Learning From The Past Can Help Us Plan For a Better Future

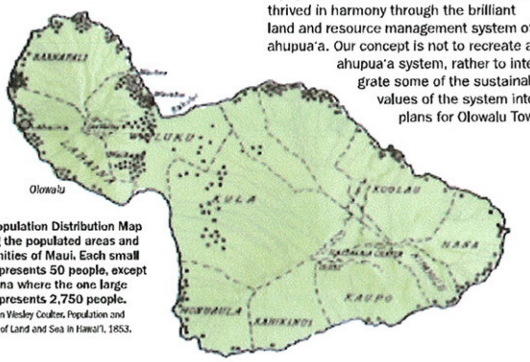
Olowalu: A Historic Population Center

It is clear from studying the historic settlement patterns of Maui that Olowalu has always been a location where people have chosen to live. Prior to Western contact, it is estimated that up to 2,000 Hawaiians were living and thriving in Olowalu. The Olowalu Ahupua'a had an abundance of natural resources. Hawaiians were able to grow breadfruit and taro in the higher areas and sweet potato and coconuts closer to the shore. The sea provided fish and the forest supplied wood for canoes and housing. A person born in the valley could learn a skill, raise a family, trade, play, and worship within the Olowalu Ahupua'a.

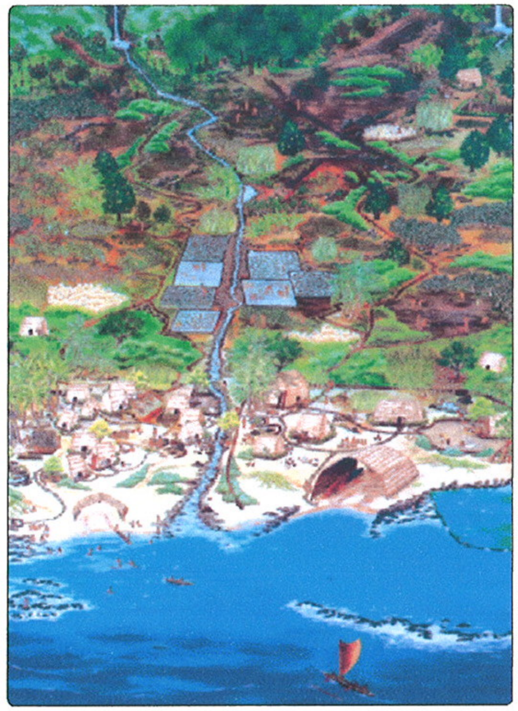
From historic times through the plantations days (see below), Olowalu has been a traditional location for a community. Only in recent times - because of the closure of the sugar mill - did Olowalu see its historic importance as a traditional population center decline. For more information about Olowalu's history please visit our website at www.olowalu.net

Learning From The Ahupua'a System

Sustainable development is not a new idea at Olowalu. For hundreds of years at Olowalu, a population of several thousand lived and thrived in harmony through the brilliant land and resource management system of ahupua'a. Our concept is not to recreate an ahupua'a system, rather to integrate some of the sustainable values of the system into the plans for Olowalu Town.



1853 Population Distribution Map showing the populated areas and communities of Maui. Each small circle represents 50 people, except in Lahaina where the one large circle represents 2,750 people.
Source: John Wesley Coulter, Population and Utilization of Land and Sea in Hawai'i, 1853.



Ahupua'a Poster by Marilyn Kahalewai, reprinted with permission of Kamehameha Schools Press. © 1982, 1993 by Kamehameha Schools. All rights reserved.

Eight Principles For Understanding And Managing The Ahupua'a

John Kaimikaua, the late kumu hula and educator from O'ahu, tells the story of how the ahupua'a evolved as a solution to the hardship and strife resulting from the depletion of natural resources. Communities had to learn to work together to take care of the land, and they formed the first stewardship organizations call the 'aha ki'ole, or people's councils.

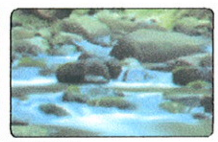
This approach centers around the preservation of and respect for the natural resources that sustain a community over time. These concepts provide insight for the reestablishment of Olowalu Town.

Learn more about John Kaimikaua's teachings at: Hawai'i.gov/dbedt/czm/todays_challenges/principles.html.

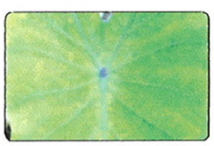
KAI MOANA
Preserve all life in the ocean, from the shoreline to the horizon.

MAKAI
Respect the land and resources extending from the shoreline to the sand's reach.

MAUKA
Respect the land and resources extending from the sand's edge to the highest mountain peak.



KAMOLEWAI
Respect all water resources including rivers, streams, and springs and the life within.



KANAKAHONUA
Preserve and respect the laws of the land and each other to insure the community's health, safety, and welfare.

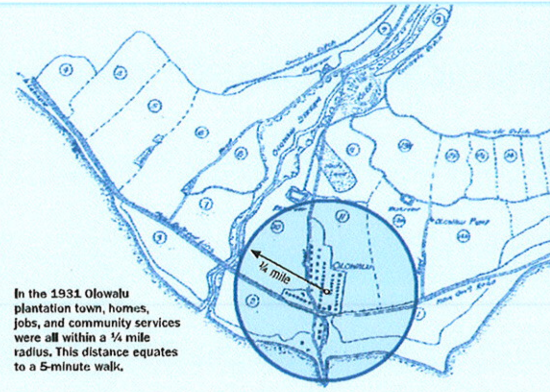
KALEWALANI
Respect elements that float in the sky including the sky, moon, clouds, stars, wind, and rain which guide the planting and fishing seasons, provide water, and create the tides and directions for ocean navigation.

KAPAHELOLONA
Preserve the knowledge of practitioners.

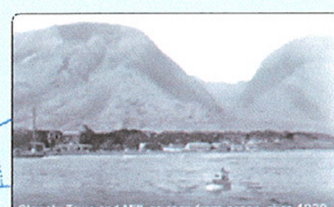
KE'IHI
Preserve and respect the sacred elements including deities, ancestors, the forces of nature, and ceremonial activities.

Learning from Plantation Days

The core values and principles of small town sustainability and balance were also found in plantation villages. As recently as 1930, Olowalu was a complete thriving plantation town including housing for employees, a school, medical facilities, stores, theater, athletic programs, and places of worship. Olowalu's plantation town integrated multi-cultural practices into daily life and was a multi-generational community where everyone knew each other, shared, and took care of those in need.



In the 1931 Olowalu plantation town, homes, jobs, and community services were all within a ¼ mile radius. This distance equates to a 5-minute walk.



Olowalu Town and Mill, as seen from ocean, circa 1930.

The Land Guides Olowalu's Design

Olowalu Talk Story was a community-based Planning Process. It began with a blank slate, there was no predetermined plan.

As planning for the proposed community began, the design team learned about existing land conditions, natural resources, archaeological and historic sites, drainage patterns, climate, scenic resources, and other critical components. This information was then used as a framework for town planning.

Long-time families of Olowalu and some of Maui's most respected cultural and professional experts provided our Lead Architect and Planner, Andrés Duany, and his design team with invaluable information related to Maui's small town communities, natural environment, and cultural history. This information helped the design team appreciate and recognize the significance of Olowalu.

Geographic Boundaries

The steep valleys and slopes surrounding Olowalu serve as natural boundaries and help establish the size and scale of the community. The project site is situated at the foothills of the West Maui Mountains. The 620-acre project site is approximately 12% of the over 5,000 acre Olowalu Ahupua'a.

Natural Resources

The design of Olowalu Town requires careful consideration of existing natural resources: the Olowalu Stream, a healthy shoreline ecosystem, abundant ocean resources, and recreational sites for surfing, fishing, diving, and snorkeling.

