 2005. [http://www.usawaterquality.org/volunteer/EColi/Staff/Manual/ecoli\\_may162005.pdf](http://www.usawaterquality.org/volunteer/EColi/Staff/Manual/ecoli_may162005.pdf)

The Clean Water Team: Guidance Compendium for Watershed Monitoring and Assessment. Great resource for protocols, general information. <http://www.waterboards.ca.gov/nps/cwtguidance.html#10>

Clean Water Team (CWT) 2004. Dissolved Oxygen Measurement Principles and Methods, DQM IP-3.1.1. in: The Clean Water Team Guidance Compendium for Watershed Monitoring and Assessment, Version 2.0. Division of Water Quality, California State Water Resources Control Board (SWRCB), Sacramento, CA. <http://www.swrcb.ca.gov/nps/docs/cwtguidance/311ip.pdf>

Coral Reef Monitoring Manual for the Caribbean and Western Atlantic. June 1994. National Park Service, Virgin Island National Park. [http://cars.er.usgs.gov/Monitoring\\_Manual.pdf](http://cars.er.usgs.gov/Monitoring_Manual.pdf)

Designing your monitoring strategy: Basic questions and resources to help guide you: <http://www.usawaterquality.org/volunteer/outreach/designingyourstrategy.pdf>

Environmental Protection Agency, quality assurance project plan: [http://www.epa.gov/region3/esc/QA/docs\\_qapp.htm](http://www.epa.gov/region3/esc/QA/docs_qapp.htm)

EPA Volunteer Stream monitoring manual: <http://www.epa.gov/owow/monitoring/volunteer/stream/>

Global Rivers Environmental Education Network (Good resource for educational based programs): <http://www.green.org/>

Hanalei Watershed Hui: <http://www.hanaleiwatershedhui.org/>

Heal the Bay, The Freshwater and Marine Team Field Guide: [http://www.healthebay.org/assets/pdfdocs/st\\_fieldguide.pdf](http://www.healthebay.org/assets/pdfdocs/st_fieldguide.pdf)

Island Stewardship: Guide to Preventing Water Pollution for Maui's Homes and Businesses. Maui's Watershed Management Advisory Committee and Hawai'i Department of Health.

Kailua Bay Advisory Council: <http://www.kbac-hi.org/resources.htm>

Santa Barbara ChannelKeeper Volunteer Citizen Monitoring Groups: <http://www.stream-team.org/>

State of California, State Water Resources Control Board, Citizen Monitoring Program (Great resource with protocols, tips and links): <http://www.swrcb.ca.gov/nps/volunteer.html>

State of Hawai'i, Department of Health, Clean Water Branch: <http://www.hawaii.gov/health/environmental/water/clean-water/index.html>

State of Hawai'i Water Quality studies database: [http://www.aecos.com/CORAL/CZM\\_WQ.html](http://www.aecos.com/CORAL/CZM_WQ.html)

Surfrider Foundation: Hawai'i water quality and beach status reports conducted annually (Check out the State of the Beach): <http://www.surfrider.org/>

Rose, A, A. Wu, D. Tarnas, and D. Sailer. December 1996. A guide to volunteer water quality monitoring for Hawai'i: A working document. Prepared for the Hawai'i State Department of Health and the Communities of Hawai'i. University of Hawai'i Sea Grant College Program.

University of Hawai'i Water Quality Extension Program: <http://www2.ctahr.hawaii.edu/wq/index.htm>

Volunteer Water Quality Monitoring National Facilitation Project: <http://www.usawaterquality.org/volunteer/>

Waterkeeper alliance (national organization with local chapters dedicated to protecting the waters from pollution): <http://www.waterkeeper.org/>

#### **Water Quality laboratories**

The AECOS Laboratory  
45-939 Kamehameha Hwy., Suite 104  
Kane'ohe, HI 96744  
Laboratory Director: Jacqueline "Snookie" Mello  
Phone: (808) 234-7770  
Fax: (808) 234-7775  
Email: [SMello@aecos.com](mailto:SMello@aecos.com)  
<http://www.aecos.com/aecoslab.html>

University of Washington Oceanography Lab:  
The Marine Chemistry Lab at the School of Oceanography provides seawater and freshwater analytical services to the University and Oceanographic communities. The lab specializes in the analysis of salinity, oxygen, nutrients, and DOC in aqueous samples and CHN analysis in particulate samples.

School of Oceanography  
Box 357940  
University of Washington  
Seattle, WA 98195-7940  
Facility manager: Katherine Kroglund  
Email: [kkrog@u.washington.edu](mailto:kkrog@u.washington.edu)  
<http://www.ocean.washington.edu/2004/services/tech/marinechem.html>

#### **Water Quality Supplies**

Aquatic Ecosystems, Inc  
2395 Apopka Blvd  
Apopka, FL 32703  
Phone: (877) 347-4788  
<http://www.aquaticeco.com/index.cfm>

Ben Meadows Company  
PO Box 5277  
Janesville WI USA 53547-5277  
Phone: (800) 241-6401  
Fax: (800)628-2068  
<http://www.benmeadows.com/>

Cole-Parmer Instrument Company  
625 East Bunker Court  
Vernon Hills, Illinois 60061-1844, USA  
Phone: (800) 323-4340  
Fax: (847) 247-2929  
Email: [sales@coleparmer.com](mailto:sales@coleparmer.com)  
[www.coleparmer.com](http://www.coleparmer.com)

Fisher Scientific  
Phone: (800) 766-7000  
Fax: (800) 926-1166  
<https://www1.fishersci.com/index.jsp>

Forestry Supplies, Inc  
205 West Rankin Street  
P.O. Box 8397  
Jackson, MS 39284-8397  
Phone: 800-647-5368  
<http://www.forestry-suppliers.com/>

Hach Company  
P.O. Box 389  
Loveland, Colorado 80539-0389  
Phone: (800) 227-4224  
Fax: (970) 669-2932  
<http://www.hach.com/>

LaMotte Company  
PO Box 329  
802 Washington Avenue  
Chestertown, MD 21620  
Phone: (800) 344-3100  
Fax: (410) 778-6394  
Sales email: [mkt@lamotte.com](mailto:mkt@lamotte.com)  
[www.lamotte.com](http://www.lamotte.com)

Onset Company (data loggers)  
PO Box 3450  
Pocasset, MA 02559-3450  
Phone: 1-800-564-4377  
Fax: 508-759-9100  
Email: [sales@onsetcomp.com](mailto:sales@onsetcomp.com)  
<http://www.onsetcomp.com>

**Watershed Restoration**

Center for Watershed Protection: <http://www.cwp.org/>  
 Department of Land and Natural Resources, Conservation  
 Hawai'i (information on Hawai'i's natural resources) <http://www.state.hi.us/dlnr/consrvhi/intro.html>

Department of Land and Natural Resources, Division of  
 Forestry and Wildlife: <http://www.dofaw.net/>

Hawaiian streams information, DLNR, Division of Aquatic  
 Resources, see also the bibliography section for additional  
 references: <http://www.hawaii.gov/dlnr/dar/streams/index.htm>

Hawai'i Association of Watershed Partnerships, information  
 on watershed, partnerships and how to help: <http://www.hawp.org/>

Hawai'i streams information, Hawai'i Stream Research Cen-  
 ter: <http://www.hawaii.edu/hsrc/home/>

Kido, M. 2002. The Hawai'i Stream Bioassessment Protocol,  
 version 3.01. The Hawai'i Stream Research Center, Center for  
 Conservation Research and Training, University of Hawai'i.  
 48p. <http://www.hawaii.gov/health/environmental/env-planning/wqm/hsbp301.pdf>

National River Restoration Science Synthesis (NRRSS) River  
 Restoration in our Nation: A Scientific Synthesis to Inform  
 Policy, Grassroots Actions, and Future Research: [http://www.nrrss.umd.edu/NRRSS\\_Proj\\_Descr.htm](http://www.nrrss.umd.edu/NRRSS_Proj_Descr.htm)

Native plants to control stream bank erosion: <http://www.ctahr.hawaii.edu/rnre/Downloads/Plants%202020Control.pdf>

Natural Resources Conservation Service, Hawai'i office, in-  
 formation for communities, farmers on soils, plants, stream  
 restoration, water quality: <http://www.hi.nrcs.usda.gov/>

Natural Resources Conservation Service. 2001. Hawai'i  
 Stream visual assessment protocol. <http://www.hawaii.gov/health/environmental/env-planning/wqm/nrcsvaproto.pdf>

Online training in watershed management, EPA: <http://www.epa.gov/watertrain/>

Riley, A. 1998. Restoring Streams in Cities: A guide for plan-  
 ners, policymakers and citizens. Island Press, Washington  
 D.C. 423p.

