Maunalua Bay
Conservation Action Plan

December 2006

Vision: A Maunalua Bay where marine life is abundant, the water is clean and clear, and where people take kuleana in caring for and sustainably managing the bay.

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

MĀLAMA HAWAI'I

MĀLAMA MAUNALUA

View of Koko Crater and Koko Head from Maunalua Bay

Nearshore reef fish in Maunalua Bay

Maunalua Bay Region, Southeast O'ahu

The Maunalua region encompasses Maunalua Bay and its adjacent watersheds. The region is approximately 22 square miles in size, with nearly 8 miles of shoreline and 6.5 square miles of ocean waters. At the East end of the Bay is a former 523-acre fishpond and wetland that was converted in the 1970s into housing and a private recreational salt-water marina. The Bay has beautiful turquoise waters and areas of intact coral reef (*Porites spp.*), and sea grass beds; and it is bordered by the striking wave-cut valleys of the Ko`olau Mountain range, home to the endangered O`ahu `Elepaio, an endangered flycatcher bird. The area is also home to at least two endangered Hawaiian waterbirds.

The resources of Maunalua Bay are important both biologically and socially. The Bay at one time was extremely productive, with a well-known fishery that provided fish, limu (seaweeds) and invertebrates for consumption and sale. This fishery is reported to have declined by as much as 90% in the last 40 years. Habitat loss in nearshore areas has also occurred.

Despite its deteriorated condition, the Bay continues to provide a large number of recreational opportunities. These include surfing, SCUBA, parasailing, outrigger canoe paddling, fishing (at a lower level of catch), jet-skiing and boating. The region of Maunalua Bay also provides some outstanding scenic resources for its approximately 60,000 residents and thousands of annual visitors.

Our Partners

In our efforts to revitalize Maunalua Bay, community partnerships represent our best hope for the future. Partnerships and alliances are voluntary associations of concerned community residents, fishermen, land-owners, government agencies, private and non-profit organizations, teachers and others committed to the common goal of stewardship of the Maunalua Bay region.

Aerial view of Maunalua Bay from NOAA satellite images

Who We Work With

In October 2005, Mālama Maunalua organization was formally launched as a coordinating body for current and future conservation projects at Maunalua Bay The group consists of residents of the area, fishers, paddlers, teachers, representatives of government agencies and non-profit organizations, facilitators, and others. This group is open to all interested parties who would like to contribute to improving the condition of Maunalua Bay.

Mālama Maunalua works closely with:

- Hui Nalu Canoe Club
- Mālama Hawai`i
- National Oceanic and Atmospheric Administration
- Polynesian Voyaging Society
- State Dept. of Land and Natural Resources
- The Nature Conservancy of Hawai`i

It also networks with:

- City & County of Honolulu
- Community Conservation Network
- Environmental Protection Agency
- Fishers
- Friends of Hanauma Bay
- Liveable Hawai`i Kai Hui
- Hawai`i Fishing News
- Hawai`i Kai Marina Association
- Hui Mālama O Ke Kai
- Makai Watch
- Oceanic Institute
- Public and private school teachers and students
- State Department of Health
- State Office of Planning
- University of Hawai`i (Sea Grant and Botany programs)
- U.S. Fish and Wildlife Service.
- Waterfront residents

Nainoa Thompson preparing students for a sail on Hōkūle'a in the Bay (above)

Students help steer Hōkūle'a on an afternoon voyage (left)

Students from Kaiser High School after a day of studying and cleaning the Bay

A large community turnout for an educational event

Conservation Planning

Maunalua's CAP team discusses various strategies.

Members from another CAP team explain their situation.

Mālama Maunalua is utilizing The Nature Conservancy's (TNC) Conservation Action Planning (CAP) process to develop site-specific conservation strategies and prepare for taking action and measuring success.

THE 10 STEPS OF THE CAP PROCESS

1. Identify People Involved In the Project
This step asks teams to identify the people who will be involved in designing and implementing the project

2. Define Project Scope & Focal Conservation Targets
This step defines the extent of the project and selects the specific species and natural systems ("targets") that the project will focus on as being representative of the overall biodiversity of the project area.

3. Assess Viability of Focal Conservation Targets
This step looks at each of the focal targets carefully to determine how to measure its "health" over time. And then to identify how the target is doing today and what a "healthy state" might look like.

4. Identify Critical Threats
This step helps to identify the various factors that immediately affect the project's focal targets and then rank them by priority.

