

# Molokini Shoal Marine Life Conservation District



Photo by Manuel Mejia

## Conservation Action Plan

Vision: To maintain and preserve the ecological quality of the Molokini MLCD, while providing a sustainable, enriching, and educational recreational experience.



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# Table of Contents



Planning Process

3

Project Background

3

Why We Are Concerned

4

What We Are Protecting

6

Target 1: Coral Reef Ecosystem

6

Target 2: Apex Predators

7

Target 3: Seabird Nesting and Resting Habitat

7

Target 4: Place-Based Nature Experience

7

Status of Conservation Targets

8

Threats to Targets

8

Objective and Strategy

9

Accomplishments

10

Measuring Our Success

10

Acronyms

12

References

13

### Planning Process

The Molokini Shoal Marine Life Conservation District (MLCD) is managed by the State of Hawai'i, Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR). DAR's mission is to manage, conserve and restore the state's unique aquatic resources and ecosystems for present and future generations. In collaboration with DAR, the Department's Division of Boating and Ocean Recreation (DOBOR) has jurisdiction over the Day-use Mooring Buoy (DMB) system utilized within the MLCD. DOBOR's mission is to enrich the lives of Hawai'i's residents and visitors by providing facilities for recreational boating and supporting opportunities for ocean activities.

This plan was developed by a dedicated, multidisciplinary team convened by DAR Maui, to preserve both the biological and social resources of Molokini today and to ensure Molokini Shoal continues to thrive and be enjoyed by the public well into the future. The team met at four workshops from 2011 to 2013 in a series of Conservation Action Planning (CAP) workshops facilitated by The Nature Conservancy (TNC) and supported by the National Oceanic and Atmospheric Administration Coral Reef Conservation Program. Two other project teams participated in the workshops - Kaho'olawe Island Reserve Commission and the Wahikuli-Honokōwai coastal area. Peer review from managers of these sites, which face similar coral reef conservation issues, was critical in the planning process as it provided additional expertise, alternative perspectives and synergistic opportunities throughout.

The project team used the CAP process to develop focused strategies and measures of success. Applying the CAP process provided practitioners a common approach and language for conservation planning and the opportunity for candid exchange and peer review. It provided an objective, consistent and transparent accounting of conservation actions and the intended and actual outcomes of conservation projects. This plan will enable project staff to responsively adapt their actions to improve strategy effectiveness and achieve greater conservation impact.

The project team is coordinated by NOAA/DAR Coral Reef Management Fellow Anne Rosinski. Current members are: Emma Anders (DAR O'ahu); Dr. Alan Friedlander (UH); Elia Herman (DLNR - Hawaiian



Photo by TNC

Figure 1. The three planning teams on a field trip to Molokini.

Islands Humpback Whale National Marine Sanctuary); Hal Koike University of Hawai'i (UH); Manuel Mejia (TNC); Paul Sesano (DLNR - DOBOR); Russell Sparks (DAR Maui); and Dr. Brian Szuster (UH).

### Project Background

#### Site Description

The Molokini Shoal MLCD consists of one square mile of marine area surrounding Molokini islet, a crescent-shaped, partially submerged extinct volcanic crater. Molokini is located within the 'Alalākeiki Channel about three miles off Maui's southwestern coast. The islet is managed by the U.S. Fish and Wildlife Service (USFWS) as a Bird Sanctuary to protect a large colony of nesting seabirds including 'ua'u kani (wedge-tailed shearwater or *Puffinus pacificus*) and to help restore native plants including 'ihi (*Portulaca molokiniensis*).

The crater's submerged floor forms a shallow inner cove, which along with an area of deeper water around the crater, comprises the state-managed Molokini Shoal MLCD (Figure 1). Subzone A of the MLCD includes a shallow reef extending from the shoreline northward to the islet's northwestern point. Subzone B is comprised of a sharp slope that extends to a depth of about 100 feet before dropping off to more than 250 feet. No extractive take is allowed within Subzone A, while in Subzone B, fishing is allowed by trolling only. The MLCD, especially the shallow areas, is heavily used for marine recreation activities.