Riparian Restoration Plant Database: [http://www.ctahr.hawaii.edu/rnre/Riparian\\_Restoration\\_Plant\\_Database.asp](http://www.ctahr.hawaii.edu/rnre/Riparian_Restoration_Plant_Database.asp)

Stormwater magazine: Storm water management tools,  
 techniques and case studies. Free magazine subscription:  
<http://www.stormh2o.com/sw.html>

Stream corridor restoration: Principles, Processes and Prac-  
 tices: The document encourages locally led, public involve-  
 ment in restoration planning and implementation. Click on  
 Table of Contents for the entire document: [http://www.nrcs.usda.gov/technical/stream\\_restoration/newgra.html](http://www.nrcs.usda.gov/technical/stream_restoration/newgra.html)

Waipi'o Valley Stream Restoration Study, a research collabo-  
 ration of scientists and students. <http://www.bishopmuseum.org/research/natsci/waipiostudy/students/intro.html>

**Website Development**

Zdnet provides reviews by their editors as well as by cus-  
 tomers of various hardware and software: [www.zdnet.com](http://www.zdnet.com)

Lava.net provides internet access, expert network consult-  
 ing and creative, intelligent graphic/web design: <http://www.lava.net/>

Yahoo! Small Business also provides a suite of web hosting  
 alternatives, with domain name registration as well. <http://smallbusiness.yahoo.com/>

Hawai'i OnLine also provides web hosting capabilities:  
<http://www.aloha.net/>

Dreamweaver is a popular software for developing a  
 website, but is costly: <http://www.macromedia.com/software/dreamweaver/>

SJ Nammo Interactive, provides a cheaper alternative to  
 Dreamweaver and is fairly easy to use. <http://www.nammo.com/store/webeditor.php>

Free web hosting search engine: <http://www.freewebspace.net/>

## FUNDING SOURCES

In addition to the sources of grant funding below, think about some simple or creative ways of fundraising:

- Bake sales, car washes, garage/yard sales.
- Using collection boxes at your booth during events.
- Fundraising events, like dinners, concerts. Find someone “famous” in your local community that will attract people to your event.
- Use videos, cartoonlets, newsletters (See awareness/out-reach) as a way to solicit contributions for your activities.

### Local

**Alexander and Baldwin Foundation Grants:** The A&B Foundation works to improve its communities through a responsive, broad-based program of giving in the following categories: health & human services, education, community, culture and arts, maritime and the environment.

*Eligible Applicants & Types of Support:* Nonprofit organizations with 501c3 are eligible. The Foundation will consider support for startup, general operating, and special project needs, as well as major and minor capital requests.

*Amount of funds awarded:* Usually \$1,000 to \$25,000, but may award more.

*Information:* <http://alexanderbaldwinfoundation.org/>

**The Atherton Family Foundation Grants:** Supports programs and projects within a broad spectrum of activities which in some way benefit the people of the state of Hawai‘i.

*Eligible Applicants & Types of Support:* 501c3 nonprofit organizations. Grant making fields in order of preference are education, human services, youth development, arts, culture and humanities, health, community development, environment, religion, and others.

*Amount of funds awarded:* Varies, usually \$1,000 to \$35,000 but can be more.

*Information:* <http://www.athertonfamilyfoundation.org/>

**Board of Water Supply, City & County of Honolulu Watershed Management Partnership Program:** For assistance to watershed partnerships, agencies, and organizations for the management, protection, and enhancement of watershed areas on O‘ahu, Hawai‘i.

*Eligible Applicants & Types of Support:* 501c3 nonprofit organizations; Subject areas of interest include: Watershed

studies, watershed resource protection, educational outreach for watershed management and protection, invasive species control, forest protection, water conservation activities.

*Amount of funds awarded:* N/A

*Information:* <http://www.hbws.org/cssweb/display.cfm?sid=1364>

**Cooke Foundation Ltd, grants:** Supports worthy endeavors in the community that the family feels will make a significant difference in the betterment and welfare of the people of Hawai‘i.

*Eligible Applicants & Types of Support:* 501c3 nonprofit organizations; Demonstration and pilot programs, and time-limited projects; Strengthening activities that help stabilize or grow an organization or improve its performance; Joint project requests from two or more nonprofit organizations seeking to explore and resolve community problems that are of interest to the Trustees

*Amount of funds awarded:* Maximum of \$25,000

*Information:* <http://www.cookefdn.org/>

**Department of Health, Clean Water Branch, Polluted Runoff Control Program, Clean Water Act Section 319 grants for controlling polluted runoff:**

*Eligible Applicants & Types of Support:* Private schools, local governments, nonprofit organizations, environmental organizations. Project types include: Demonstrates new and innovative best management practices (BMPs) in urban, forested areas, agricultural areas, marina and recreational boating areas, or hydro-modified areas. Develops a Watershed-Based Plan (WBP) that includes all of EPA’s Components for Watershed-Based Plans. Protects waters (Natural Area Reserves, wetlands, et. al.) that are at risk of being impaired from residential, commercial, industrial and/or agricultural developments

*Amount of funds awarded:* Maximum \$300,000

*Information:* <http://www.hawaii.gov/health/environmental/water/cleanwater/prc/index.html>



Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW), Watershed management and Wildlife urban interface grants.

*Information:* <http://www.dofaw.net/>

***The Harold K.L Castle Foundation:***

*Eligible Applicants & Types of Support:* 501c3 nonprofit organizations. Proposals are usually not considered for: Ongoing operating expenses, vehicles, endowments, annual fund drives, sponsorships or special events.

*Amount of funds awarded:* varies

*Information:* <http://www.castlefoundation.org/>

***Hawai'i Coastal Zone Management program, section 309 grants:*** Section 309 of the federal Coastal Zone Management Act establishes a voluntary coastal zone enhancement grants program to encourage states and territories to develop programs in one or more of nine coastal zone enhancement areas. The nine enhancement objectives are wetlands, public access, coastal hazards, CSI, energy and government facility siting, marine debris, ocean resources, special area management plans, and aquaculture.

*Information:* [http://www.hawaii.gov/dbedt/czm/program\\_documents/section\\_309.html](http://www.hawaii.gov/dbedt/czm/program_documents/section_309.html)

***Hawai'i Community Foundation – Nonprofit grants:*** Has recently launched major programs focusing on the protection of natural resources, building community leadership and social capital, and broad-based public health initiatives.

*Eligible Applicants & Types of Support:* Hawai'i nonprofit organizations. Funds are not given to support: Endowments, loans, Individuals (with the exception of the Scholarships program), large capital projects (with rare exceptions), funding after an event has occurred.

*Amount of funds awarded:* Varies

*Information:* <http://www.hawaiicommunityfoundation.org/grants/grantmaking.php>

***Hawai'i Invasive Species Council:*** Various grants, including education outreach on invasive species in Hawai'i.

*Information:* <http://www.state.hi.us/dlnr/dofaw/HISC/>

*Also sign up on the various Invasive Species Council listserves to obtain announcements:*

<http://www.hear.org/hearlists/index.html>

***Hawai'i Tourism Authority*** offers a variety of grants throughout the year.

*Information:* <http://www.hawaii.gov/tourism/>

***Mau'i County, Department of Housing and Human Concerns, Grants administration:***

*Information:* <http://www.co.maui.hi.us/departments/Housing/grants.htm>.

*Email:* [grants.hhc@co.maui.hi.us](mailto:grants.hhc@co.maui.hi.us) Phone: (808) 270-7807

***Office of Hawaiian Affairs,*** to help communities make a difference for Hawaiians, in the areas of education, health, human services and culture.

*Eligible Applicants & Types of Support:* Hawai'i nonprofit organization; must have clear potential to improve the socio-economic well-being of the community; include the community in membership, decision-making and project development; and demonstrate outreach and organizing activities.

*Amount of funds awarded:* up to \$50,000

*Information:* [http://www.oha.org/cat\\_content.asp?contentid=59&catid=57](http://www.oha.org/cat_content.asp?contentid=59&catid=57)

***Patagonia Enviro Action Grants:*** Fund activists who take radical and strategic steps to protect habitat, wilderness and biodiversity.