5. Conduct Situation Analysis
This step looks at both the biological issues and the human context in which the project occurs.

6. Develop Strategies: Objectives and Actions
This step describes what success looks like and develops practical and *strategic* actions to be taken.

7. Establish Measures
This step involves deciding how the project team will measure results and see whether strategies are working as planned.

8. Develop Work Plans
This step takes strategic actions and measures and develops specific plans for doing this work as the project goes forward.

9. Implement
Implementation is the most important step in this entire process.

10. Analyze, Learn, Adapt, & Share
This step provides insight on how actions are working, what may need to change, and what to emphasize next. Teams document what was learned to share it with other people who may benefit from the insight.

Conservation Targets

The marine communities, and important species in Maunalua Bay that we are trying to protect or restore fall within 4 groupings. We call these our "Conservation Targets":

TARGET 1: **Inshore Area Habitats.** This target consists of all habitats within the breakers of Maunalua Bay. It includes soft bottom, colonized hard bottom, sea grass beds, intertidal areas, beaches and channels. A major stress to this target is alteration and/or loss of these habitats..

TARGET 2: **Fore-Reef Area.** This target refers to live coral reefs and associated sessile (attached, unmoving) marine life to a depth of 100 feet. The main stress to this target is altered structure and composition of habitats.

TARGET 3: **Reef Species Assemblage**. This target encompasses all biomass (fishes and invertebrates) associated with reefs. Goatfishes (particularly *weke*) can serve as a good indicator for the rest of the reef assemblage due to their reproductive biology and life history. The main stressors to this target are altered structure and composition of reef fish populations and habitat loss and/or alteration.

TARGET 4: **Restoration Species (Cultural Target).** This target encompasses certain species of cultural significance such as *weke*, *wana*, *limu* and others. The main stressors to this target are altered structure and composition of targeted fish populations and habitat loss and/or alteration.

1. LANDSCAPE CONTEXT

An integrated measure of two factors:
1) the dominant environmental regimes and processes that establish and maintain the ecosystems and 2) connectivity.

2. CONDITION

An integrated measure of the composition, structure, and biotic interactions that characterize the ecosystem.

3. SIZE

Size is a measure of the area of the ecosystem, i.e., its geographic coverage. Minimum dynamic area, or the area needed to ensure survival or reestablishment after a natural disturbance, is another aspect of size.

Limu kohu, native Hawaiian algae

Goatfish, weke
Photo by Jack Randall

Storm drain next to Maunalua Bay

Acanthophora spicifera, invasive marine algae

Unknown substance in channelized stream near ocean

Critical Threats

The conservation targets face multiple threats, which act together to alter their viability/integrity. Based on information from surveys, maps, monitoring, informational interviews, and personal observations, we ranked the main threats for each conservation target for Maunalua Bay (see Appendix B for threat summary). The highest ranking critical threats fall into three groups:

POLLUTED RUNOFF AND SEDIMENT

(entering Maunalua Bay via storm drains, streams and canals).

- Mud and soil (from poorly constructed infrastructure, construction etc.)
- Petroleum Products (oil, gasoline, pesticides etc.) from cars, boats and residential areas
- Fertilizers and other nutrients (including detergents, humus, pet wastes, sewage and algae growth.
- Other toxic substances (borates, chlorine bleach, batteries, etc.)

INVASIVE MARINE ALGAE (non-native)

- *Gracilaria salicornia* (Gorilla *Ogo*)
- *Avrainvillea amadelpha* (Mud weed)
- *Acanthophera spicifera*

UNSUSTAINABLE HARVESTING PRACTICES

- Damaging or destructive harvesting practices
- Overharvesting

These high ranking threats have direct impacts to the marine ecosystems of Maunalua Bay. Sediments (mud and soil) smother and kill native plants, as well as corals, clams and other invertebrates in the inshore areas. In a chain reaction, baitfishes, reef fishes, waterbirds and other animals who feed upon these organisms are thus depleted. Toxic pollutants such as oil, gasoline and pesticides kill the floating larvae of fish, lobster and corals in all areas. Invasive algae disrupt and change the ecological balance of native ecosystems by outcompeting native *limu* and other organisms for habitat space, and their spread results in fewer fish. They are often also an indicator of other threats to marine ecosystems (high sediment levels, high nutrient levels). Unsustainable harvesting practices in Maunalua Bay have contributed to the severe depletion or disappearance of fish and invertebrate species, particularly in the inshore areas.