Figure 2. Regulated areas of the Molokini Shoal MLCD and the USFWS Bird Sanctuary.

### Cultural History

The origins of the Molokini crater have been described in numerous mo‘olelo (stories) and oli (chants) that have connections to the four major gods of Hawai‘i: Kū, Kāne, Kanaloa, and Lono (Severns & Fiene, 2008). These stories describe the direct connection between Molokini and the birth of Kaho‘olawe, whose placenta was cut by Uluhia and tossed into the sea where it became the islet of Molokini. According to native Hawaiian tradition, parents hoping their son would become a seafarer should place his placenta into the waters of the Kealaikahiki Channel, meaning “path to Tahiti”, between Kaho‘olawe and Molokini.

Another story describes a love triangle between the goddess Pele and the lizard girl Pu‘uoinaina, who jumped into the ocean off Kaho‘olawe to escape the wrath of the goddess Pele. Pu‘uoinaina was captured

and her body was cut in half, the tail forming the shape of the Molokini crater while the head forming the Pu‘u‘Ōla‘i cinder cone near Mākena Beach.

A final story tells of a hill rising up on Moloka‘i that is then destroyed by the Kupua Kana. The Kupua Kana scatters the hill all over Hawai‘i, including one small piece that fell into the ‘Alalākeiki Channel to form Molokini (Severns & Fiene, 2008).

### Why We Are Concerned

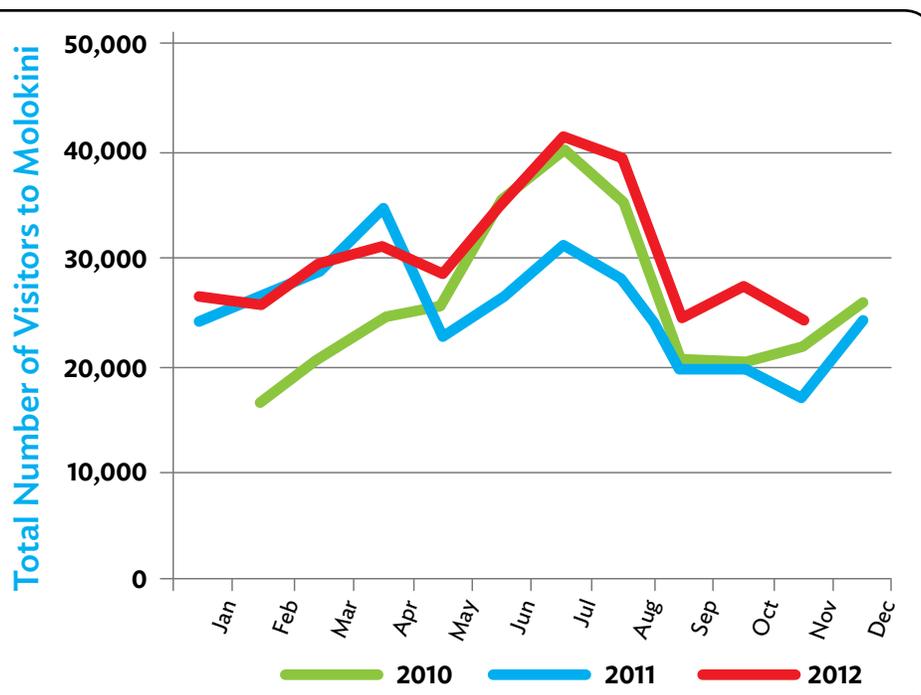
After designation as a MLCD in 1977, Molokini became a popular visitor destination. As interest in visiting Molokini rapidly increased, regular users raised concerns about overcrowding and possible reef damage from boat anchors. In 1981, the state responded by establishing a commercial operator permitting

system, which included a stipulation that only active commercial operators would be allowed to apply. DLNR issued 42 Molokini Commercial Operators permits at this time and effectively prevented any new commercial operators from obtaining commercial access to the MLCD. The non-transferable commercial permits were purposely attached to each vessel, allowing DAR to manage the area at the appropriate level of sustainable use. In 1987, the state installed the first Day-use Mooring Buoys (DMBs) within the Molokini Shoal MLCD. At this time, recreational use was relatively low (CORAL, 2009).