*Eligible Applicants & Types of Support:* Small 501c3 nonprofit organizations. They fund work that: is action-oriented, builds public involvement and support, is strategic, focuses on root causes, accomplishes specific goals and objective, takes place in communities in which we do business. Areas of interest include: Alternative Energy, Biodiversity, Forests, International, Media/Publications, Resource Extraction, Social Activism, Sustainable Agriculture, Toxics/Nuclear, Water/Marine

*Amount of funds awarded:* small, generally under \$10,000

*Information:* [http://www.patagonia.com/enviro/enviro\\_grants.shtml](http://www.patagonia.com/enviro/enviro_grants.shtml)



## Federal

**Environmental Protection Agency (EPA) Environmental Education Grants:** provides financial support for projects that increase public awareness about environmental issues and provide the public with skills to make informed decisions and take responsible actions.

**Eligible Applicants & Types of Support:** Educational agencies, colleges, universities, state educational or environmental agencies, not-for-profit organizations and noncommercial educational broadcasting entities are eligible.

**Award Amounts/Project Examples:** Up to \$50,000 awarded per project. It is a competitive program; matching funds of 25% of the total grant are required. The likelihood of funding increases with more modest requests; a significant amount of the regional allocation is targeted for requests of \$10,000 or less.

**Information:** <http://epa.gov/region09/enviroed/grants.html>

**Environmental Protection Agency (EPA), Environmental Justice Grants:** Provides financial assistance to eligible community groups with projects that address environmental justice issues.

**Eligible Applicants & Types of Support:** 501c3 nonprofit organizations and other located in locally affected area

**Amount of funds awarded:** \$25,000 per project; max \$50,000 per region

**Information:** <http://www.epa.gov/compliance/environmentaljustice/grants/index.html>

**Environmental Protection Agency (EPA) Environmental Research Grants:**

**Information:** <http://es.epa.gov/ncer/rfa/>

**Environmental Protection Agency (EPA), Region 9 (includes Hawai'i) grant opportunities:** <http://www.epa.gov/region09/funding/index.html>

**Environmental Protection Agency (EPA), Smart Growth Funding:** To encourage community groups, businesses, and government agencies to work together on sustainable developmental efforts that protect the local environment and conserve natural resources while supporting a healthy economy and an improved quality of life. NOAA Coastal

Services Center Program offers several grant programs, including in Hawai'i, the Bay Watershed Education and Training Program. The program supports existing environmental education programs, fosters the growth of new programs, and encourages the development of partnerships among environmental education programs throughout the Hawai'i. Funded projects provide meaningful outdoor experiences for students and professional development opportunities for teachers in the area of environmental education.

**Eligible Applicants & Types of Support:** K-through-12 public and independent schools and school systems, institutions of higher education, commercial and nonprofit organizations, state or local government agencies, and Indian tribal governments. Proposals must address one or both of the two areas of interest: (1) Meaningful Outdoor Experiences for Students; or (2) Professional Development in the Area of Environmental Education for Teachers.

**Amount of funds awarded:** Typically \$10,000 to \$50,000

**Information:** <http://www.epa.gov/dced/topics/funding.htm>

**NOAA Coral Reef Conservation Program Grants:**

**Eligible Applicants & Types of Support:** State and Territory Coral Reef Management (Applicants: State and Territory Management Agencies); State and Territory Coral Reef Ecosystem Monitoring (Applicants: State and Territory Management Agencies);

Coral Reef Ecosystem Research (Applicants: Academia, NGO's, etc.); Projects to Improve or Amend Coral Reef Fishery Management Plans (Applicants: South Atlantic, Caribbean, Gulf of Mexico, and Western Pacific Fishery Management Councils); General Coral Reef Conservation (Applicants: Academia, NGOs, Local and Tribal governments, community organizations, etc.); and International Coral Reef Conservation (Applicants: International governments, NGOs).

**Amount of funds awarded:** Varies

**Information:** <http://www.coralreef.noaa.gov/grants.html>

**NOAA Restoration Center:** Various funding opportunities, including Habitat Restoration, American Rivers, 5-Star program, Marine debris, etc: The Community-based Restoration Program's objective is to bring together citizen groups, public and nonprofit organizations, industry, corporations and businesses, youth conservation corps, students, land-

owners, and local government, state and Federal agencies to restore fishery habitat around the coastal U.S.

*Information:* [http://www.nmfs.noaa.gov/habitat/restoration/funding\\_opportunities/funding.html](http://www.nmfs.noaa.gov/habitat/restoration/funding_opportunities/funding.html)

**NOAA, National Marine Sanctuaries Foundation, Ernest F. Hollings Ocean Awareness Trust Fund:** New for 2006. The Foundation seeks to fund projects that educate and engage the public to increase their awareness of ocean issues and understanding of their relevance to future health and well-being. Key areas include marine debris, human interaction with marine mammals, or public health issues like red tide or marine pharmaceuticals.

*Eligible Applicants & Types of Support:* Formal or informal education institutions, nonprofits, commercial organizations, and state, local and Indian tribal governments.

*Amount of funds awarded:* Total funding for 2006: \$150,000; awards typically \$10,000 to \$25,000.

*Information:* [http://www.nmsfocean.org/docs/oatf\\_rfp.doc](http://www.nmsfocean.org/docs/oatf_rfp.doc)

**National Park Service (NPS), Rivers, Trails and Conservation Assistance Program:** To provide technical assistance to citizen groups, local communities, and governments working to conserve river corridors and watersheds and to establish trails and greenways.

*Information:* <http://www.nps.gov/rtca>

**National Resources Conservation Service (NRCS), Wildlife Habitat Incentive Program (WHIP):** This is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land.

*Information:* <http://www.nrcs.usda.gov/programs/whip/>

**National Resources Conservation Service (NRCS), Environmental Quality Incentive Program (EQIP):** This program provides a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

*Information:* <http://www.nrcs.usda.gov/programs/eqip/>

**National Resources Conservation Service (NRCS), Conservation Innovation Grants:** This is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production.

*Information:* <http://www.nrcs.usda.gov/programs/cig/>

**U.S. Fish and Wildlife Service, Division of Bird Habitat Conservation North American Wetlands Conservation Act (NAWCA) Grants Program:** Provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands conservation projects in the United States, Canada, and Mexico.

*Amount of funds awarded:* Small grants less than 25,000; larger grants in Standard grants program.

*Information:* <http://www.fws.gov/birdhabitat/NAWCA/grants.htm>

**U.S. Fish and Wildlife Endangered Species grants to States, territories and private landowners:** The Private Stewardship program provides grants and other assistance to individuals and groups involved in local, private and voluntary conservation efforts that benefit federally listed, proposed or candidate species or other at-risk species. A ten percent match of cash or through in-kind contribution is required. Private landowners are eligible, and in Fiscal Year 2004, more than \$7 million was awarded.

*Information:* <http://www.fws.gov/endangered/grants/index.html>

**Water & Watersheds Research; U. S. Dept. of Agriculture (USDA), U.S. EPA, & the National Science Foundation (NSF):** The goal of this competition is to develop an improved understanding of the natural and anthropogenic processes that govern the quality, and availability of water resources in natural and human-dominated systems.

*Eligible Applicants & Types of Support:* Areas of interest include: Biological and Ecological Research, Hydrologic, Geochemical, and Engineering Research, Social Science Research. Proposals on the following will not be considered in this competition: industrial accidents, spills, routine monitoring projects, routine application of well-established

models, projects involving site-specific remediation practices, drinking water treatment and distribution, point-source waste-water treatment and sanitary sewerage infrastructure, and research on human health effects.

*Amount of funds awarded:* \$75,000 to \$500,000

*Information:* <http://es.epa.gov/ncer/rfa/archive/grants/96/96wwsann.html>

### **National Funding Organizations**

***Ben and Jerry's Foundation:*** Offers competitive grants to not-for-profit, grassroots organizations throughout the United States which facilitate progressive social change by addressing the underlying conditions of societal and environmental problems.

*Eligible Applicants & Types of Support:* The Ben & Jerry's Foundation does not fund:

- Discretionary or emergency requests, colleges or universities, individuals or scholarship, programs, research projects, capital campaigns, state agencies, religious programs
- international or foreign-based programs, social service programs.

*Amount of funds awarded:* Up to \$15,000

*Information:* <http://www.benjerry.com/foundation/guidelines.html>

***Boat US Foundation:*** To support education & hands on efforts to clean up the boating environment.

*Eligible Applicants & Types of Support:* Local community organizations focusing on promoting safe boating practices, clean boating education.