Historical and Cultural Resources

Olowalu area contains many significant archaeological sites and historical features including Ka'iwaloa (Kawailoa) heiau, Awalua Cemetery, historic burials, Pu'u Kilea, petroglyphs, Kapaiki Village, the historic Olowalu Church, the Olowalu General Store, Olowalu Wharf, and the old Olowalu Sugar Mill. The preservation, enhancement, and protection of these sites and features shall be incorporated into the community design.

Cultural Reserve

The current Olowalu Cultural Reserve is approximately 75 acres. Plans include expanding the Cult ural Reserve to increase mauka to makai access and enhance educational opportunities.

1,350 Residents Participate in "Olowalu Talk Story"

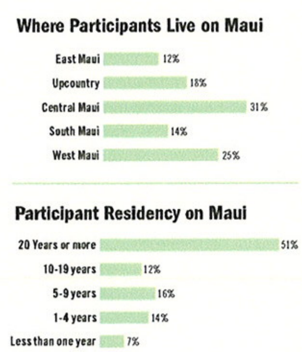
"Olowalu Talk Story," a week-long series of workshops and general sessions attracted 1,350 participants.

The workshops asked the community to help design a Small Town at Olowalu.

This was a significant first step in the continuing effort to maintain a dialogue between Maui residents, town planners, public officials and others.

WORKSHOP ATTENDANCE

SESSION	ATTENDANCE
Opening Session	420
Highway Traffic	105
Recreational Resources	60
Infrastructure Systems	100
Mid-Point Presentation	100
Public Facilities	35
Business / Commercial	40
Residential	110
Aloha Closing Session	380
Total Attendance	1,350



Hokulani Holt-Padilla provided the design team with valuable knowledge of Hawaiian history, language, and culture.

Local Architects provided the design team with tours of Lahaina, Paia, Wailuku, and Makawao.

Reverend Earl Kukahiko conducted a Blessing prior to the planning workshop with the design team and the Olowalu residents.

Ed Lindsey led a tour of Honokowai Valley describing the natural environment, cultural history, and native plants.

The People Guide The Town Plan

During the Olowalu Talk Story workshop, participants and town planners exchanged valuable knowledge and experiences.

A town for Maui should be designed with insights from the people of Maui. Town planners learned essential information about Maui's culture and lifestyle, including the need to preserve our quality of life, provide affordable housing for Maui's residents, and preserve our natural resources.

The original Olowalu Talk Story newsletter informed and invited participants to the week-long community-based planning workshop. It was mailed to everyone on Maui.

An Evolving Design Process

Important Design Components:

Throughout the planning workshop, a number of alternative designs were presented to participants for review, comment, and feedback. The site plans were continuously evaluated, assessed, and updated to incorporate the following design components:

Streets/Circulation
Pedestrian-friendly, tree-lined roadways and connective street network.

Residential
A wide variety of housing types, including affordable, senior, market, single-family, multi-family, and rental.

Recreational Resources
Easy access to open spaces, parks, beaches, greenways, trails, and bike ways.

Infrastructure Systems
Environmentally sensitive infrastructure systems, at no cost to public, to include roadways, water, wastewater, and utility systems

Public/Civic Facilities
Sites for community centers, social services, schools, police, fire, and medical facilities.

Business/Commercial
Neighborhood town centers for local businesses with economic opportunities for residents, including live/work units and access to daily services.

Plans were created based on various neighborhood locations. Each neighborhood is defined by the 5-minute walk.

Traditional Neighborhoods for People, Not Cars

Mixed-Use Neighborhoods

The basic building block for Olowalu Town is the mixed-use neighborhood. Neighborhoods will have defined centers, shops and stores to satisfy daily household needs, and a variety of places to live and work.

Small Walkable Neighborhoods

The ideal size or scale of a walkable neighborhood is measured by a **5-Minute Walk*** with only a ¼ mile from center to edge. The neighborhood center is a gathering place, such as a town square, a park, town center, or green space.

*Defined as a Pedestrian Shed

"The planning and growth of a small town community is just like that of a family."

"The planning and growth of a small town community is just like that of a family. What you nurture from the very beginning of its conception and continue to nurture has a direct result on its presence to the world. People and things that are close to the family and hold it dear to their heart will inevitably look out for its best interests. So, too, with town planning. Success is achieved with knowing and respecting the environment, the needs of the people, and the purpose of preparing a healthy future."

GEORGE RIXEY
Past President of the American Institute of Architects Maui, Past President of the Kihei Community Association

Olowalu Talk Story started with a "blank slate." All design occurred in sessions open to the public where participants were encouraged to review and comment. The plans were continuously updated and modified based on participant's feedback.



Olowalu Town: A Traditional Maui Community

Conceptual plans for Olowalu Town reflect the reestablishment of a community at Olowalu where Maui's residents can afford to live.

Housing will be provided in many forms including affordable, senior, apartments, below market, single family, multi-family, and live/work opportunities.

Stores, schools, parks, beaches, and community services will be integrated within walking distance of homes. Town centers will provide business and commercial opportunities for residents to live and work in the same community.

These plans are being developed based on the information gathered in the Olowalu Talk Story Community-based Planning Event and community input over the past 18 months.

The conceptual drawings and charts provide more detail about living in this community. We look forward to finalizing these plans based upon continued dialogue with the public.

> **"Olowalu reminds me of the small towns that I knew as a youngster growing up on Maui."**
>
> 
>
> *"How Maui will grow to meet the housing needs of our working families is an important question facing us. Olowalu Town answers that question by proposing to build a true community with a mix of housing, beach access and with planning for local neighborhood businesses, schools, and community facilities. Olowalu reminds me of the small towns that I knew as a youngster growing up on Maui."*
>
> ***BILL KAMAI***
> ***Senior Service Representative,***
> ***Hawai'i Carpenters Union, Maui Office***

Financial Feasibility

The Olowalu Town Project will need to be financially feasible in order to become reality. Under current conceptual plans, Olowalu Town will provide roughly:

- **500 affordable housing units (less than 120% median income)**
- **500 sub-market housing units (below existing average market prices)**
- **500 market rate housing units (above average market prices)**

As designed, this plan would meet or exceed Maui's existing Workforce Housing Ordinance. As proposed, the market rate housing units will help to finance the affordable housing units and the costly infrastructure improvements.

A Detailed Look at a Mixed-Use Neighborhood

1. Recreational activities: surfing, swimming, fishing, hiking, and diving
2. Streets lined with trees, sidewalks, and bike lanes.
3. Preserved archaeological site
4. Landscape buffer along highway
5. Town center with local businesses
6. Land reserved for community centers, social services, and civic/religious organizations
7. Land available for police and fire stations
8. Corner store near live/work unit
9. Apartment or multi-family building
10. Wide range of housing for work force, under market, market, senior, fee simple, and rentals
11. Connected street network provides multiple routes to disperse local traffic and minimize highway use
12. Homes within five-minute walk (1/4 mile) from parks, school, coastline, stores and work centers
13. Historic cemetery
14. Rural house lots
15. Farmstead homes
16. Bed & breakfast, inn, or lodge