However, a few years thereafter, the numbers of boats visiting Molokini began to increase dramatically to around 40 boats per day (CORAL, 2009). Stakeholders and managers became concerned by observations that when permitted operators left their businesses, they also sold their vessel(s) with all attached permits (including the Molokini Commercial Operators Permit) to new operators. Over time, this practice resulted in growth of commercial activity and subsequent increased use of the MLCD. Many operations also upgraded their small vessels to larger vessels with greater passenger capacity. Some had purchased several smaller operations, resulting in fewer companies running multiple permitted vessels in the Molokini MLCD.

In 2009, DAR revised the Molokini commercial permitting system in order to minimize the impact of recreation activities and to obtain human use data. The 2009 permits included caps on the vessel passenger capacity based on 2009 levels, restrictions on SCUBA diver to guide ratios, prohibition on “resort or intro-dive” non-certified SCUBA dive tours, and depth and tether restrictions on SNUBA operations. Additionally, permit holders are now required to submit monthly use logs that report their passenger numbers by activity and moorings used within the MLCD.

Today there are 41 permitted commercial vessels running tours in the Molokini MLCD. According to submitted permit logs, just over 330,000 people visited Molokini in 2012. This number grew by approximately 16% since 2010 (DAR, 2013). The state has only been collecting use data for three years during which the country was recovering from an economic downturn, so this increase may reflect recovery to pre-recession use levels. Usage varies both by time of day and year, with most of the commercial operations at Molokini visiting between 8-11am, with a peak in visitors during the summer months, likely because of favorable weather conditions and overall tourism trends (DAR, 2013) See Figure 3. Usage also varies by location with most of the boat activity concentrated at a few DMBs (Figure 4).



Most visitors to Molokini are snorkelers (90%) while the remainder split evenly between SCUBA and SNUBA (DAR, 2013). According to permit logs, there was an average of 29 vessels per day in Molokini crater between May and November 2012. The effect of these visitor numbers on Molokini’s visitors themselves was evaluated in a 2010 survey at Molokini, which reported a majority of guests feel crowded during their trip to the MLCD. Sixty-seven percent of survey respondents felt crowded by the number of boats and the number of people on their boat, 70% felt crowded by the number of people in the water, and 73% by the total number of people at Molokini (Szuster & Needham, 2010).

Figure 3. The total number of monthly visitors to the Molokini Shoal MLCD during the years 2010 - 2012.