*Amount of funds awarded:* Up to \$4,000

*Information:* <http://www.boatus.com/foundation/#>

***Home Depot – Environmental Grants:*** To promote the most effective environmental effect, such as by supporting sustainable and green building practices, forestry & ecology, recycling & clean-up, lead poisoning prevention, & consumer education.

*Information:* <http://www.homedepotfoundation.org/>

***Ludwick Family Foundation:*** To support environmental organizations.

*Eligible Applicants & Types of Support:* 501c3 nonprofit organizations. New vehicles or equipment, equipment replacement and modernization, improvements to facilities, and educational materials.

*Amount of funds awarded:* Grants range from \$5,000 to \$50,000

*Information:* <http://www.ludwick.org>

***National Fish and Wildlife Foundation (NFWF):*** NFWF conserves healthy populations of fish, wildlife and plants, on land and in the sea, through creative and respectful partnerships, sustainable solutions, and better education.

*Information:* <http://www.nfwf.org/>

***The Ocean Fund, founded by Royal Caribbean International and Celebrity Cruises:*** To support marine conservation organizations in their efforts to preserve the world's oceans.

*Eligible Applicants & Types of Support:* Non-profit groups and institutions conducting activities directly related to marine conservation, including research, education and innovative technologies.

*Amount of funds awarded:* averages \$25,000-\$50,000, but no maximum

*Information:* <http://www.royalcaribbean.com/ourCompany/environment/oceanFund.do>

***The David and Lucile Packard Foundation Conservation and Science Program:*** The Conservation and Science Program is focused on the challenge of sustainability, finding paths for human progress that protect and restore the ecological systems upon which all life depends.

*Eligible Applicants & Types of Support:* 501c3 nonprofit organizations in areas of oceans and coasts and atmosphere. Coastal systems program for Western Pacific islands only.

*Amount of funds awarded:* Varies.

*Information:* <http://www.packard.org/categoryList.aspx?RootCatID=3&CategoryID=61>

**PADI Foundation grants:** To encourage the understanding & preservation of the aquatic environment, and to encourage sensitivity to and protection of underwater life.

National Fish and Wildlife Foundation, has a variety of grant programs:

**Eligible Applicants & Types of Support:** All applicants, Projects should enrich mankind's understanding of the aquatic environment and encourage sensitivity to and protection of the delicate ecological balance of underwater life.

**Amount of funds awarded:** Up to \$20,000, typical award \$5,000 to \$10,000

**Information:** <http://www.padifoundation.org/>

**Project AWARE Foundation grants:** Project AWARE is committed to conserving and preserving the aquatic environment and its resources.

**Eligible Applicants & Types of Support:** All applicants. Public education (formal and informal), grass roots conservation and enhancement projects, environmentally focused research that leads to conservation measures, public awareness initiatives, Environmental assessment and monitoring projects, volunteer-supported community activism.

**Amount of funds awarded:** \$1,000-\$10,000

**Information:** <http://www.projectaware.org/americas/english/grants.asp>

**Sea World and Busch Gardens Conservation Fund:**

**Eligible Applicants & Types of Support:** All applicants. The primary focus is to support conservation efforts directly benefiting wildlife in their native ranges (in-situ). Project areas include: Species Research – Aquatic, Species Research – Terrestrial, Habitat Protection, Animal Rescue & Rehabilitation, Conservation Education

**Amount of funds awarded:** Usually between \$5,000 and \$25,000.

**Information:** <http://www.swbg-conservationfund.org/>

**Switzer Foundation Environmental Fellowship Award Program; Switzer Foundation:** To support projects that have direct, early, & measurable results in improving the quality of the natural environment.

**Eligible Applicants & Types of Support:** Graduate students in environmental fields

**Amount of funds awarded:** A one year \$13,000 cash award.

**Information:** <http://www.switzernetwork.org/>

**The Tom's of Maine Grant Program:**

**Eligible Applicants & Types of Support:** 501c3 nonprofit organizations. Funded projects must integrate two areas of giving which the Tom's of Maine support; such as environment and education; environment and the arts, or environment and human needs of youth, disabled people, and indigenous people. They are moving towards grants funding core missions and leadership development programs.

**Amount of funds awarded:** Grants range from \$1,000 to \$10,000.

**Information:** <http://www.tomsomaine.com/toms/community/grants.asp>

**Other resources for funding sources:**

Coastal Listserve is a coastal engineering list, and members post job listings and grant opportunities related to the coastal zone. [www.switzernetwork.org/fellowship-overview.html](http://www.switzernetwork.org/fellowship-overview.html)[http://udel.edu/mailman/listinfo/coastal\\_list](http://udel.edu/mailman/listinfo/coastal_list)

EPA's Catalog of Federal Funding Sources for Watershed Protection: <http://cfpub.epa.gov/fedfund/>

The Foundation Center, Grantmaker Web sites: <http://fdncenter.org/funders/grantmaker/>

The Foundation Center, request for proposals announcements: [http://fdncenter.org/pnd/rfp/cat\\_environment.jhtml](http://fdncenter.org/pnd/rfp/cat_environment.jhtml)

Invasive Species Manager's Tool Kit - Grants & Funding: <http://www.invasivespeciesinfo.gov/toolkit/grants.shtml#2005>

NOAA's Coral Listserve also provides a forum for discussion of coral reef health and monitoring; members post job listings and grant opportunities related to coral reefs: <http://coral.aoml.noaa.gov/mailman/listinfo/coral-list/>

NOAA's FishNews provides weekly updates with regards to the nation's fisheries; includes public notices about research reports, draft rules impacting fisheries as well as grant opportunities announcements. <http://www.nmfs.noaa.gov/fishnews.htm>

## SUMMARY OF REGULATIONS

### LOCAL/STATE REGULATIONS

#### **Statutory Authority to Designate Marine Managed Areas**

DLNR/DAR has sufficient legal authority to establish a variety of marine managed areas based on existing statutes, however this process by its very nature requires significant public input and as been applied to date on a site by site basis. See Antolini et al (2003) for a complete analysis of the statutes enabling DLNR to establish marine managed areas. A brief summary the statutes that are applicable to DAR follow, additional statutory authority also exists within the Division of Forestry and Wildlife and with the Kaho'olawe Island Reserve Commission:

**Hawai'i Revised Statute (HRS) Chapter 187A-2(3) Powers and duties of department** – The department shall establish, manage, and regulate...marine life conservation districts, shoreline fishery management areas, refuges, and other areas pursuant to title 12.

**HRS Chapter 187A-5: Rules.** Subject to chapter 91, the department shall adopt, amend, and repeal rules for...the conservation and allocation of the natural supply of aquatic life in any area. The rules may include the following: (1) Size limits; (2) Bag limits; (3) Open and closed fishing seasons; (4) Specifications and numbers of fishing or taking gear which may be used or possessed; and (5) Prescribe and limit the kind and amount of bait that may be used in the taking of aquatic life, and the conditions for entry into areas for taking aquatic life.

**HRS Chapter 188-22.6** – Designation of community based subsistence fishing area. (a) The DLNR may designate community based subsistence fishing areas and carry out fishery management strategies for such areas, through administrative rules adopted pursuant to chapter 91, for the purpose of reaffirming and protecting fishing practices customarily and traditionally exercised for purposes of native Hawaiian subsistence, culture, and religion.

**HRS Chapter 188-53** – Fishing reserves, refuges, and public fishing areas. (a) For the purposes of managing, preserving, protecting, conserving, and propagating..., the DLNR may establish, maintain, manage, and operate freshwater or marine fishing reserves, refuges, and public fishing areas.... The department may make, adopt, and amend rules and may issue permits as it deems necessary for managing the

fishing reserves, refuges, public fishing areas, and other waters or lands under the jurisdiction or control of the State.

**HRS Chapter 190** – Marine Life Conservation Program. This chapter authorizes the department to establish and modify conservation districts with rules that may prohibit activities that may disturb, degrade, or alter the marine environment, establish open and closed seasons, designate areas in which all or any one or more species may not be taken, prescribe and limit the methods of fishing, and otherwise regulate the fishing and taking of marine life.

