



Creating a Region-wide Green Infrastructure Strategic Plan for Maunalua Bay

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Objectives

The health of Maunalua Bay is heavily impacted by urban/storm water runoff from the ten highly suburbanized watersheds that feed into it. In recent years, Mālama Maunalua (MM) has worked to address the impacts of water pollution in the ocean and on land. However, our effort has been piecemeal in scope and geography. Maunalua Bay, along with the community which depends upon it for recreation, culture, and livelihoods, would benefit greatly from a region-wide Green-Infrastructure Strategic Plan that:

- 1) Determines priority hotspots for runoff (emphasis on shopping centers, major streams)
- 2) Creates a runoff reduction plan for the worst offending hot spot areas
- 3) Recommends best management options for the greatest ecological gains for the Bay

Significance

MM, a non-profit community organization, is the only entity dedicated entirely to the restoration and conservation of Maunalua Bay, and is considered a leader bay management. MM has launched key projects on land and in the water to address the three main threats to Maunalua Bay, including land-based sources of pollution, overfishing, and invasive alien algae (IAA) to restore and conserve it. This project would focus on the land-based sources of pollution to the bay from key urban development areas.

MM's land-based program, *Pulama Wai* ("Cherish our Waters"), works with communities, schools, and businesses to implement best management practices and promote stewardship. The project educates community on home and business practices to reduce runoff and installs best management practices (e.g., rain gardens). Though the work has been successful, we are aware that the more challenging causes of runoff are not being addressed.

There is widespread support from the community, especially from fishers and *kupuna* ("elders") who depend upon a healthy bay for their livelihoods and cultural practices, respectively, to address land-based pollution to restore native *limu*, seagrass, and fisheries. At present, MM is implementing various water quality projects with bay users and resource experts.

Due to capacity and expertise, we haven't been able to conduct a full assessment of best management practices for the region; one that identifies and ranks needs, provides solutions, and



is integrally linked to the marine ecosystem. This is where Bren School students can provide invaluable assistance in developing a strategic plan with best management practices.

Some questions that could be considered in a management plan:

- 1) What should be done about the cemented streams that carry vast volumes of runoff?
- 2) What is the best way to get homeowners to reduce runoff?
- 3) What is the best technique to reduce runoff from shopping centers?
- 4) What is the trade-off between focusing on the large *mauka* lands versus urbanized zones?
- 5) How can we link management decisions to the ecology of the bay?

MM is the target client, but the work will benefit numerous partners active on the subject: Army Corps of Engineers, City and County of Honolulu, Department of Transportation, Department of Land and Natural Resources, and environmental/community organizations. With this assessment, MM can coordinate specific projects that will have the greatest impact for the Bay. The Bay would benefit from a reduction in urban and storm water runoff. The community would benefit from a healthier bay for recreation, fishing, and ecological integrity.

Background

What is the project location?

The Maunalua Region is situated in southeast O‘ahu (Hawai‘i) stretching from Koko Head (*Kawaihoa*) to Black Point (*Kupikipiki‘o*) and to the summit of the Ko‘olau Mountains. The region is approximately 28 mi² in size and has eight miles of shoreline fronting Maunalua Bay. Maunalua Bay comprises about 6.5 mi² of submerged waters. The Bay is characterized by large reef flats extending well out from the shoreline to a fore reef that drops to about 15-20 feet.

Maunalua Bay is a biological and cultural treasure of Hawai‘i with a special history of waters abundant with fish and coral, inland fishponds and farms, and people who lived off and cared for the lands and the waters. With its natural inlet, Maunalua was an ideal location for early settlements and was developed by ancient Hawaiians into a rich fishpond system. The great Kuapa fishpond was one of O‘ahu’s largest. Other fishponds edged the shore of the Bay at Pāiko, Niu and Wailupe. Historically, the fishponds, deep water fisheries, streams and lands were carefully managed for sustainability by a *konohiki* (landlord).

Until the 1950s, the Maunalua region was rural, consisting of some homes, vegetable/flower/dairy farms, and the largest fishpond in Hawai‘i, the 523 acre Kuapa Pond. The Bay was healthy. A 1950s fishing cooperative’s regulations in the Bay pointed to the stewardship and former abundance of resources: daily catch limits for any one member, his guests, and household were “30 fish, 5 squid, 5 lobsters, and no limit on crab.”

Today, the Bay is recognized as one of the most heavily impacted and overfished marine systems in the State: 1) Listed as an impaired water by the State Department of Health, 2) Supports lowest levels of fisheries biomass when compared to other sites monitored around the State, and 3) Inundated by sediment and invasive alien algae (IAA) with coral cover <10%.

How did the problem arise?

The decline of health of Maunalua Bay results from a breakdown of the *konohiki* (traditional resource management) tradition by the middle of the 20th century and inappropriate land development and fisheries management.



In 1970s, there was major push to develop Hawaii Kai, abutting the Eastern portion of the bay. Kuapa Pond was filled and walled for the construction of housing developments and the Hawaii Kai Marina. Since then, the entire buildable coastal fringe and ridgelines have been developed. The region now supports over 50,000 households, 11 shopping centers, and channelized/cemented streams. The State built an extensive network of storm drains to take water off land as quickly as possible - bringing large quantities of runoff into the bay untreated.

During the time period, there was a significant change in fishing practices from traditional to the use modern technologies and increase in number of fishers as the island became more populated. The removal of herbivores has enabled IAA to thrive, smothering coral and native *limu* (“algae”)/seagrass. The loss of a healthy marine system has impacted the Bay’s ability to serve as *i’a hinai* (“fish basket”) for the community.