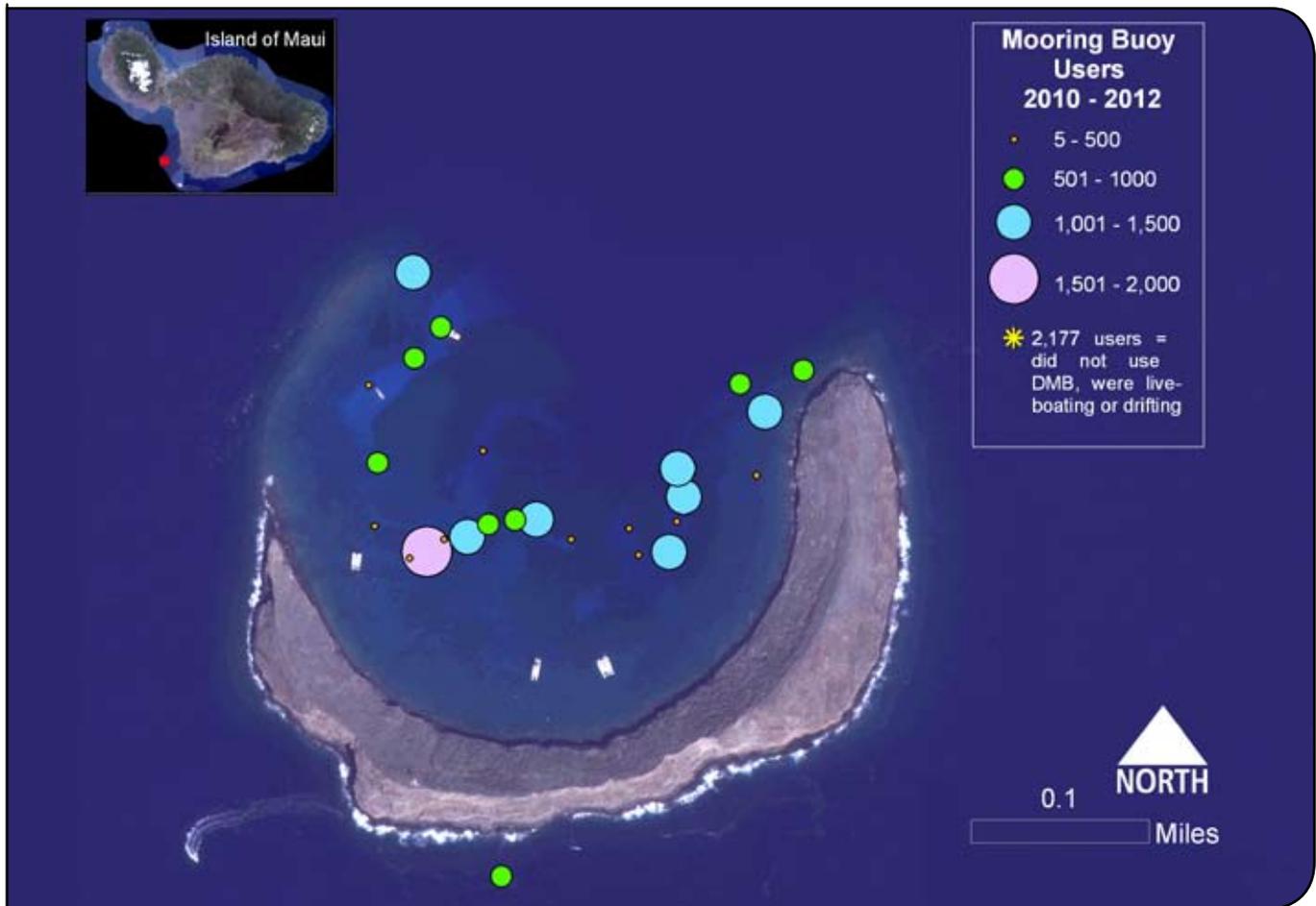


Figure 4. Total number of boats moored to each DMB between 2010 - 2012. Live-boating/driftng refers to when a boat remains unattached to a mooring buoy and the engine is on while divers/snorkelers are in the water.

The isolated location and high levels of use in the MLCD also makes enforcement and monitoring by the Division of Conservation and Resource Enforcement difficult. Additionally, there are administrative capacity challenges including funding for and ability to maintain the current DMB system at Molokini.

### What We Are Protecting

Molokini Shoal is made up of several unique natural and cultural assets that require management and protection to ensure they thrive for present and future generations. Within this project scope, the CAP team identified four priority conservation targets. Conservation targets are the features of the area that are the primary focus of management. Specific species and natural communities that will be conserved by preserving our conservation targets are listed as nested targets.

### Target 1: Coral Reef Ecosystem

The living coral animal is foundational to the coral reef. Stony corals build the structure on which reef dwelling plants, animals, and invertebrates depend. There are approximately 77 acres of coral reef habitat within the MLCD, including associated sandy and deep-water habitats. Coral cover within the MLCD is one of the highest in the state. Overall, the Molokini reef ecosystem, including reef fishes and other marine life, remains a good example of a healthy reef ecosystem (DAR, 2012). It is one of the only sites in the state that has maintained a relatively constant high coral cover (~75%) over the last 10 years (DAR, 2010; Friedlander et al., 2005). The three most common coral species found in the Molokini MLCD are *Montipora patula*, *Porites lobata*, and *Montipora capitata* (Friedlander et al., 2005). Black coral (*Antipathes grandis*) was once found in abundance in the deeper waters around Molokini, but

was harvested extensively for the jewelry trade between 1950-1970. Harvesting of this endemic resource is now prohibited within the MLCD and small colonies can be found there.