Homes in Olowalu Town

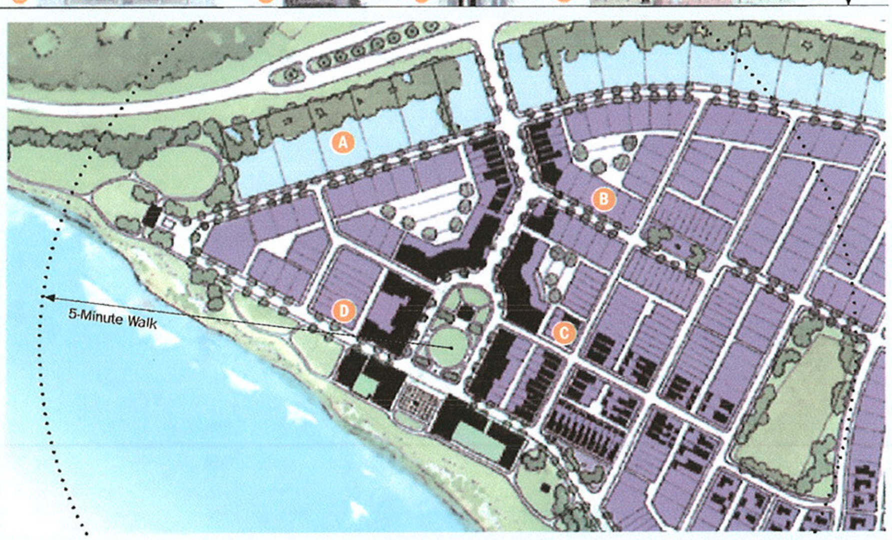
Olowalu will offer a wide range of housing for all ages and income levels — young singles, families, service workers, working farmers, entrepreneurs, and retirees. From single-family lots to live/work units, Olowalu homes will be dignified and close to the town center, parks, and beaches.

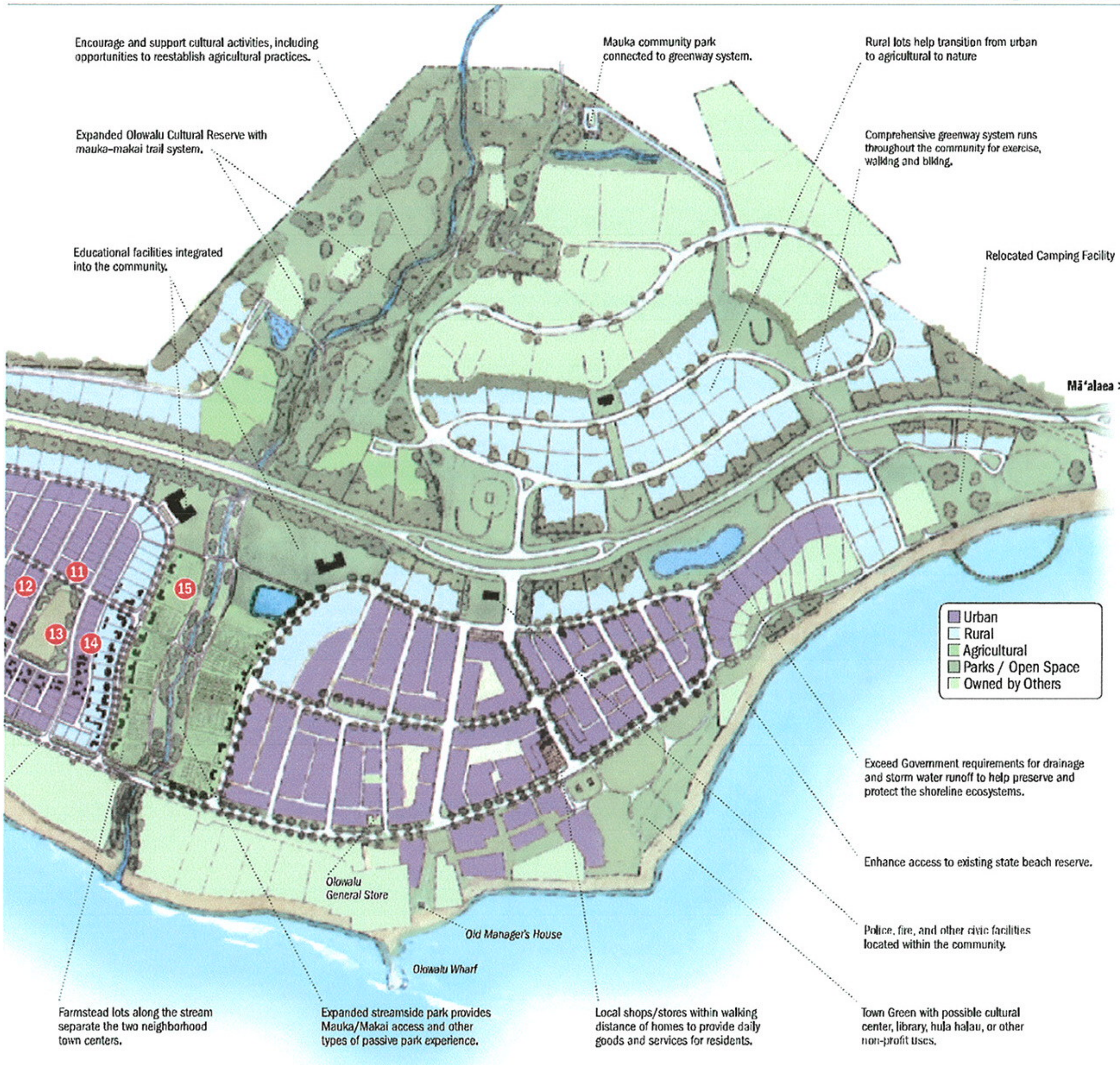
A. Rural Residential
Single-family homes on minimum one-half acre lot with rural character.

B. Urban Residential
Single-family homes on smaller lots, closer to neighborhood town centers.

C. Urban Live/Work Units
Residential living space above, small family business or commercial use on street level.

D. Urban Town Houses
Multi-Family units create higher density located near neighborhood town centers.

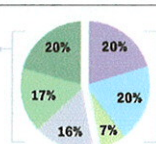




Olowalu Town Land Use Breakdown

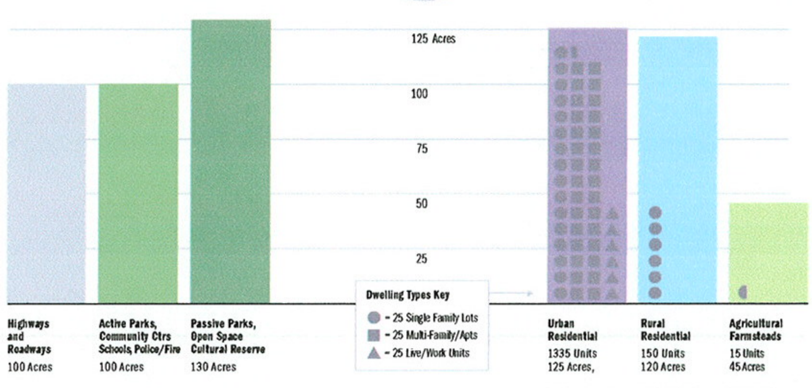
Parks, Open Space & Community Space: 53%

- Passive Parks, Open Space, Cultural Reserve: 20%
- Active Parks, Community Center, Schools, Police/Fire: 17%
- Highway and Roadway Corridors: 16%



Residential Land Use: 47%

- Urban Residential and Commercial Business: 20%
- Rural Residential: 20%
- Agricultural Farmsteads: 7%



Highways and Roadways	Active Parks, Community Ctrs Schools, Police/Fire	Passive Parks, Open Space Cultural Reserve	Urban Residential	Rural Residential	Agricultural Farmsteads
100 Acres	100 Acres	130 Acres	1335 Units 125 Acres,	150 Units 120 Acres	15 Units 45Acres
			0.09 ac./unit	0.8 ac./unit	3 ac./unit

Note: Preliminary figures based upon conceptual master plan.