Gracilaria salicornia, Gorilla ogo, an invasive marine algae

Conservation Objectives

Our overall conservation goal for the Maunalua Bay region is to enhance the viability of each of the native ecosystems and embedded native species and abate the most critical threats. The broad objectives below are the highest priority and focus of our initial work. They will serve as a foundation to guide our management and educational activities and provide the basis for measuring our success (see Measures and Monitoring).

- Reduce alien invasive algae biomass to 5% of total benthic cover at 3 remediation sites in Maunalua Bay by 2010, and potentially expand to other sites by 2016
- Reduce by X% sediment Inputs at identified key high-input sites from Kuliouou to Wailupe by 2016. (percentage to be determined in initial survey and analysis).
- Achieve strong positive trends in increases in 5 indicator fish species across Bay habitats by 2010.

Conservation Strategies

We have identified 10 strategies to achieve three main conservation objectives. Nearly all of these require community education and outreach, and working together with partners. Each strategy directly addresses at least one critical threat, and often indirectly addresses another (e.g., strategies to improve water quality may also slow the growth of alien invasive algae). Each strategic action below consists of several action steps with varying time frames.

REDUCING COASTAL DISCHARGES OF SEDIMENT & ASSOCIATED POLLUTANTS

Strategic Action 1: *Identify and prioritize high-input sites for management consideration.*

Primary Action Steps:

- Walk the shoreline and locate places that are key loading sites for sediment and pollution.
- Understand the actual sources (e.g. road, residential development) of inputs for each site.
- Use comparative photo sources to track changes in sediment loads over time.
- Develop goals on a percentage basis of amount of sediments to be reduced at key sites.
- Obtain preliminary water quality data.

Strategic Action 2: *Develop a plan through partnerships to reduce coastal sediment and pollutant discharges.*

Primary Action Steps:

- Meet with the Land Based Pollution Local Action Strategy Group.
- Meet with appropriate Federal, State Local, and other agencies.
- Develop the Plan.

REDUCING INVASIVE ALIEN ALGAE

Strategic Action 3: *Coordinate involved and interested algae-control parties and develop an action plan with them.*

Primary Action Steps:

- Participate in meeting with UH researchers, teachers, DLNR staff and others.
- Develop a plan which involves schools, community members, agencies.
- Identify specific boundaries for and prioritize areas in the Bay and assign lead entities to each.

Strategic Action 4: *Implement manual, mechanical and biocontrol means to remove alien algae in a coordinated manner.*

Primary Action Steps:

- Organize/support collective clean-up events in addition to smaller ongoing efforts.
- Secure use of necessary equipment (e.g. “Super Sucker,” boats, etc.)
- Develop a roster of trained individuals who can assist with super sucker efforts.

Studying the flow in the Bay using a non-toxic dye

High school students from the community remove alien algae.

Youth Conservation Corps members remove tons of Gorilla ogo.

Speaking to Bay residents at public fairs

Students board Hōkūle'a, the Polynesian voyaging canoe, in the Bay

People of all ages enjoy fishing at Maunalua Bay.

EVALUATING AND MONITORING FISH POPULATIONS

Strategic Action 5: *Recruit an advisory group of collaborative fishers to inform and assist in fishery evaluation and monitoring.*

Primary Action Steps:

- Identify fishers wanting to be involved.
- Convene a group of individual fishers who are willing to participate in fishery management decisions.

Strategic Action 6: *Evaluate the condition of fisheries in Maunalua Bay.*

Primary Action Steps:

- Enlist advisory group in indicator species identification and monitoring program development.
- Conduct early investigations (including *pakini* surveys) to inform understanding of the status of fish populations.
- Understand biological and ecological perspectives on fish sustainability for each indicator species/group.
- Based on the previous steps, develop a strategy to improve sustainability.

Strategic Action 7: *Create a long-range monitoring program that includes an educational component.*

Primary Action Steps:

- Identify key players, including schools, community groups, businesses, support organizations, and UH researchers.
- Create a monitoring program for identified species.
- Consider the Makai Watch model as a means to both monitor fish populations and reduce illegal fishing.

Strategic Action 8: *Link with the statewide "Fair Catch" responsible fishing program.*

Primary Action Steps:

- Link with the statewide campaign to obtain materials and knowledge.
- Follow up with community education and outreach.