### Target 2: Apex Predators

An apex predator is an animal that occupies a food web's highest trophic level, or level of the food chain (Estes et al. 2001). The absence of apex predators like sharks and jacks in a marine ecosystem can have negative consequences including higher numbers of medium-sized predators that commonly reduce or eliminate smaller vertebrate species. On a coral reef, this means a sharp increase of small to medium reef fish (Estes et al., 2001). Because top carnivores serve a valued ecological purpose, their removal often leads to a cascade of extinctions of other species (Christensen et al., 1985, Pauly et al., 1998, Pinnegar et al., 2000). It can also make the ecosystem less stable, making it more vulnerable to natural and anthropogenic disturbances (Jackson et al., 2001). Apex predators are particularly important as a direct management target because once these species are absent from an area, it is difficult to restore the ecosystem to its former state (Gibbons & Odum, 1993).

In general, fish surveys in the MLCD indicate high fish species diversity, richness, and biomass (Friedlander et al. 2005). Surveys conducted in 2005 found that predators comprise 41% of the total number of fish observed (Figure 5) (Friedlander et al., 2005).

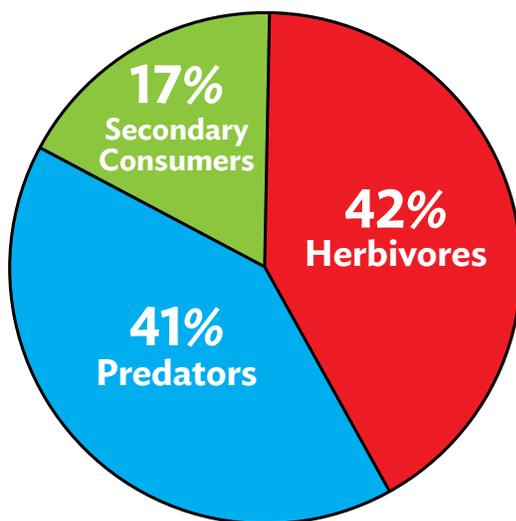


Figure 5. Trophic level composition within the Molokini Shoal MLCD (Friedlander et al., 2005).

Large fish (over 2 feet) were documented 35% of the time during these same surveys (Friedlander et al., 2005). The most commonly observed apex predators at Molokini are mano lalakea (whitetip reef shark or *Triaenodon obesus*) and ulua (blue trevally or *Caranx melampygus*), which frequent the shoal for resting, foraging and reproduction (Friedlander et al., 2005). Molokini is home to larger individuals of heavily targeted species, including ulua, when compared to similar areas that are open to fishing (Friedlander et al., 2005).

### Target 3: Seabird Nesting and Resting Habitat

Molokini islet is managed by the U.S. Fish and Wildlife Service (USFWS) to protect a large colony of nesting seabirds. Species nesting and roosting on Molokini include the largest colony of 'ua'u kani in Maui Nui and smaller populations of 'ou (Bulwer's petrel or *Bulweria bulwerii*), 'iwa (great frigate or *Fregata minor*), noio (black noddy or *Anous minutus*) and noio kōhā (brown noddy or *Anous stolidus*). 'Ua'u kani colonies are surveyed by researchers three to six times during nesting season (March – November) and USFWS is currently conducting further research to determine population parameters. USFWS identifies obtaining more data on seabird nesting on Molokini islet as an adaptive management goal (USFWS, 2011).