Olowalu Acreage

Olowalu Town .... 620 acres
Parks, Open Space and Community Space ... 330 acres
Residential Use .... 290 acres

Passive Parks and Open Space

Streamside Park, Cultural Preserve, Neighborhood Parks, Pocket Parks, Archaeological Sites

Active Parks/Community Services

Coastal Parks, Community Centers, Schools, Police / Fire Facilities

Roadway Corridors

Tree-Lined Roadway, Greenways, Relocated Highway, Streets, Alleys, Bikeways, Trails

Number of Units by Type

Single Family Lots 565
Multi-Family / Apartments 785
Live/Work Units 150

Commercial Business Space

25,000 sf in the Town Centers for:

Surf Shops	Doctors	Cafés
Restaurants	Dentists	Book Store
Markets	Video Stores	Hardware Store
Drug Stores	Bakeries	Bar

"Bill and Dave did a beautiful job working and talking with us. I've seen what the community came up with and it is a good project."

– *KATHERINE D. KING - Born and Raised in Olowalu*

Sustainable Infrastructure

Learn from our natural resources, use the best available technologies, and build independent infrastructure.

Respect Our Natural Resources

Olowalu Town will build innovative infrastructure systems that are based upon sustainable technologies which minimize adverse impacts upon the natural environment. Efficient "green" technologies modeled from natural systems are planned at Olowalu Town with emphasis on conservation, cleaning, and recycling. Compact decentralized infrastructure systems are both economically and environmentally friendly. These systems create a smaller, less intensive "ecological footprint" than larger centralized systems.

Healthy Communities

Olowalu Town's residents will utilize walking for many daily needs thus reducing the number of daily car trips. Not only will residents reduce their reliance on imported gasoline and cut down on vehicle emissions, Olowalu Town will provide residents access to beach parks, playgrounds, hiking, and biking from their homes. Walkable communities also increase interaction with neighbors and lead to physically and socially healthy communities.

Independent Infrastructure

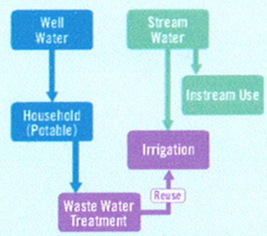
Olowalu Town will be supported by privately funded, independent infrastructure. The water, wastewater, and drainage systems will be sized appropriately to support the town's needs. In many cases, these infrastructure systems will be decentralized which allows for less impact on the environment. Olowalu Town has also reserved sites for community services including educational, police, and fire facilities. The relocation of Honoapi'ilani Highway at Olowalu will be constructed in conjunction with the first phase of reestablishing the Olowalu Community.

Water and Wastewater

Through the use of Integrated Resource Planning, Olowalu's Natural Resource Engineers carefully assessed and examined innovative alternatives for water, wastewater, and drainage systems.

Drinking Water

The drinking water (potable water) requirement to support Olowalu Town is roughly 600,000 gallons per day. The Olowalu aquifer's sustainable yield is estimated at 3 million gallons per day. The Olowalu Town Plan is designed to utilize only 20% of the aquifer's sustainable yield.



Water Used Wisely **The Olowalu water treatment plant will reclaim wastewater from households and make it reusable for irrigation keeping more stream water in Olowalu Stream.**

Wastewater

State-of-the-art wastewater treatment plants are relatively small and have little odor or other effect on the environment. These plants efficiently produce clean recycled water for irrigation use.

Irrigation Water

Irrigation water (non-potable water) will be provided by a combination of recycled wastewater, stream water and possibly captured storm water. Use of native plants will reduce overall irrigation water demands.

Stream Water Restoration

The integrated irrigation water system will provide opportunities to significantly reduce the amount of stream water currently being utilized for irrigation.

Drainage/Storm Water

Olowalu Town will use best management practices (BMPs) to design and build drainage systems that protect the health of residents and their homes, preserve and enhance the natural environment, and protect shoreline water quality. The BMP standards will protect the surrounding environment from soil erosion, sediment production, and other non-point source pollutants. Drainage systems will exceed government requirements to ensure protection of near-shore water quality.

Fewer Trips, Better Flow, Less Traffic

Instead of just planning streets for cars, Olowalu Town is designed to provide many modes of transportation for people including walking, biking, mass transit, and automobiles.

These different modes of transportation address movement within the neighborhood (circulation), between neighborhoods (connectivity), and to different parts of the island (regional transportation).

Connectivity

Olowalu Town is designed with interconnected streets that include trees and sidewalks that slow down automobiles and encourage walking and biking. This well-connected network of narrow streets provides better mobility and is safer and more efficient than poorly-connected network of wide streets. Olowalu Town's neighborhood block system shortens travel routes and encourages alternatives to automobiles.

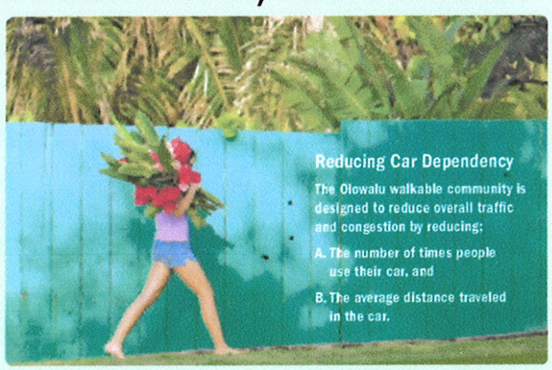
Planning for neighborhood stores, parks, community centers, and educational facilities within walking distance of neighborhoods will reduce the number of automobile vehicular trips and encourage the casual meeting of residents that form the bonds of a community.

Circulation

Internal roadway systems connecting Olowalu's neighborhoods will provide additional ways to move people throughout the community. The monkeypod-lined portion of the existing Honoapi'ilani Highway will be preserved and utilized as a lower volume connector road between the Olowalu neighborhoods. In the case of an emergency on Honoapi'ilani Highway, this thoroughfare could be used to route highway traffic through Olowalu. Bike and walking paths will also serve as another connection between neighborhoods and allow people easy access to beach parks, shops, and homes.

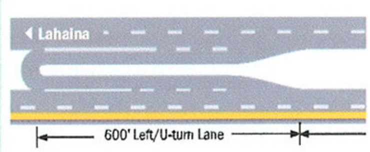
Regional Transportation

Olowalu Town will also greatly improve regional transportation. The construction of the Olowalu portion of the relocated Honoapi'ilani Highway in conjunction with the first phase of Olowalu Town will greatly improve regional transportation to West Maui. Additionally, Olowalu Town residents will have safe and easy access to necessary regional transportation. The highway corridor is designed to conveniently accommodate mass transit alternatives when available. Olowalu transit stops have been designed to be within walking distance of the neighborhoods to increase personal travel choices and reduce reliance on the automobile.



Honoapi'ilani Highway

During the Olowalu Talk Story workshop, options to improve Honoapi'ilani Highway evolved from simply widening the existing road to considering various alternatives, including the ones shown at right. The alignment favored by workshop participants (far right) provided the best opportunity to serve a small town at Olowalu and to enhance the free flow of highway traffic.



Artist rendering and U-turn diagram not to scale.


Access to beaches, surfing, parks, and play areas.


Neighborhood parks provide "back yards" for children.


Series of interconnected greenways/ bikeways for walking or biking.


Places where residents can just hang out with friends, sit and relax.

200+ Acres of Parks and Open Space

The design of Olowalu Town includes over 200 acres of parks, beaches, greenways, ball fields, community gathering areas, and open space. Healthy and active communities help provide for the social, spiritual, and cultural needs of its residents, and enhance our quality of life.


Olowalu Cultural Reserve will be increased in size and enhanced with trail systems.

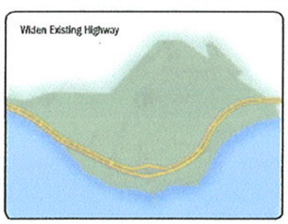

Homes are situated within easy walking distance to recreational facilities.