**HRS Chapter 188F-3** – West Hawai'i regional fishery management area: purpose:... (1) Ensure the sustainability of the State's nearshore ocean resources;... (3) Provide management plans as well as implementing regulations for minimizing user conflicts and resource depletion, through the designation of sections of coastal waters in the West Hawai'i regional fishery management area as fish replenishment areas where certain specified fish harvesting activities are prohibited, and other areas where anchoring and ocean recreation activities are restricted;... (7) Provide for substantive involvement of the community in resource management decisions for this area through facilitated dialogues between community residents and resource users.

**Fishing Regulations** – See the DLNR's Division of Aquatics website for fishing regulations: [http://www.hawaii.gov/dlnr/dar/fish\\_regs/index.htm](http://www.hawaii.gov/dlnr/dar/fish_regs/index.htm)

**Boating regulations** – DLNR, Division of Boating and Ocean Recreation <http://www.hawaii.gov/dlnr/dbor/borrules.htm>  
Frequently Asked Questions: <http://www.hawaii.gov/dlnr/dbor/borrekn.html>

**Department of Land and Natural Resources, frequently asked questions, by division or by search term** – [http://hawaiideptland.custhelp.com/cgi-bin/hawaiideptland.cfg/php/enduser/std\\_alp.php](http://hawaiideptland.custhelp.com/cgi-bin/hawaiideptland.cfg/php/enduser/std_alp.php)

**Hawai'i Coastal Zone Management** – Hawai'i revised statute Chapter 205A: This statute sets up Hawaii's coastal zone management program and provides objectives, policies and guidelines for all agencies charged with adhering to these policies.

[http://www.capitol.hawaii.gov/hrscurrent/Vol04\\_Ch02010257/HRS0205A/HRS\\_0205A-.htm](http://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch02010257/HRS0205A/HRS_0205A-.htm)

**Water Quality Standards, Hawai'i Administrative Rule (HAR) 11-54** – General policy of water quality anti-degradation: 1) Existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. 2) Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the director finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located.... 3) Where high quality waters constitute an outstanding national resource, such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

**Water pollution control, Hawai'i Revised Statute (HRS) 342D-50** – No person, including any public body, shall discharge any water pollutant into state waters, or cause or allow any water pollutant to enter state waters except in compliance with this chapter, rules adopted pursuant to this chapter, or a permit or variance issued by the director.

#### FEDERAL LAWS

**Clean Water Act (CWA)** – In 1972, the Clean Water Act, then the Federal Water Pollution Control Act, was created. Over the years it has had several amendments and modifications, as well as other acts passed to work in coordination with CWA. The statute was implemented to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters” (33 USCA § 1251(a)) as its main goal. The Environmental Protection Agency (EPA) works with the state to set standards of acceptable levels of pollutants in water bodies in order to ensure a designated water quality standard. Point source polluters must either have a permit to continue dumping, must meet the standards allowed for release, or must not discharge anything that will disrupt the integrity of the water body.

Communities can intervene in the permitting process, can file administrative appeals if they feel a point source is not complying with the standards, or they can sue to enforce regulation and monitoring to be performed. Also, the EPA regularly holds public meetings to gather input on the adequacy of water quality standards set. Any opportunity arising through agency processes instilled through the CWA is a place for collaborative processes to enhance the effectiveness of the CWA on specific bodies of water. This may work effectively through a collaborative structure that continually monitors water quality and overall status of a specific body of water to stay informed so that when critical processes or stages of processes open for public involvement they can be maximized to meet your group's goal.

Under Section 404 of the Clean Water Act (CWA), the United States Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA) jointly regulate the discharge of dredged and fill material into U.S. waters through a permit review process. Individual and general permits are granted by the USACE. Permit applicants must prove they have taken steps to avoid wetland impacts where practicable, minimized potential impacts to wetlands, and provided compensation for any remaining, unavoidable impacts. Section 401 of the CWA gives the state the authority to review and approve, condition, or deny all Federal permits that might result in discharge to State waters.

**Coastal Zone Management Act (CZMA)** – The CZMA established a voluntary national program within the Department of Commerce to encourage coastal States to develop and implement their own coastal zone management plans, consistent with the federal law and its goals. The goals of the act are “to preserve, protect, develop, enhance and restore, where possible, the coastal resources.” The National Estuarine Research Reserves system was created in 1972 with the passage of CZMA. The Act also provided funds for states to assist in the management of the coastal zone. In 1990, a section was added to reduce nonpoint source pollution of coastal waters, requiring states that have a CZM program to develop and implement coastal nonpoint pollution control programs. Check out the Department of Health's Clean Water Branch, Polluted Runoff Control Program:

<http://www.hawaii.gov/health/environmental/water/cleanwater/prc/index.html>

**Endangered Species Act (ESA)** – The ESA is key legislation for community stewards who may be dealing with an issue involving an endangered or threatened species. It is helpful to understand the basics of this statute even if your issue is not directly affected by ESA, because recommendations given by your group may not be feasible for implementation due to extenuating circumstances. In 1973 the ESA achieved approval by Congress as a means to conserve, restore, and protect endangered and threatened species and their habitats. The ESA consists of five key regulations addressing: how a species gets listed, the process for consulting federal actions, a prohibition of “taking” a listed species, the process for getting a permit to “take”, and enforcement mandates of the act. A species is listed based on scientific and commercial data proving its immediate danger of extinction or likelihood to become endangered. The second step simply determines whether a listed species may be present on federal land, like a national forest, and - if it is in jeopardy -what actions should be taken to avoid species harm. The third and fourth components define what it means to “take” (kill, injure, or harm) a species and the process rules for determining whether a permit to incidentally “take” it is reasonable under certain circumstances. Finally, enforcement of ESA is the responsibility of the U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration (NOAA), but citizens also have standing to stop an agency violation of the mandate. Although ESA allows for citizen standing, overall the act is not really open to public participation, with the exception of aiding in developing and implementing a recovery plan for a species.

**Marine Mammal Protection Act (MMPA)** – The Marine Mammal Protection Act was enacted in 1972 due to worldwide concern about the status of marine mammals and concern about human impacts on these species. The MMPA prohibits the take of marine mammals through a moratorium on the take of species (a “complete cessation of the taking of marine mammals and a complete ban on the importation into the United States of marine mammals and marine mammal products” Section 1362 [7], (16 U.S.C. 1362 [7])), a long term research effort to better understand

the animals and their environment and a set of prohibitions and penalties for violation of the act. Implementation of the act is split between the NOAA (through NOAA Fisheries) and the U.S Fish and Wildlife Service (FWS). NOAA Fisheries is responsible for cetaceans (whales, dolphins and porpoises), and all members, except walruses of the order Pinnipedia (seals and sea lions). The FWS is responsible for all other marine mammals including sea otters, polar bears, walruses, manatees and dugongs.

**Migratory Bird Treaty Act** – The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful. Thus it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not.

**National Environmental Policy Act (NEPA)** – This act was passed in 1969 as a formal environmental policy mandate. Any federal action that may have a significant effect on the environment must undergo what’s commonly referred to as the “NEPA process,” as a means of ensuring consideration for environmental protection. Agencies must prepare an Environmental Analysis, which covers potential environmental effects of the proposed federal action. If it reveals that significant changes will occur in environmental quality due to the proposed action, the agency must then provide an environmental impact statement. This “EIS,” as it is known, includes a description of what the significant environmental impacts will be for a given action, and some reasonable alternatives to the proposed action. NEPA is also an important law to consider because it actually promotes collaboration between agencies and the public throughout the process. The public can help scope the significant issues to include in the EIS, and then the public can comment on the draft EIS – to which the agency must respond – before a final one is produced. Collaboration among stakeholders is a great way to influence a particular NEPA process. However, some stakeholders feel that any “collaboration” through NEPA is merely advisory, since the agency is still the ultimate decision making authority and must only

“consider” the public’s opinion. The best way to get the most out of a NEPA collaboration is by creating a group of local stakeholders that addresses the scope of the EIS early on and can pull together what could be widely different opinions of the general public.



## HAWAII'S MARINE RESOURCES

### HISTORICAL CONTEXT

#### How Hawaiians Took Care of Resources

When Polynesians first came and settled in the islands, their philosophy and spiritual beliefs were embedded in natural customs and in preserving a sustainable way of life. Nature was seen as equal to human living and treated in unity with the existence of day-to-day life. Nature and the Gods formed the Hawaiians way of living and spiritual belief system.