### Target 4: Place-Based Nature Experience

This target focuses on the opportunity for residents and visitors to experience the unique natural coral reef environment of Molokini. Currently, the majority of visitors expect to escape crowds by visiting Molokini, but over two-thirds of survey-takers reported feeling crowded after their visit (Figure 6) (Szuster & Needham, 2010). Respondents reported encountering an average of 175 people during their trip to the Molokini MLCD. These perceived crowding levels suggest that Molokini is overcapacity and immediate management action is necessary to improve and preserve visitor experiences (Vaske & Shelby, 2008). The place-based nature experience is valued because of the educational opportunity a visit to the Molokini MLCD can provide. Place-based educational experiences can enhance learning, connect both visitors

and local communities to a place, and encourage environmental stewardship behavior (PEEC, 2010).

### Percentage of Visitors Feeling Crowded by:

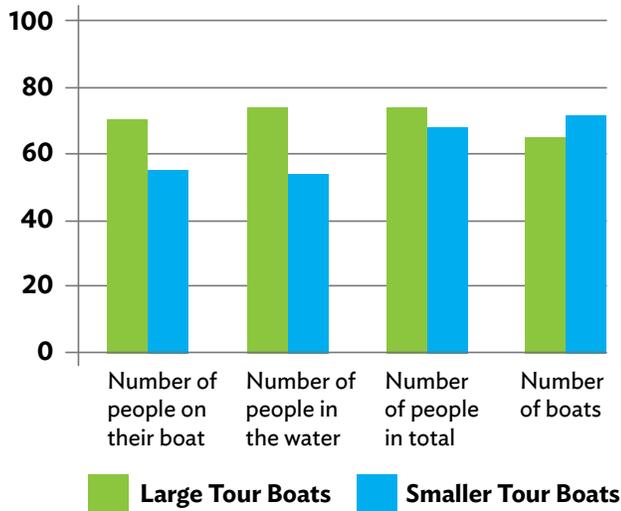


Figure 6. Perceived crowding of Molokini visitors, adapted from Szuster & Needham, 2010.

### Status of Conservation Targets

We evaluated the status of each conservation target according to the key ecological attributes that are essential to its viability. We assessed viability by assigning values along a four-part scale from poor,

fair, good to very good. Each target is assigned a current ranking as well as a desired future ranking. The strategies focus on moving each target from its present state to a preferred future state.

### Threats to Targets

Each conservation target is impacted by specific threats. A total of 27 threats were identified and ranked using specific criteria. The highest ranked threats are listed below. We used these threats to help identify priorities for developing conservation strategies.



#### Crowding

- Crowding of boats and people
- Noise above and below water
- User conflict



#### Unequal Public Access

- Dominance of commercial operators
- Lack of equality in access



#### Lack of Awareness

- Lack of knowledge and respect of Hawaiian cultural resources

Table 2. Threats to the targets of the Molokini CAP.

### Table 1: Status of Conservation Targets

Conservation Target	Nested Target	Current Status	Desired Status
Coral Reef Ecosystem		Good	Good
Apex Predators	Sharks, giant trevally (uluu), bluefin trevally (omilu), grey snapper (uku)	Good	Good
Seabird nesting and resting Habitat	Wedge-tailed shearwater, bulwer's petrel, red-footed booby, brown booby, great frigate	Fair	Good
Place-based Nature Experience		Poor	Good

**Crowding**

In the previously mentioned 2010 visitor experience survey by Szuster and Needham, the majority of visitors to Molokini reported feeling crowded in the MLCD. Noise from vessels may also negatively affect the visitor experience and the behavior and distribution of Molokini’s apex predators. Research is currently being conducted to evaluate whether activities in the Molokini MLCD are displacing this key ecological resource. If no management action is taken, with this level of perceived crowding, Molokini is likely to become a “sacrifice area”, where quality of the natural environment and visitor experiences may be severely compromised (Shelby et al. 1989).

**Unequal Public Access**

Commercial operators are the dominant users of the DMB system at Molokini and there is relatively little use by the public on recreational vessels (Szuster & Needham, 2010). Despite language in the Hawaii Administrative Rules designating a zone for recreational use, staff observations point to lack of access and usage of the Molokini DMBs by non-commercial vessels, especially in the morning when conditions are favorable and commercial use peaks.