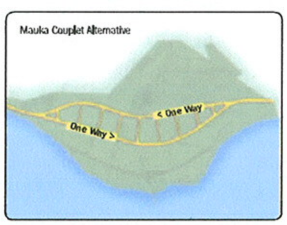

Easy access to civic, religious, and non-profit facilities.

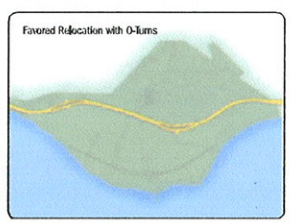

Preserve and enhance public access to shoreline resources.


Camping facilities.

Relocation Process and The Innovative Olowalu O-Turn

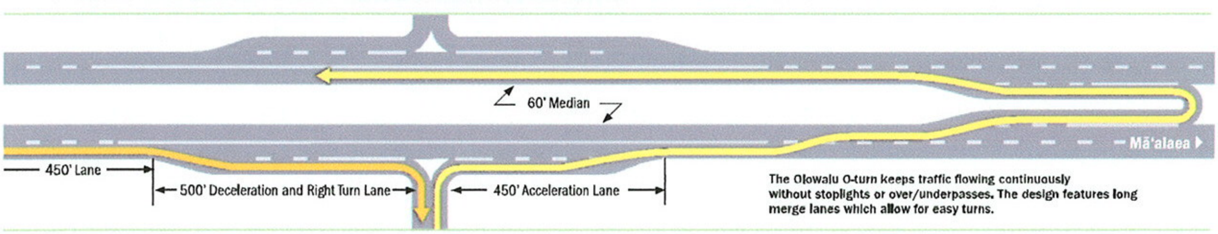






Relocation Highlights

- Highway constructed in conjunction with first phase of development
- Three separate O-Turns provide access to town and disperse traffic and allow left turns without delays
- Medians designed to accommodate light rail or other mass transit system, as it becomes available
- Public access to larger beach parks between the relocated highway and the ocean



The Olowalu O-turn keeps traffic flowing continuously without stoplights or over/underpasses. The design features long merge lanes which allow for easy turns.

How the O-Turn Works

The Olowalu Turn or O-Turn works by preventing drivers from making left turns across traffic. Drivers safely take a U-turn with the assist of merge lanes and enter into the flow of traffic going in the reverse direction. Then, by merging to the right lane, drivers may turn right and reach their destination. Meetings with the Department of Transportation have been productive and they have been receptive to these innovative ideas.

No Stoplights, Continuous Flow

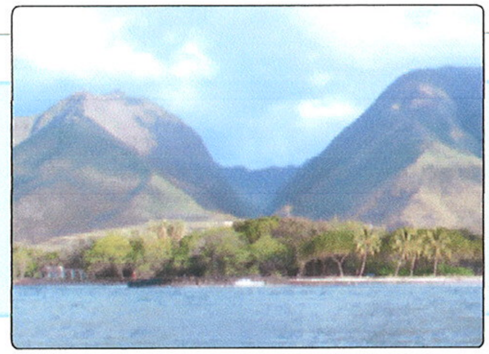
One of the problems with the existing flow of traffic through Olowalu is that cars making turns off the highway – especially left-turns – invariably slow the overall flow of the traffic. Our mainland and local traffic engineers at the workshop introduced a new approach to Maui which we call the "O-Turn." It is an efficient solution that allows for easy and safe turns without interrupting the flow of traffic and is successfully being used in other states. Our traffic engineers have designed it to accommodate the existing and future traffic volumes on Honoapi'ilani Highway.

O-Turn Benefits

- No stoplights
- No under/overpass
- Easy turns
- Long on/off lanes
- Continuous traffic flow

"One advantage that Maui has is the island still has a number of traditional towns. These small towns represent the model of sustainable communities that are compact, connected and complete."

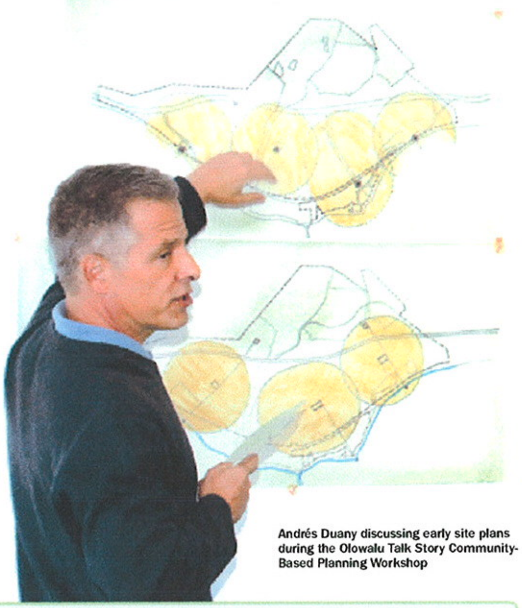
ANDRÉS DUANY Lead Architect of Olowalu Town



Olowalu's Urban Growth Boundaries combined with the natural land features create a combination of restrictions that will prevent Olowalu Town from sprawling into other communities.

A Message from Andrés Duany:

A Small Town for Maui



Andrés Duany discussing early site plans during the Olowalu Talk Story Community-Based Planning Workshop

Today, Maui has the opportunity to chart its own future and determine the manner and form of development that will occur on the island for many years to come.

The plan for Olowalu Town returns to the original Maui small town model of complete and compact communities, where most, if not all, daily needs can be met within a five-minute walk of one's home.

Until recently what has proliferated on Maui and in Hawai'i is the conventional suburban planning imported wholesale from the mainland. This development model comes with a number of disadvantages, penalties, and inconveniences, such as larger land consumption, segregated and isolated pockets of development, traffic congestion, pollution, and loss of open space, and public amenities.

Olowalu Town's layout, structures, density, and land use all contribute to create a compact, walkable environment. Olowalu will have a wide range of housing types, including townhouses, apartments, bungalows, cottages and large houses on farmsteads, with a substantial portion given to much-needed affordable housing.

There will be live/work units to encourage people to start new businesses, which would help reduce the need to commute to work and create a wider, more diverse, economic base. Two town centers will feature facilities and amenities for the larger community, including retail and commercial spaces, civic buildings, and public open space.

The building of Olowalu Town will be guided and framed by a new design code. This new code marries traditional settlement patterns with sustainable ecological strategies, and is proposed to overlap and simplify the existing zoning code, with the creation of livable streets at a variety of densities, uses, and residential unit types.

Olowalu Town is the model for a new opportunity to re-build communities on the island of Maui.

Maui County's General Plan And The Future Of Maui

The Maui County General Plan is currently being updated. The 2030 General Plan will establish the overall vision that will guide the growth and development of Maui County for the next 20 years. One of the key components of the General Plan will include the establishment of Urban and Rural growth boundaries. Future growth and development within these identified Urban and Rural boundaries will be encouraged; growth in areas located outside of these boundaries will be discouraged. The 2030 General Plan will be comprehensive and address the social, economic, and physical environment through a community-driven process to collectively define values, goals, and objectives.

Long Range Effects

When ultimately adopted by the Maui County Council, the 2030 General Plan has the potential to affect almost every decision we will make about where to live, work, send our children to school and prepare our families for a better life in the years ahead.

We encourage you to stay informed and participate in this vital work.

Participate Now

You can send your ideas to the Long Range Planning Division online at www.generalplan2030@mauicounty.gov or by phone at 270-733. All of the meetings relating to the development of the General Plan, including those of the current General Plan Advisory Committee (made up of 25 dedicated citizen-volunteers), the Planning Commission and the County Council are open to the public. The notice of meetings is published on the Maui County government website www.mauicounty.gov.