The term *Aloha Aina* encompasses this framework meaning “love for the land”. With this tradition, the Hawaiian people believe that they do not possess or own land or resources but maintain stewardship over it. The Hawaiian people began this with their planting and fishing practices based on natural elements such as the moon phases or changes in the rainy to dry seasons. This is the core of the Hawaiian conservation and resource methods. *Ahupua'a*, is the traditional way of dividing the land from the mountains to the sea. It is the basic unit of Hawaiian natural and cultural resource management. Natural elements are seen as interconnected and interdependent, and land management must take all aspects of the land into account.

#### Fishing

The ocean plays a central role in the Hawaiian way of life. Early Hawaiians called the ocean *'aina*, “that which nourishes”. The vastness of the ocean was seen not only to provide sustenance and nourish their physical bodies, but their mind and spirits as well. Fishing was central to life and was practiced by everyone in the community. These fishing practices differ from the large fishing industries today. *Akua*, was not to be insulted by over consumption and fish was caught in a sustainable and non-wasteful way. Sharing amongst others was also demonstrated and kept the balance of fish in check, with the practice of “*pono*.” The fishing areas, *ko'a* were well cared for and no more than what was needed left the ocean. This message was passed down to generations and with gratitude for what the sea brought. *Kapu*, was the set of regulations that guided people's behavior. The *Kapu* reflected natural cycles, following spawning and tides of local areas. Failure to comply with these rules met with strict punishment, in order to keep a necessary balance. Since these rules led

to a respected balance of the natural world and human interaction, resources were plentifully and there was always enough for everyone to continue to thrive. Native Hawaiians indicate fishing as greatly important to their culture by leaving offerings and praying at the *ko'a* before fishing. The first fish caught were often left there as an offering to *Ku'ula*, the principal god of fishermen.

#### HOW THE ISLANDS WERE CREATED

In early Hawaiian tradition, there was a time when the air was surrounded with spiritual beings and a thin divide between the living and the dead occurred. The natural and the supernatural were undivided and spiritual beings could protect or harm you based on the way you lived. During that time *Pele*, goddess of the volcano, came to Hawai'i. Having traveled for many miles in search of a suitable home for her fire, *Pele* settled in the crater of Halema 'uma 'u at the summit of Kilauea.

The Hawaiian Islands sit on the creator of the island chain, the Hawaiian hotspot. The Pacific plate moves through time allowing the volcanoes to move with the sea floor. The age trend allows the formation of the islands to occur moving with the floor of the North Pacific Ocean. The Pacific Ocean is mostly floored by a single tectonic plate (known as the “Pacific Plate”) that is moving over the layer in the Earth known as the asthenosphere. As the plate moves over a fixed spot deeper in the Earth where magma (molten lava) forms, a new volcano can punch through this

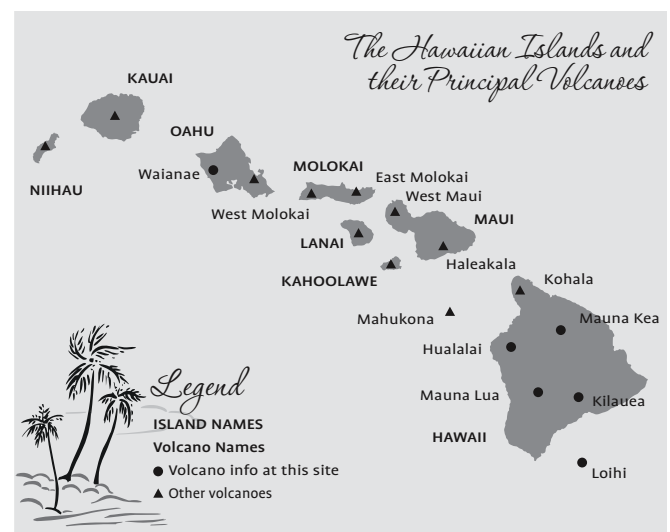


plate and create an island. The result of this movement can be the creation of islands, such as Hawai'i. As the plate moves away, the volcano stops erupting and a new one is formed in its place. Over time, the volcanoes keep drifting westward and get older relative to more active and younger volcanoes. As they age, the crust upon which they sit cools and subsides. This combined with erosion of the islands stops active volcanism and leads to the shrinking of the islands.

#### **IMPORTANCE OF HAWAII'S MARINE RESOURCES**

Hawaiian marine resources are extremely precious based on economic and ecological value to coastal communities and their wildlife. Plant, animal & sea life, as well as people on a worldwide scale depend on these resources for various functions.

#### **Biodiversity**

Biodiversity encompasses the diversity of genes within species of the ecosystems, and the ecosystems themselves. For example, coral reefs are considered a diverse ecosystem with numerous aquatic species. Biodiversity within ecosystems provides a wealth of essential goods and services which human's well-being depends on. Essential goods come in the form of foods, fuels, fibers, and medicines. The vast majority of plants, fungi, and microorganisms have potential to provide medicinal properties. Further values of biodiversity lie in the inspiration experienced in watching rare species or exploring the wilderness. Causes of species endangerment and extinction include destruction of habitat, over harvesting, and the introduction of non-native species into new areas. The coral reefs found in Hawai'i have a high level of biological diversity, with 93,000 species already identified by scientists. Diversity is critical in maintaining a delicate balance in Hawaii's unique ecosystem.

#### **Coastal Protection**

Coral reefs protect coastlines and help prevent erosion. They act as natural barriers by absorbing the force of storm waves and reducing damage to the shoreline. With the increase in coastal community populations living by the sea side, erosion is a serious problem that needs to be considered when building up community development. By using corals as a barrier to protect beach areas, the

development build up changes beach shapes and the flow of currents, altering the corals ability to provide protection for marine life and the erosion of land.

#### **Seafood**

Hawaii's marine resources stem from its coral reef and coastal communities. It is a major source of protein and income for the island communities. The reef can yield amounts of 15 tons of fish per kilometer per year (on average) if using sustainable methods. Recently, this balance has been exceeded, with the introduction of increased fishing technology and an increase in population.

#### **Economic Value - Tourism/Recreation**

Hawaii's coral reefs generate \$360 million a year for Hawaii's economy, based on reef-related tourism and fisheries activities. The overall value of the state's 410,000 acres of reef area is estimated at \$10 billion (Cesar et al, 2002). The marine ecosystem provides many Hawaiian residents with jobs and income through both tourism and fishing. Tourism has most often been viewed from a demand perspective rather than a supply perspective, with most attention given to marketing and promotion rather than managing the resources on which tourism depends. More recently, in the face of negative environmental impacts, resource conflicts have occurred. The recognition of tourism as a resource-based industry has emerged as a result of damaged reef. The concept of sustainable tourism is now widely embraced although it is very challenging to implement. Sustainable tourism can be defined as: "tourism that operates within natural capacities for the regeneration and future productivity of natural resources, and recognize the contribution that people and communities make the tourism experience"

#### **Aesthetic & Cultural Value**

The coral reefs and coastal areas in Hawai'i are one of the most unique and colorful environments in the world. The breath taking beauty of the reefs and associated marine life captivate snorkelers, divers and other marine enthusiasts. The reefs also represent a culturally significant area to the communities within Hawai'i and hold a special place in traditional Hawaiian culture.

### **New Medicines**

An increasing number of marine species located on Hawaii's coast and within the reef systems have been found to contain compounds that can be used in medicine (biomedical compounds), including some applied to the treatment of HIV, cancer, ulcers and cardiovascular diseases. In addition, the unique skeletal structure of coral has been used to make forms of bone grafting materials. Hawaii's physical setting and extensive marine science research facilities have made the state a significant player in the marine biotechnology industry.

### **COMMON MARINE SPECIES**

Marine habitats are divided into 3 major zones: littoral, sublittoral and deep sea. These areas are important and dependent upon each other and the species that coexist within them. Food webs play an interactive role in allowing for species variety to cooperate and work within the food chain.

Hawaii's fish populations are very intelligent and have learned to adapt to their surroundings. Over time they have passed on genetic traits, which make their offspring more adapted for survival in Hawaiian waters. Such traits include: a variety of diets, varying fish faces depending on their diets, body shapes and camouflage to hide from predators, and coloring to confuse predators such as the "false eye" located on the tail of many fish.

Hawaii's Endangered Marine Animals: Humpback whale, Green sea turtle, Hawksbill sea turtle, Leatherback turtle, Loggerhead turtle, Olive ridley turtle, and Hawaiian monk seal.