**Lack of Awareness**

There is a general lack of awareness of Molokini’s cultural resources. Only 42% of survey takers felt satisfied with the amount of information they received pertaining to Hawaiian culture and history after their trip to Molokini (Szuster & Needham 2010). There are currently no outreach or education standards for interpretive guides in Molokini. Cultural awareness is crucial to the place-based nature experience and the context it provides visitors in understanding and appreciating Hawai’i in general and Molokini specifically.

**Objectives and Strategies**

Four objectives and associated strategic actions were created to achieve the overall mission of maintaining and preserving the ecological quality of the Molokini coral reef ecosystem, while providing a sustainable and enriching place-based visitor experience. Each objective and associated strategic action focuses on either improving the status of or reducing a threat to the conservation targets. The objectives and strategic actions are not listed in any particular order and are all considered priorities at this time.

<b>Objective 1</b>	Less than 50% of users report over-crowded conditions by 2015.
<b>Objective 2</b>	Create a natural acoustic environment by reducing human-caused noise to “an acceptable level” or less at all times by 2015.
<b>Objective 3</b>	Majority of visitors leave with basic knowledge of reef etiquette and of the natural and cultural history of Molokini by 2015
<b>Objective 4</b>	Ensure recreational vessels have access to site at all times by 2015.
<b>Objective 5</b>	Ensure reliable and dedicated funding for management costs of the Molokini MLCD now and in the future.

**Objective 1: Less than 50% of users report over-crowded conditions by 2015.**

*Strategic Actions*

- 1.1 Reduce number of moorings from 26 to an appropriate number as indicated by best available use and scientific information.
- 1.2 Ensure adequate maintenance of all moorings.
- 1.3 Increase spacing between moorings.
- 1.4 Work with users and utilize user logs to establish spatial-temporal management schedule.
- 1.5 Update rules to implement necessary changes and to make rules consistent across DAR and DOBOR after consultation with stakeholders: a) Prohibit anchoring at all times within MLCD, b) Prohibit discharging passengers while live boat diving (when a boat remains unattached to a mooring buoy and the engine is on while divers are in the water)/ snorkeling within Subzone A.
- 1.6 Prohibit any commercial operation within the MLCD without a Molokini Commercial Operators Permit.
- 1.7 Create and implement a surveillance and enforcement plan for MLCD users.

**Objective 2: Create a natural acoustic environment by reducing human-caused noise to “an acceptable level” or less at all times by 2015.**

*Strategic Actions*

- 2.1 Conduct passive acoustic research to establish

- natural acoustic atmosphere parameters and define “acceptable level” of human-caused noise (in progress).
- 2.2 Change rule to prohibit air horns and amplified noise (except in emergency situations).
  - 2.3 Work with operators and users to use visual signals and other non-disruptive methods to communicate instructions to groups.
  - 2.4 Understand links between animal behavior and noise (apex predators/birds) through active acoustic research (in progress).

**Objective 3: Majority of visitors leave with basic knowledge of reef etiquette and of the natural and cultural history of Molokini by 2015.**

*Strategic Actions*

- 3.1 Develop and implement a certification, training and safety program for operators:
  - a) Finalize user-friendly materials with basic knowledge which includes pertinent rules, reef etiquette, human etiquette and natural & cultural history (in progress).
  - b) Finalize a briefing protocol & naturalist certification curriculum for staff training.
  - c) Implement training on interpretive guide for Molokini naturalists.
  - d) Ensure that all commercial operators have one certified Molokini naturalist on board at all times.

**Objective 4: Ensure recreational vessels have access to the Molokini MLCD at all times by 2015.**

*Strategic Actions*

- 4.1 Work with permit holders to ensure non-commercial access:
  - a) Create boat harbor sign with language to encourage participation by recreational vessels.
  - b) Permanently designate two moorings as non-commercial and convert these two moorings to surface moorings.
  - c) Explore different ways (e.g.: family days, discounted/free trips for public) for non-commercial users to access Molokini.

**Objective 5: Ensure reliable and dedicated funding for management costs of the Molokini MLCD now and in the future.**

*Strategic Actions*

- 5.1 Develop an annual budget of Molokini MLCD operating costs.