Talk To Maui's Long Range Planning Division
Phone: 270-7335 | Online: www.mauicounty.gov

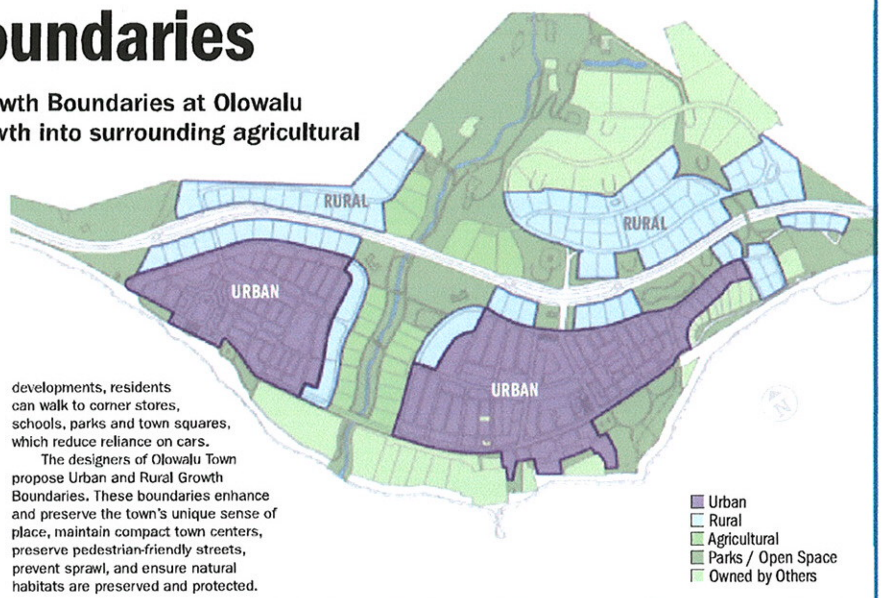
Suburban Sprawl vs Traditional

Suburban Sprawl	Traditional Neighborhood Design
General Characteristics	
• Segregated land uses • Congested roadways • Continuous outward growth of communities • Inefficient use of resources	• Mixed-use communities • Pedestrian-friendly • Wide range of housing for all income levels • Environmentally sustainable
Traffic & Roadways	
• Designed for cars and unsafe for pedestrians • Congested connector roads • High-speed streets, wide and open • Dead end, cul-de-sacs	• Designed for people, not cars • Multiple connected and parallel roadways • Low-speed streets, lined with trees and sidewalks
Community	
• Sprawling sub-urban developments • Require car to get to services and schools • Social and civic facilities an afterthought	• Multi-generational communities • Walking distance to schools and parks • Social and civic facilities planned within town
Land Use	
• Sprawling suburbs and isolated land use • No sense of community • Reduced open-space and uncontainable growth	• Smaller neighborhoods and efficient land use • Distinct sense of place • Open-space and urban boundaries
Infrastructure	
• Large, expensive infrastructure systems • Extensive transmission lines	• Efficient, small-scale infrastructure systems • Fewer transmission lines
Environmental Resources	
• Low-density developments pave over open-space • Large development footprint • Many car trips required per day	• Clustered, higher-density communities • Small urban footprint on environment • Designed to encourage walking, reduce car trips

Olowalu Town's proposed Urban Growth Boundaries are shown in relation with existing and proposed neighboring urban areas.

Growth Boundaries

The Urban and Rural Growth Boundaries at Olowalu will prevent outward growth into surrounding agricultural and open space areas.



Once established, these growth boundaries will maintain Olowalu's small town scale, ensuring its continued sense of place.

Over the past 40 to 50 years our island's urban areas have grown and expanded outward, blending together and reducing farmland and open space.

In an effort to prevent this suburban sprawl, many communities across the country have begun to create Urban Growth Boundaries. An Urban Growth Boundary is a line drawn around an existing or proposed urban area beyond which urbanization cannot occur. Once established, growth must take place only within this area. Rural Growth Boundaries soften the transition from these urban areas to agricultural and natural areas.

Olowalu's Urban boundaries will encourage higher density mixed-use development resulting in increased land use efficiency. In mixed-use developments, residents can walk to corner stores, schools, parks and town squares, which reduce reliance on cars.

The designers of Olowalu Town propose Urban and Rural Growth Boundaries. These boundaries enhance and preserve the town's unique sense of place, maintain compact town centers, preserve pedestrian-friendly streets, prevent sprawl, and ensure natural habitats are preserved and protected.

Neighborhood Design (TND)

Suburban sprawl is the result of mainland "zoning" concepts that strictly separate uses and activities into single locations.

It is typically composed of subdivisions of homes without community services; local stores, parks and amenities.

As a result the automobile dominates the setting, thus requiring more and more roads that repeatedly fill up with traffic. This form of growth is a wasteful use of precious resources.

Principles of TND

The master plan for Olowalu Town is compatible with Maui's small town traditions and ensures that a meaningful and distinctive community is created.

At Olowalu, we are committed to Traditional Neighborhood Design (TND). This innovative concept uses specific planning and design tools to guide the environment for existing and new communities, with the ultimate objective to build towns and communities that are pedestrian-friendly, comfortable, safe, and ecologically and economically sustainable.

Traditional Neighborhood Design Principles

1 The basic increment or building block will be the mixed-use neighborhood ("pedestrian sheds"), and neighborhoods will be designed and sized to be walkable.

2 Each mixed-use neighborhood shall have a discernible center to serve as a community gathering place. This center will also contain a transit stop.

3 The neighborhood will be of small size and scale with a maximum standard of a 5-minute walk from the edge to the center. This distance averages one-quarter of a mile.

4 Shops and stores within close proximity to neighborhoods will be sufficiently varied to satisfy ordinary daily household needs, such as a convenience store.

5 The neighborhood shall incorporate a variety of places to work, including live-work units.

6 Neighborhoods shall include a variety of dwelling types, such that younger and older persons, single households and families may be housed.

7 Educational facilities shall be available, or a site reserved, within walking distance of most dwellings.

8 Small playgrounds or neighborhood parks will be situated within one-eighth of a mile to all dwellings, not more than a 2- to 3-minute walk.

9 Thoroughfares and roadways shall be designed as a network, with emphasis on connecting adjacent thoroughfares wherever possible to provide drivers with options to disperse traffic.

10 Thoroughfares shall be designed to slow traffic, creating an environment appropriate for pedestrians, bicyclists, and automobiles.

11 Building frontages shall collectively support pedestrian streetscapes, parking lots to be located behind buildings.

12 Sensitive natural resources and cultural areas are preserved as permanent open-space.

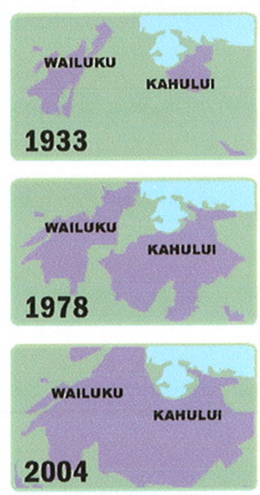
13 Exceptional sites or special locations to be reserved for community uses or civic buildings.

14 Buildings for meetings, education, religion, or culture will be located at the termination of street vistas or within the Neighborhood centers.

15 Youth and seniors benefit because walkable neighborhoods are not dependent on automobile transportation.

The Value of Boundaries as a Design Tool

Kahului and Wailuku used to be compact and complete communities separated by agricultural and open space. With the establishment of zoning and subdivision laws in the 1950's, these communities began to merge together. At Olowalu, Urban and Rural Growth Boundaries are designed to maintain its small town scale.



Source: Maui County Planning Department

Olowalu Town Community Benefits

Our goal for Olowalu Town is to reestablish a small town community that reflects the vision, values and goals of Maui's citizens and families.