Endemic Fish Species: Bandit angelfish, Hawaiian cleaner wrasse, Milletseed butterfly fish, Multiband butterfly fish, Saddle wrasse, Whitesaddle goatfish

Hawaii's Common Fish Species: Banded coral shrimp, Black durgon, Collector urchin, Eagle ray, Fantail filefish, Green linckia star, Hawaiian dascyllus, Moorish idol, Ornate butterfly fish, Ornate octopus, Palenose parrotfish, Raccoon butterfly fish, Reef triggerfish, Sea cucumber, Sea slug, Slate pencil sea urchin, Spotted trunkfish, Stripebelly puffer fish, Trumpet fish, Vermillion clathria sponge.

### **OTHER THREATS TO THE MARINE ENVIRONMENT**

In addition to problems of land based pollution, overfishing, recreational overuse and invasive species, marine pollution, global warming, disease and natural events are threatening reefs as well.

**Marine Pollution** – Reefs are harmed when human, animal waste and/or fertilizer is dumped into the ocean via storm drains or when river systems or runoff during storm events carry these pollutants to reef waters. These pollutants increase the level of nitrogen around coral reefs, potentially causing an overgrowth of algae, which smothers the reefs by cutting off their sunlight. Floating trash also kills coral reef animals and can cover reefs, blocking off sunlight that polyps need to survive. Turtles often mistake plastic bags for jellyfish and eat them, blocking their digestive tract and causing them to starve to death.

**Global warming, coral bleaching and natural events** – Global warming is caused by the accumulation of carbon dioxide and other heat-trapping gasses in the atmosphere. These gases act as a blanket, preventing the heat of the sun to escape through our atmosphere. Ocean warming is a result of global warming and can be extremely dangerous to coral organisms, which are very sensitive to changes in temperature. This occurs when coral polyps, stressed by heat or ultraviolet radiation, expel the algae that live within them. These algae, called zooxanthellae normally provide the coral with up to 80% of their energy, making zooxanthellae essential for coral survival. The algae are also normally responsible for the color of coral, so when they are expelled, the coral appears white or "bleached". Natural events, such as hurricanes can also destroy a reef in just minutes.

### **STATUS OF HAWAII'S MARINE ECOSYSTEMS**

The biggest concern is the sustainability of Hawaii's coral reefs and biodiversity in the future. Long-term datasets are needed to examine and evaluate changes in reef populations and water quality.

The Hawai'i Coral Reef Initiative Research Program (HCRI-RP) supports scientific research and monitoring to enhance the state's capacity to manage coral reef ecosystems. The Hawai'i Department of Land and Natural Resources/ Division of Aquatic Resources (DLNR/DAR) and the



University of Hawai'i (UH) jointly manage HCRI-RP. HCRI-RP sponsor research and monitoring of the states' coastal reef ecosystems to understand the impacts of human activity on reef ecosystem. Results are used to provide resource managers with information to help them effectively and efficiently prevent, and possibly reverse, resource damage and degradation. The group also participates in many education and outreach programs, which follows a mandate for preserving and educating future generations. With organizations such as HCRI-RP Hawai'i can continue to monitor and prevent further degradation to coastal ecosystems amongst the islands.

The current priorities in examining Hawaii's reef systems include: finding the non-economic value, stressors of the coral reefs, tracking down invasive species, limiting fishing pressure, pollution and disease, and monitoring coastal development and recreation. More research is needed to understand the impacts of specific threats on the dynamic relationships among coral, algae, fish, and other reef organisms. Resource assessments and monitoring are crucial to understanding the health of coral reef ecosystems.

## WHAT YOU CAN DO TO PROTECT THE OCEAN

*From Island Stewardship, Guide to preventing water pollution for Maui's Homes and Businesses, and the Coral Reef Outreach Network*

### TO CONTROL RUNOFF AND EROSION

- Use more plants and less concrete and asphalt.
- Divert runoff from pavement and roof drains onto grass or other vegetation
- Don't overwater. Use drip irrigation.

### TO MINIMIZE NUTRIENT BUILD-UP

- Use less fertilizer. Choose slow release fertilizer and apply it conservatively.
- Use phosphate-free biodegradable soaps and detergents.
- Use the bathrooms on shore before going out in a boat.

### TO CONTROL BACTERIA AND VIRUSES

- Never put grease down the drain. It's the #1 cause of raw sewage spills.
- Pick up animal feces and put in trash or toilet.
- Keep garbage dumpsters covered.

### TO CONTROL TOXIC CHEMICALS

- Tolerate more bugs and use fewer pesticides. Use, store, and dispose of pesticides according to instructions on the label.
- Recycle used motor oil and car batteries.
- Learn about safe alternatives to household hazardous chemicals.
- Dispose of household wastes properly. Never put oil, paint, or antifreeze down a storm drain.

### TO REDUCE MARINE DEBRIS

- Recycle glass, plastic, cardboard, aluminum cans, and tires.
- Buy products made from recycled materials.
- Select products with minimal packaging and reusable containers.
- Use tote bags for purchases instead of obtaining hundreds of plastic bags.
- Dispose of your rubbish properly. Don't leave unwanted lines or nets in the water or on the beach. Any kind of litter pollutes the water and can harm the reef and the fish.
- For the last 13 years, cigarette filters were the number one item collected at beach cleanups. Use an ash can, not the sand.

### TO CONSERVE WATER AND ENERGY

- Repair leaks and install water-saving showerheads and toilet flappers.
- Learn about xeriscaping (landscaping to conserve water)

### TO PRESERVE THE REEF

- Never release aquarium or non-native plants or animals into Hawaii's waters. They can become vicious predators and/or carry disease that can kill Hawaii's reefs and fish.
- Stay off the reef when swimming, snorkeling and diving. One touch can harm it. More can kill it.
- Anchoring on the reef can kill it! Look for sandy bottom or use moorings if available.
- Leave marine life alone. Enjoy nature but don't touch or chase animals as many are protected by law.
- Take only the fish you will eat that day. Leave tomorrow's catch in the water. Fishing pressure is one of the most serious threats to Hawaii's coral reef ecosystem and our island lifestyle.

### TO TAKE ACTION

- Support reef-friendly businesses. Ask the fishing, boating, hotel, aquarium, dive or snorkeling operators how they protect the reef. Be sure they care for the living reef ecosystem.
- Be an informed consumer. Ask how the fish and coral were collected, and if the organization responsible is part of a coral reef ecosystem management effort.
- Help reduce pollution by leaving your car at home. Walk, bike or ride the bus.
- Volunteer for or organize reef and beach cleanups and monitoring programs.
- Encourage others to share your concern. Teach them how to protect the reef.
- Help enforce the rules. Help others understand the things they should and should not do.
- Get involved! Write, email or call your legislators to encourage legislation that protects Hawaii's coral reef ecosystem. Discourage them from legislation or rules that can harm the reef.
- Support the creation and maintenance of marine parks and marine protected areas (MPAs)





## GLOSSARY

**Abundance (of species)** – The number of individuals of a particular species occurring within a defined area.

**Ahupua'a** – Land division from the mountains to the sea is the basic unit of Hawaiian natural and cultural resource management.

**Aina** – Ocean, that which nourishes.

**Alien or Introduced Species** – Organisms that were not brought to that location naturally, but by man, such as the Polynesian. The common guava and feral pigs are examples.

**Aloha Aina** – Love of the land, people do not possess or own land and its resources but maintain stewardship over it.

**Anthropogenic** – Human-induced or resulting from human activities; often used to refer to environmental changes, global or local in scale.

**Benthic (zone)** – Occurring at the bottom of a body of water, usually in the depths of the ocean.

**Biodiversity** – The variety and variability of life forms, including genetic and ecosystem diversity, in a defined area at and over time.

**Biomass** – The quantity of living matter (living organisms) expressed as unit of weight per unit area or unit volume.

**Biotechnical** – Combination of a structural or mechanical element and vegetative elements working together to stabilize a site-specific condition. Structural components are employed to allow the establishment of vegetative elements, while at the same time providing a level of protection for stability. Vegetative components serve as a natural erosion and stabilization measure.

**Carrying capacity (humans in an area)** – Number of individuals that the resources of an area can support.

**Chart datum** – Approximately the lowest level due to astronomical effects and excluding meteorological effects.

**Coral cover** – How much of the bottom is covered with living coral.

**Day-use mooring** – A buoy or other device to which boats can be secured without anchoring.

**Deforestation** – The permanent destruction of indigenous forests and woodlands.

**Domain name** – Name of your website in the format www.yournamehere. (com, net, gov, edu, org)

**Ecology** – The study of how organisms interact with each other and their physical environment.

**Ecosystem** – A community of plants, animals, and microorganisms that are linked by energy and nutrient flows and that interact with each other and with the physical environment.