- 5.2 Work with MCLD users and stakeholders to establish sustainable funding options.
- 5.3 Assess the viability for sustainable funding and develop a funding strategy that will meet the MLCD's operating costs.

### Accomplishments

During the development of the CAP, these strategic actions were previously included and have since been accomplished:

- 1.1 Take decision-makers on visits to Molokini to observe the status of identified threats.
- 1.2 Define place-based Molokini MLCD basic knowledge for development of interpretive guidelines.

### Measuring Our Success

For the Molokini CAP, a monitoring plan answers two basic, interrelated questions:

**Resource Status**

How are key targets, threats, and other factors at the project site changing over time?

**Strategy Effectiveness**

Are the conservation actions we are taking achieving their desired results?

To answer these questions, we are collecting data on a number of indicators that gauge either the status of a target, change in a threat, or progress towards an objective.

These indicators inform us of our progress towards accomplishing our objectives, and ultimately the goal of the Molokini CAP – to maintain and preserve the ecological quality of the Molokini MLCD, while providing a sustainable, enriching, and educational recreational experience. The following tables describe the Molokini CAP project progress indicators both from the resource status (Table 3) and a strategy effectiveness perspective (Table 4).

**Table 3: How is Resource Status Changing Over Time?**

<b>Coral Reef Ecosystem status indicators</b>	<b>Current monitoring</b>	<b>Frequency</b>
Natural benthic community structure	Coral Reef Assessment Monitoring Program (CRAMP) surveys by DAR	Annual
Size and composition of coral species on the reef		
Range of colony sizes		
Fish assemblage percentages		
<b>Apex Predator status indicators</b>		
Biomass within MLCD (8am - 11am)	Predator tagging, passive acoustic monitoring	Continuous over the 18 month project period
<b>Place-Based Nature Experience status indicators</b>		
Absence of conflict	Reassessment of Marine Recreation study conducted by Szuster & Needham (2010)	Every 3 - 5 years
Quality and accessibility of moorings	Analysis of mooring permit data by DAR and UH	Annual
Knowing place names and cultural history	Knowledge survey of Molokini visitors and guides	Knowledge assessment of guides and visitors before and after development of CORAL training program
Number of Boats	Analysis of mooring permit data by DAR and UH	Annual
<b>Seabird Nesting/Resting Habitat status indicators</b>		
Presence of land predators and insects	Periodic monitoring by USFWS.	3-6 times during nesting season
Amount of light disturbance		
Concentration of appropriate nesting habitat		
Quality of calm, quiet environment		

**Table 4: Are Our Actions Having the Desired Effect?**

Objective	What we Want to See (2013 - 2016)	How we will measure
1. Crowding	Appropriate number of moorings in the MLCD; increased spacing between DMBs; presence of a spatial-temporal schedule; rule change to prohibit air horns and amplified noise	Re-assessment of Molokini permit data by 2015, successful passage of rule change
2. Natural Acoustic Environment	Understanding sound environment and effect of noise in Molokini MLCD; use of visual signals and non-disruptive communication methods	Completion of acoustic research and visual signal and communication guide
3. Lack of Awareness	Certification, training, and safety program used by the majority of operators	Certification program in place, certified naturalist present on commercial vessels by 2016
4. Access	Recreational vessel access provided in the MLCD at all times	Two surface moorings present in the Molokini MLCD designated as non-commercial
5. Funding	Annual budget, sustainable funding strategy	Sustainable funding strategy implemented

**Acronyms**

- DAR - Division of Aquatic Resources
- DLNR - Department of Land and Natural Resources
- DMB - Day-use Mooring Buoy
- DOBOR - Division of Boating and Recreation
- CAP - Conservation Action Plan
- CORAL - Coral Reef Alliance
- MLCD - Marine Life Conservation District
- NOAA - National Oceanic and Atmospheric Administration
- TNC - The Nature Conservancy
- UH - University of Hawaii at Mānoa
- USFWS - United States Fish and Wildlife Service



Photo by Manuel Mejia

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