1. A community where Maui's families can afford to live
2. A mixed-use community with homes close to parks, schools, corner stores, beaches, community centers, town centers, etc.
3. A wide range of housing types for all ages and all income levels
4. Plans include the construction of bypass highway through Olowalu, in conjunction with first phase
5. Over 200 acres of parks and open space (1/3 of the project) including preservation and enhancement of public shoreline access
6. Infrastructure systems at no cost to the County
7. Neighborhood town centers to provide community with economic sustainability, employment opportunities, and local business opportunities
8. Innovative infrastructure systems designed to have minimal adverse impacts upon the environmental resources
9. Exceed government regulations for drainage and storm water runoff to protect shoreline ecosystems
10. Innovative "O-Turn" on bypass highway allows cars to flow without stopping with no street lights or over/under passes
11. New bypass highway designed to accommodate light rail or mass transit
12. Existing Olowalu Cultural Reserve along stream expanded and enhanced to include mauka and makai trail system with educational/interpretive program
13. Walkable town reduces the number and length of automobile trips, reduces traffic congestion, conserves fuel/energy, and lowers emissions
14. Design team and architects certified by U.S. Green Building Council for Leadership in Energy Efficiency Design (LEED)

This project is planned to be a LEED-certified Neighborhood Development. The LEED for Neighborhood Development Rating System integrates the principles of smart growth, new urbanism, and green building. Certification provides independent, third party verification that the development's location and design meet accepted high standards for environmental responsibility and sustainable development. You can learn more at www.usgbc.org

Planning and Construction Timeline

2005–2007

Community-Based Planning

Early Consultation with Key Groups/People

Olowalu Talk Story

Community Outreach

In-House Conceptual Review

General Plan Advisory Committee Recommendation for Urban Boundaries

2008–2012

Permitting and Entitlement Process

Early Consultation and Notice of Environmental Impact Statement

Development of Technical Studies for Environmental Impact Statement

Public Review of EIS

Government Approval Process for Land Use Entitlements

Final Approval of Governmental Land Use Entitlements and Permits

2013–2018

Infrastructure Design And Construction

Final Design of Infrastructure

Construction of Initial Infrastructure Improvements including: Phase 1 Water Improvements, Decentralized Wastewater Treatment, Drainage Systems

Construction of relocated Honoapi'ilani Highway at Olowalu

Occupancy of First New Residents at Olowalu

2019–2028

First Neighborhood Construction Phase

Residents live and work in Olowalu's first neighborhood center

Neighborhood stores, parks, educational facilities within walking distance

Affordable, rental, senior, single-family, multi-family, apartment housing options

2029–2038

Second Neighborhood Construction Phase

Residents live and work around Olowalu's second neighborhood center

Additional infrastructure improvements

Expansion of civic, social and community services

Continued Suggestions Improve Town Plan

We would like to thank the following groups, associations, and community leaders listed below for helping to improve our plans for Olowalu Town.

Over the past 18 months they have provided us with opportunities to share our plans with them.

Please note that those listed below have not provided us with official endorsements or approvals; rather, they have kindly provided us with valuable feedback and suggestions on how to improve our plans.

- American Institute of Architects
- County Department of Transportation
- County Mayor and Administration
- County Planning Department
- County Public Works Department and Environmental Management
- Filipino Centennial Chair
- Governor's Office
- Hawai'i Carpenter's Union Reps.
- Island Of the Worlds Conference on Sustainability
- Kahului Rotary
- Kihei-Wailea Rotary
- Lahaina Rotary
- Maui Chamber of Commerce - West Side
- Maui Coastal Land Trust
- Maui Contractor's Association
- Maui County Council Members
- Maui Economic Development Board
- Maui Economic Opportunity
- Maui Tomorrow Board of Directors
- Maui Young Business Round Table Leaders
- Maui Nui Housing Task Force First Time Home Buyers Conference
- Na Kupuna O Maui
- Office of Hawaiian Affairs
- Sierra Club Executive Committee
- State Association of Professional Engineers
- State Department of Transportation - Highways Division
- State Senators and House Members
- Tri-Isle Main Street Resource Center
- Wailuku Rotary
- Lahaina-Honolua Senoir Citizen Club
- West Maui Taxpayers Association
- West Maui Mountains Watershed Partnership

The First Steps of a Long Journey

We are currently completing the first steps of a long journey. The Olowalu Town project will be entitled and constructed over the next 25 to 30 years.

Community-based Planning phase. Highlights of this phase include:

- Olowalu Talk Story: 1,350 participants openly exchanged ideas with our design team during a weeklong event to help create the Conceptual Master Plan for Olowalu Town.
- Feedback: Presentations of plans have been made over past 18 months to various groups, associations, and community leaders. The purpose of these meetings was not to seek any endorsements or approvals, rather, the purpose was to seek suggestions on how to improve the plan.
- GPAC Process: We have committed not to begin our Entitlement and Permitting Phase until the General Plan Advisory Committee (GPAC) has reviewed and approved a Maui Island Plan.

Permitting and Entitlement: The next phase of the project is the Permitting and Entitlement Process which will include a request to change the existing land use designations from Agriculture to Project District (includes Urban and Rural Designations). Accordingly, this phase will involve a thorough public review and approval process, including:

- Preparation and Acceptance of an Environmental Impact Statement (EIS) Detailed and comprehensive review of project, technical studies, public meetings, and full disclosure of project's impacts upon natural and human environment.
- Land Use Entitlements Review and approval by the State Land Use Commission, the County Council, and Maui Planning Commission, with many public hearings and meetings.

Infrastructure Design and Construction: Once entitled, the project will begin infrastructure design and construction including the new mauka Honoapi'ilani Highway at Olowalu, internal roadways, parks/greenways, and water and wastewater systems. Ultimately, this phase will include families moving into a range of affordable, below market, and market homes.

Future Neighborhood Construction: With initial infrastructure in place, neighborhoods will begin to be established. Future construction of the project will include additional homes, business/commercial establishments, neighborhood town centers, additional infrastructure systems, space for civic/social services, and educational facilities.

Mahalo for taking time to read our paper. We hope that this report will provide you with helpful information that you can use as we continue our planning process for Olowalu Town.

Feedback: Your comments and feedback regarding Olowalu Town are welcome at our website at: www.Olowalu.net or by writing us at: Olowalu Town, 2073 Wells Street, Suite 101, Wailuku, Hawai'i 96793.

"It's a community where you can afford to live and raise a family."

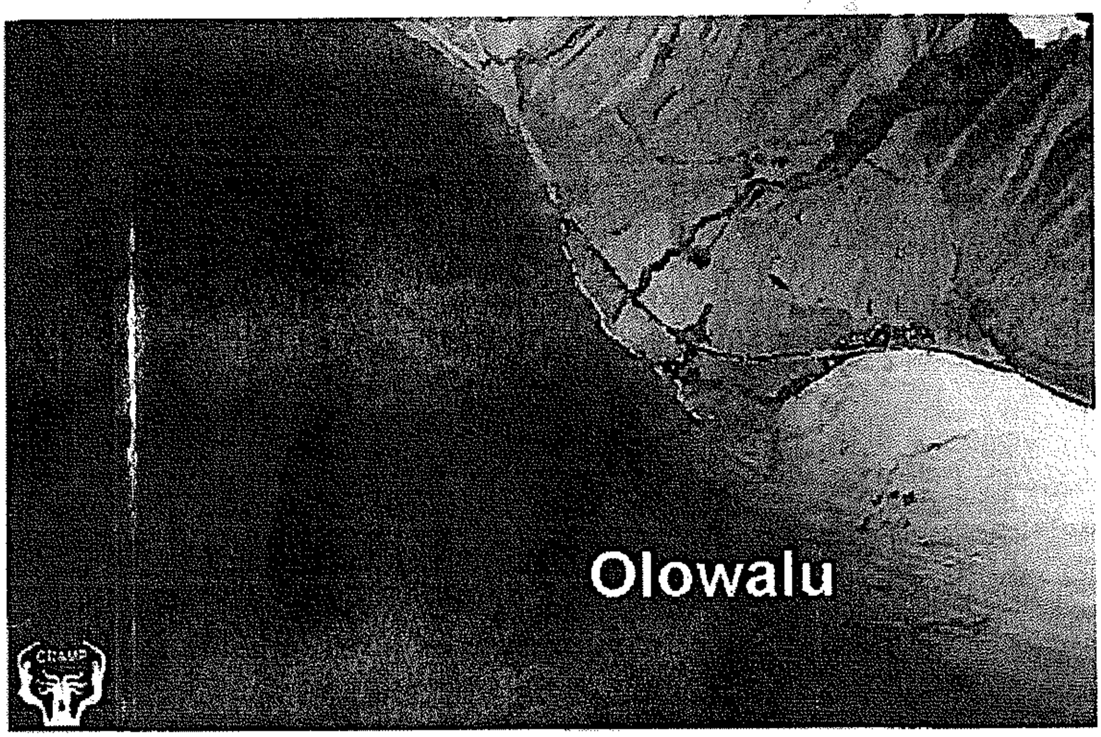
I grew up in a small town where we knew our neighbors, we looked out for each other, and we could safely walk or ride our bikes to the store, school, or church. Our pace of life was not so hectic; the quality of life on Maui was good. I know that Bill and Dave are concerned about the changes to our island, especially about the changes to our small towns and communities. Olowalu Town is designed to be a small town like the one I grew up in, a community where you can afford to live and raise a family.