Strategic Action 9: *Support the ban of lay gill nets in Maunalua Bay.*

Primary Action Steps:

- Attend DLNR hearings and submit written testimony.
- Follow up with community education and outreach.

COMMUNITY OUTREACH AND EDUCATION

Strategic Action 10: *Develop outreach and education strategies to build awareness, encourage participation and inform residents of progress, for each of the activity areas: alien algae removal, sediment & pollution reduction, and fishery restoration.*

Primary Action Steps:

- Identify key stakeholders and early adopters.
- Identify and link with potential partners, resource people and funding sources.
- Develop public awareness campaigns for general (Mālama Maunalua) branding and for each of the identified priority outreach and education targets.
- Make Hōkūle`a a symbol for Maunalua Bay.
- Investigate the potential for how, where and when an educational site could be established in Maunalua Bay.

Measures and Monitoring

How do we know if the conservation strategies we are using are having their intended impact? To answer this question we have identified a number of indicators that will gauge how well we are keeping the critical threats in check, and in turn, whether the condition of the native ecosystems is improving.

Objective 1: Reduce alien invasive algae biomass to 5% of total benthic cover at 3 remediation sites in Maunalua Bay by 2010, and potentially expand to other sites by 2016

Indicators:
1) Percent cover of alien invasive algae at removal sites.

Objective 2: Reduce by X% sediment Inputs at identified key high-input sites from Kuli'ou'ou to Wailupe by 2016. (percentage to be determined in initial survey and analysis).

Indicators:
1) Size and content of deposited (alluvial) plumes in the Bay
2) Suspended solids levels in estuaries and inshore area
3) Flow measurements and composition at input sites (streams and canals)

Objective 3: Achieve strong positive trends in increases in 5 indicator fish species across Bay habitats by 2010.

Indicators:
1) Presence/absence of various size classes, and overall abundance of key fish species over time (species list to be determined, see next column)
2) Biomass: Metric tons/hectare of reef fishes

Both management and monitoring components will have a strong community participation element, as Mālama Maunalua strives to reconnect local residents with the health of the resources and environment. Community participation will also ensure a wider awareness of, and demand for, resource protection in Maunalua Bay.

Monitoring measures for alien invasive marine algae will be developed by an AIMA working group. Sediment loads to the Bay will be monitored initially through aerial photos, ground surveys and mapping, and later through aerial photo comparisons and ongoing water quality monitoring. A monitoring framework for coral reef assemblage species and inshore habitats will be developed in the coming months by a group of partners consisting of scientists, educators community organizations and government agency staff.

Potential Indicator Species

This species list will be determined with the help of community members, fishers, and marine managers.

- *`Ama`ama,* mullet, *Mugil cephalus,*
- *Manini - Acanthurus triostegus*
- *Uhu* — Parrotfish, *Chlorurus perspicillatus, C. sordidus, C. rubroviolaceus, Scarus psittacus, S. dubius, Caolmotus carolinus*
- *Weke* — Goatfish, *Mulloidichthys vanicolensis (weke`ula), M. flavolineatus (weke`a), Parupeneus multifasciatus (moano), P. bifasciatus (munu), P. porchyreus (kumu), P. cyclostomus (moano ukali ulua), Upaneus taeniopterus* (nightmare *weke*)
- Baitfish — Mosquito fish- *Gambusia affinis,* Herring, *Halalu* (baby *akule) Selar crumenopthalmus, Pua'ama (*baby mullet*),* *`Ōpae (*shrimp)

Instructing students on *limu* identification

Healthy sea cucumber

'Ama'ama, Mullet
Photo by Jack Randall

Canoes from Hui Nalu are used to assist with monitoring trips.

How Will We Put All the Pieces Together?

Careful planning and community outreach will be essential as Mālama Maunalua moves forward.

Success in sustainably managing and caring for Maunalua Bay is fundamentally dependent upon place-based, educational and collaborative efforts by community. We want to inspire responsibility and pride in our surroundings, re-establish a sense of *kuleana*, and motivate, encourage and challenge people to take action to improve the environmental conditions in their own backyards.

Success is also dependent upon maintaining strong partnerships and communications (between residents, teachers & students, businesses, organizations, government); and taking the time to periodically evaluate our actions, to update and refine our knowledge, to share our results with other communities, and to learn from our results.

Finally, success will also rely upon the development of an effective fundraising strategy to ensure adequate support for management activities and ongoing monitoring. Financial sustainability is key to Mālama Maunalua's coordination and outreach efforts.