**Effluent** – Wastewater- treated or untreated- that flows out of a treatment plant, sewer, or industrial outfall.

**Endemic** – Organisms that are native and can be found only in that location. Examples of organisms that are endemic to Hawai'i are the spectacled parrotfish, fantail filefish, and Hawaiian Monk Seal.

**Erosion** – The wearing away and removal of materials of the Earth's crust by natural means, including running water, waves, moving ice, wind currents, and chemical solution.

**Fluorescence** – The absorption of light at one wavelength and its re-emission at a longer wavelength. Fluorescence plays an important role in the perceived color of many objects.

**Fringing reef** – A coral reef that forms near the shoreline.

**Geometric Mean** – A measure of central tendency calculated by multiplying a series of numbers and taking the nth root of the product, where n is the number of items in the series. The geometric mean is often used when finding an average for numbers presented as percentages.

**Global Positioning System (GPS)** – A system of satellites and receiving devices used to compute positions on the Earth.

**Goal** – A general summary of the desired state that a project is working to achieve.

**Groundwater** – The supply of freshwater found beneath the Earth's surface, usually in aquifers, which is often used to supply wells and springs.

**Habitat** – The environment in which an animal or plant can normally be found or normally grows.

**Haul out** – When a marine mammal or sea turtle come out of the water to rest, molt or give birth.

**Heterotroph** – Any living organism that obtains its energy from organic substances produced by other organisms. All animals and fungi are heterotrophs, and they include herbivores (plant eaters), carnivores (eats other animals), and saprotrophs (those that feed on dead animal and plant material).

**Ho'okuleana** – To take responsibility.

**Hydrology** – The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

**Hydrometer** – A device used to compare the densities of liquids.

**Impervious (surface)** – Impervious surfaces are mainly constructed surfaces - rooftops, sidewalks, roads, and parking lots - covered by impenetrable materials such as asphalt, concrete, brick, and stone. These materials seal surfaces, repel water and prevent precipitation and meltwater from infiltrating soils. Soils compacted by urban development are also highly impervious.

**Indigenous** – Organisms that are native but can be found elsewhere. An example of this is the Hawaiian Green Sea Turtle.

**Intertidal** – The zone between high and low tide.

**Invasive Species** – Plants, animals, and microbes not native to a region which, when introduced either accidentally or intentionally, out-compete native species for available resources, reproduce prolifically, and dominate regions and ecosystems. Because they often arrive in new areas unaccompanied by their native predators, invasive species can be difficult to control.

**Invertebrate** – An animal without a backbone, such as an urchin or crab.

**Kapu** – The set of regulations that guided people's behavior reflecting natural cycles, following spawning and tides of local areas. Failure to comply with these rules met with strict punishment, in order to keep a necessary balance.

**Keiki** – Child, kid

**Ko'a** – Fishing areas.

**Konohiki** – The administrator for the chief who regulated the fish ponds and who was familiar with the patterns and habits of each fish species. He determined how and when fishing should take place to ensure the survival of the species.

**Kupuna** – Grandparent, ancestor

**Lagoon** – A shallow sound or body of water, connected to a larger body of water.

**Marine debris** – Marine debris is any type of manufactured or manmade material that enters the coastal or marine environment via a stream, outfalls, tossed by beachgoers, or lost by boats at sea.

**Meniscus** – The curved top of a column of liquid in a small tube.

**Monitoring** – The periodic collection and evaluation of data relative to stated project goals, objectives and activities.

**Native** – Organisms brought to a location without the help of man, such as by wind, wave and or birds.

**Nephelometric turbidity units (NTU)** – A measure of the clarity of water. Turbidity is measured with an instrument called a nephelometer, which measures the intensity of light scattered by suspended matter in the water. Turbidity in excess of 5 NTU is just noticeable to the average person.

**Non-governmental organizations** – Sometimes referred to as nonprofit (not for profit) organizations or organizations not government related, these organizations are formed to assist, work with or represent communities in a variety of topics.

**Nonpoint source** – Sources of pollution discharged over a wide land area, not from one specific location. These sources include urban runoff, agricultural runoff, erosion, construction, and mining.

**Nutrient loading** – The introduction of excessive amounts of nutrients such as nitrogen or phosphorus from fertilizers into the soil or water, usually via non-point source runoff and sewage effluent. Nutrient loading often leads to algal blooms.

**Objective** – A specific statement detailing the desired accomplishments or outcomes of a project.



**Pathogenic microorganisms** – Microorganisms that can cause disease in other organisms or in humans, animals, and plants.

**Photosynthesis** – The process by which plants use light energy trapped by chlorophyll to convert water and carbon dioxide into stored energy or food.

**Poaching** – Illegal fishing. It may be illegal because – It is not the season to fish. The means used are illegal (using banned types of fishing gear). The person has taken too much. The person is fishing in a “no fishing area”.

**Point source** – A stationary location or fixed facility from which pollutants are discharged or emitted (e.g. pipe, ditch, ship)

**Pollutant** – A substance that adversely alters the physical, chemical or biological properties of the environment.

**Presence/absence** – A monitoring technique that determines simply if an organism is present or not in the sample area.

**Reagent** – A substance used in a chemical reaction to detect, analyze, or produce a characteristic reaction in order to determine the presence of another compound.

**Recharge** – Water that drains through the soil and reaches the water table.

**Reef crest** – The sharp break in slope at seaward margin or edge of reef flat.

**Reef flat** – The shallow area between the shoreline intertidal zone and the reef crest of a fringing reef.

**Refractometer** – An instrument which measures the bending (refraction) of light through a liquid. It can be used to measure the salinity of water.

**Respiration** – The metabolic process by which plants and animals convert food to energy.

**Restoration** – Repair or reconstruction of a damaged ecosystem or habitat..

**Runoff** – Water from precipitation or irrigation that flows over the ground and into bodies of water. It can contribute to soil erosion and carry harmful pollutants.

**Secchi disk** – The Secchi disk is used to measure how deep a person can see into the water. To obtain a measurement, the disk is lowered into the water while observing the depth at which it disappears. The disk is then raised until it reappears. The depth of the water where the disk vanishes and reappears is the Secchi disk reading. The depth level reading on the tape at the surface level of the water body is recorded to the nearest foot.

**Sedimentation** – Settling of particulate matter in water related to particle size, water velocity, and water flow.

**Spectrophotometer** – A photometer (a device for measuring light intensity) that can measure intensity as a function of the color, or more specifically, the wavelength of light.

**Stakeholder** – Individuals who will be affected by an issue or the resolution of that issue.

**Stewardship** – Care or management of land or waters and passing healthy ecosystems to future generations.

**Stranding** – The term “stranding” is used for marine mammals (seals, dolphins, whales) and sea turtles that are found on the beach either dead or alive. Injury or death in seals can be attributed to – shark bites, parasites, respiratory ailments, or human inflicted causes such as net entanglement, vessel strike, toxic pollution and ingestion of plastics.

**Stream velocity** – The speed at which water flows through a stream. The higher the velocity, the greater the erosive force of the stream.

**Substrate** – The surface or material on which an organism lives--rock, sand, mud, pilings, shells.

**Sustainable** – Referring to an activity that is able to be carried out without damaging the long-term health and integrity of natural and cultural environments.

**Tidepool** – A tidepool is a rocky pool by the ocean that is filled with seawater, which forms when the ocean covers the beach twice a day during the tides.

**Toxin** – A toxin is a substance that is capable of inducing adverse effects (i.e. illness, organ dysfunction, or death) to living organisms.

**Transect** – An area of land or seafloor sectioned off, usually in the form of a long, continuous strip and used to survey the distribution of organisms or substrate across a given area. Sample plots or points are established along the transect for collecting data.

**Water table** – The upper limit of saturated ground in an aquifer.

**Watershed** – A geographic area in which water, sediments, and dissolved materials drain to a common outlet- to a point on a larger stream, lake underlying aquifer, estuary, or ocean.

**Webmaster** – An individual who manages a Web site. Depending on the size of the site, the Webmaster might be responsible for any of the following – making sure that the Web server hardware and software is running properly, designing the Web site, creating and updating Web pages, replying to user feedback, monitoring traffic through the site.

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