What data are available to address this problem?

MM has a substantial amount of pertinent information that will tie directly into the management plan: repository of existing research on Maunaloa Bay (on-line library, ArcGIS), State of Water Quality report, N-SPEC modeling, site-specific best management plans, Department of Health approved Wailupe Watershed Plan, water quality monitoring studies, neighborhood runoff assessments, various regional plans by City & County, Department of Transportation and others, and host of other studies from scientists. The information sheds insights on relevant projects, current thinking about target areas, and water quality issues.

How and where can the students acquire data for their analysis?

MM can provide the data directly to the students immediately. MM is also part of several working groups addressing land-based runoff - Maunaloa Watershed Hui (a consortium of residents and regional organizations), water quality team for Maunaloa Bay (e.g., Department of Health, University of Hawaii, The Nature Conservancy), and has relations with experts in the field. MM can connect the students with these groups/ individuals as a resource, if needed.

Possible approaches

To address the project objects, the following approaches may be:

- Land based modeling to determine amount of runoff coming from each hotspot area
- Literature review of successful green infrastructure projects to apply to Maunaloa
- Thorough assessment (ranking) of projects (with detailed steps and expected ecological and social gains) at multiple scales and stakeholders (e.g., stream, commercial shopping center)
- A schematic with associated data to support various options (e.g. X amount of shopping center parking lot converted to Y green infrastructure reduces A amount of runoff).

Deliverables

The deliverable is a Region-wide Green Infrastructure Strategic Plan for Maunaloa Bay. Based on the Plan, the Team will work with our Outreach and Communications Coordinator to create brochures and flyers to share with key partners, stakeholders, and community.

Internships

Please refer to the client’s letter of support.



Supporting Materials

Citations

DLNR DAR. 2010. Long-Term Monitoring of Coral Reefs of the Main Hawaiian Islands. Final Report 2009 NOAA Coral Reef Conservation Program State of Hawai'i Monitoring Report 10/01/2006 – 09/30/2010.

NOAA Pacific Islands Fisheries Science Center. 2016. Pacific Reef Assessment and Monitoring Program. Ecological monitoring 2015—reef fishes and benthic habitats of the main Hawaiian Islands, Northwestern Hawaiian Islands, Pacific Remote Island Areas, and American Samoa. Data Report DR-16-002.

McDuff et al. 2012. Invasive alga removal accelerates sediment flushing in Maunalua Bay. Research Poster.

Pollock J. 1928. Fringing and fossil coral reefs of Oahu. Bernice P. Bishop Museum Bulletin 55.

The Department of Health, Honolulu. 2008. 2006 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to §303(d) and §305(b), Clean Water Act (P.L.97-117). Chapter IV Assessment of Waters.

The Nature Conservancy of Hawaii. 2009. Maunalua Marine Survey Report.

Wolanski et al. 2009. Quantifying the impact of watershed urbanization on a coral reef: Maunalua Bay, Hawaii. *Estuarine, Coastal and Shelf Science* 84 (2009) 259–268.

Sustainable Resources Group Intn'l, Inc. 2010. Watershed Based Plan for Reduction of Nonpoint Source Pollution in Wailupe Stream Watershed. Final Report.

For a more complete list of reports and articles on Maunalua Bay, please go to:
<http://www.malamamaunalua.org/resource-library>

Budget and Justification

Mālama Maunalua does not anticipate many, if any, associated costs for this project. At present, the item that comes to mind would be the license for a computer program (such as ESRI ArcGIS) for which MM will cover.

Client letter of support

Refer to attached client letter of support.



Internships

As stated in the letter of support, MM intends to offer one paid internship. Through the Student Science and Research Program, MM invites several more interested students to intern (unpaid) with the organization. The internship can be at any time of the year.

MM is committed to supporting student research projects. In 2018, for example, MM mentored 12 interns and two classes at University of Hawaii and Kapiolani Community College. Students provide expertise and knowledge to further MM's mission.

Final projects are shared widely with our partners and the community to ensure that the work is used. In particular, the recommendations from this project will lead MM's land-based efforts and become central to the Maunaloa Watershed Hui's agenda.

Funding

Refer to attached client letter of support.

Data

MM expects that all of the data will be provided to the student group with no stipulation for a non-disclosure agreement or restriction for publication. If by some unexpected reason a non-disclosure agreement is required, MM will work with the research and the student group to work out the constraints around the use of the data.



Board of Directors

January 22, 2019

*Mitch D'Olier
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Dear Group Project Committee,

Thank you for considering supporting Mālama Maunalua and our critical work in restoring and conserving Maunalua Bay today and for future generations. Your work with Mālama Maunalua will have a far-reaching impact on the communities that depend upon a healthy watershed for their livelihoods and pleasure.

In recent years, Mālama Maunalua (MM) has built a strong Student Science and Research Program. The purpose is two-fold: 1) for MM to receive additional assistance on research in Maunalua Bay from college/graduate students, and 2) for the next generation of resource managers and stewards to get in-the-field experience for what they are learning in the classroom. Our efforts have led to a greater understanding of the bay, and provided students with valuable real-world experience.

MM would like to be able to offer at least one paid summer internship (pending financial resources in the given year). We can offer several unpaid internships. MM is committed to providing data, additional funding (subject to review) and/or any other resources for the project. We have a long track-record of providing valuable, multi-disciplinary mentorship to students.

We look forward to working with Bren School of Environmental Science and Management in general and a student group in particular.

Aloha,

Doug Harper
Executive Director