In Fall 2006, community members and resource people met in a special session aimed at producing a three-year action plan. The session also provided an opportunity for the community to form working groups to further refine the action steps association with each identified management or monitoring activity and oversee implementation. Four working groups were formed:

- Invasive Alien Algae Removal,
- Fishery Evaluation and Monitoring,
- Water Quality, and
- Community Outreach and Education.

The working groups are presently developing timelines for each Strategic Action and its associated Action Steps. An estimated three-year budget summary is found at Appendix C.

A priority of Mālama Maunalua is involving youth in determining the future of the Bay.

Appendix A
Viability Assessment of Conservation Targets in Maunalua Bay

Conservation Targets	Landscape Context	Condition	Size	Viability Rank
Inshore Habitats	Fair	Poor	Good	Fair
Fore-reef	Good	Good	Good	Good
Reef Species Assemblage	Good	Fair	Fair	Fair
Cultural Target (Restoration Spp)	Poor	Poor	Poor	Poor
Overall Site Biodiversity Health Rank				Fair

Biodiversity Health and Viability Ranking System

Viability ratings are made using the best science available and often with vigorous discussion. The planning team develops simple categories that define the status of the target in terms of landscape context, condition, and size. The viability of the selected conservation targets are assigned a rank on a four-level scale.

- Very Good. The factor is functioning at its ecologically desirable status and requires little human intervention.
- Good. The factor is functioning within its range of acceptable variation. However, it may require some human intervention to maintain its status.
- Fair. The factor lies outside its range of acceptable variation and requires human intervention. If unchecked, the target will be vulnerable to serious degradation.
- Poor. Allowing this factor to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible.

Ranking Information

- Landscape Context. This category includes supporting systems and external forces acting upon the target. For example, do targets have access to all habitats necessary to sustain them? Are hydrologic systems (i.e. watersheds) functioning to maintain proper salinity and water quality?
- Condition. This refers to the composition and structure of targeted ecosystems. For example, are species reproducing? How healthy are populations? Are characteristic species present?
- Size. This refers to either the minimum area required for maintenance of an ecosystem target or the minimum population size of a species target required for genetically viable reproductions.

Appendix B
Overview of Threats, Maunalua Bay

Threats Across Systems	Inshore Habitats	Fore-reef	Reef Species Assemblage	Restoration Species (Cultural target)	Overall Threat Rank
Polluted Runoff & Sediment	High	Low	High	High	High
Invasive Marine Algae	High	Low	High	Medium	High
Unsustainable Harvesting Practices	Medium	Low	High	High	High
Trampling	Medium	-	Low	-	Low
Anchoring	-	Medium	-	-	Low
Threat Status for Target and Site	High	Low	High	High	High

Ranking Information

Threats are composed of stresses and sources of stress ("sources"). A stress is defined as a process or event with direct negative consequences on the conservation target (e.g., alteration of streamflow, habitat destruction). The source of stress is the action or entity that produces a stress (e.g., invasive species). The planning team identified and ranked the stresses and sources for each ecosystem. Stresses are ranked based on the severity and scope of the damage expected within 10 years under the current circumstances. Sources of stress are ranked based on the expected contribution of the sources and the irreversibility of the impact.

Appendix C
Estimated Three-Year Budget

A. Estimated Core Budget

This table reflects estimated core budget for 2007-2009. Costs include staff salary & benefits, fees paid for back office and fiscal management services (Community Links Hawai'i), plus office operations and some outreach and events costs. The table reflects a July 1-June 30 Fiscal Year.

Budget Item	**2007**	**2008**	**2009**	**3-yr Total** (thousands of dollars)
Salaries & Benefits	88	91	94	273
Fees	11	13	15	39
Operations, including Communications	20	20.6	21	61.6
Events	6	6.2	6.4	18.6
Annual Totals	125	130.8	136.4	
			3-Yr TOTAL	**392.2**

B. Estimated Projects Budget (includes part-time staff and partner in-kind contributions)

Project Area	**2007**	**2008**	**2009**	**3-yr Total** (thousands of dollars)
INVASIVE ALGAE	100	100	100	300
WATER QUALITY	100	200	200	500
FISH	100	100	100	300
EDUCATION for projects	100	100	100	300
			SUBTOTAL	1,400
			MONITORING (20% of total)	280
			3-Yr TOTAL	**1,680**