– JON SANTOS
Raised in Haiku

APPENDIX C.

A Baseline Study on Sediment Loading, Water Quality, and Selected Marine Life in Nearshore Waters of Olowalu, Maui

A baseline study on sediment loading, water quality, and selected marine life in nearshore waters of Olowalu, Maui



Prepared for:
Ed Lindsey
Address

Prepared by:
Hawaii Wildlife Fund
P.O. Box 637
Paia, Hawaii 96779

and

Pacific Rim Research
P.O. Box 791625
Paia, Hawaii 96779

February, 2003

A baseline study on sediment loading, water quality and selected marine life in nearshore waters of Olowalu, Maui: January 2001 - November 2002

February 5, 2003

Prepared for Ed Lindsey by:

Hawaii Wildlife Fund:
Hodges[1], A.H., Brown[2], E.K., Brown[3], D., Bernard[4], H., and Harris[4], A.

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[4]Hawaii Wildlife Fund, P.O. Box 637, Paia, HI 96779

Abstract

Sediment Dynamics and Water Quality at Hekili Point, Maui

INTRODUCTION

Due to past agricultural practices and coastal development, West Maui has experienced coral reef degradation and nuisance algae blooms (Hawaii Wildlife Fund 1999). Increased sediment input along tropical coastlines is one major cause of anthropogenic damage to coral reefs worldwide (Brown and Howard 1985; McManus 1988; Rogers 1990). Sediments can smother corals and reduce light transmission through the water column, inhibiting photosynthesis in coral tissue (Rogers 1990). It has been suggested that chronic sediment loading rates exceeding 10 mg cm^{-2} day^{-1} are detrimental to reefs (Pastorok and Bilyard 1985; Rogers 1977, 1990).

There is a natural balance between algal and coral growth in healthy coral reef environments (Brown et al. 2002). Terrestrial run-off can contain high levels of nutrients, such as nitrogen and phosphorus, which can promote algal growth. Algae can grow faster than corals, allowing it to overgrow surrounding corals and eventually kill them. This shift in the benthic community can also affect the amount and type of fish inhabiting the reef.

Such changes can adversely affect the continued value of reefs for recreation, fishing, scientific research, conservation, and educational activities (Brown et al. 2002). It is therefore important to establish the existing reef health of our nearshore waters, so future changes can be documented and quantified. The analysis in this study will help give researchers, developers, and the West Maui community a baseline view of reef health at Olowalu, West Maui, Hawaii.

METHODS

Study Site

Sediments

Sediment traps were placed on the reef to estimate the quantity and type of sediment that corals were exposed to on a daily and seasonal basis. These traps were critically validated in both laboratory and field studies (Gardner, 1980a, 1980b). Each sediment trap was constructed from a plastic garden tray (46cm X 46cm) and 3 PVC pipes (5.1cm diameter X 15.2cm height) with endcaps on the bottom. The pipes were oriented vertically through the inverted tray bottom and spaced 15cm from each other in a linear array to sample independently of each other (Gardner, 1980). The tray was weighted with 2 bricks on each corner and attached to the bottom using 2-3 cable ties in order to restrict movement and reduce vandalism. Two trays were deployed at the study site.

<u>Total Sediment Loading</u>

Samples from the traps were retrieved, filtered, dried and weighed to determine quantity of sediment collected in mg cm^{-2} day^{-1}. Samples were collected and analyzed every month from December 2001 to July 2002.

<u>Grain Size Analysis</u>

Trap samples and Grab samples – additional sediment samples obtained by scooping sediment adjacent to the trap into Ziploc containers – were analyzed to determine the size of particles corals were exposed to. This grain size analysis was conducted using the following categories (sieve size); gravel (4mm), fine gravel (2mm), extra coarse sand (500µm), coarse sand (250µm), sand (125µm), fine sand (63μm), and silt (<63μm). Values in each category are represented as a percentage of the total sample.

Carbonate Fraction

Carbonate fraction analysis was also performed on the sediment samples to quantify the percentage of marine vs. terrestrial sediments present. Subsamples of whole sediment samples were placed in a large hard plastic container and digested with muriatic acid. After all of the calcium carbonate had disintegrated (approximately 4 hours), the solution was poured gently though a pre-weighed, pre-labeled filter paper. Once the sample dried, it was weighed and the percentage of the total sediment sample was calculated.

Water quality

Water quality parameters were measured at 8 stations during dry and storm periods. Dissolved oxygen (ppm), salinity (ppt), temperature (°C), and conductivity (ms) were measured using an YSI Meter. Measurements were obtained by dangling the probe in the water approximately 1-2 feet below the surface. Turbidity (NTU) was measured using a LaMotte turbidity meter Model 2008. Samples for turbidity were taken approximately 1-2 feet below the surface using a plastic bottle and transferred to the glass bottle used for measurements in the LaMotte meter. Nutrient levels for total nitrogen (TN), nitrate+nitrite (NO_3+NO_2), ammonia (NH_4), and total phosphorus (TP) were collected and analyzed by Aecos, Inc. Surface samples were also analyzed for Total Petroleum Hydrocarbons (TPH) by Aecos, Inc. These samples were collected 1-2 feet below the surface using bottles sent by Aecos, Inc. and shipped in a chilled container to Honolulu for analysis.

RESULTS

General Characteristics

Sediments

Total Sediment Loading

Grain Size Analysis

Carbonate Fraction

Water quality

DISCUSSION

Sediments

Total Sediment Loading

Grain Size Analysis

Carbonate Fraction

Water quality

-currents

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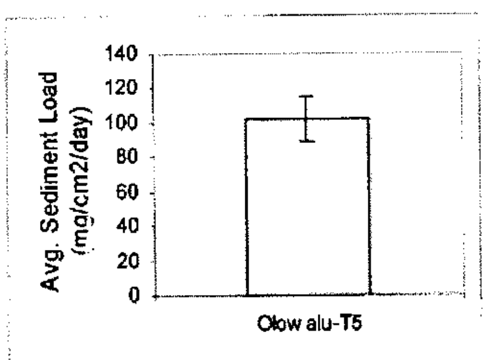


Figure 1. Average Sediment Load at Olowalu.
Sediment load calculated from 6 traps on 8 separate collection dates. Error bar represent one standard error.

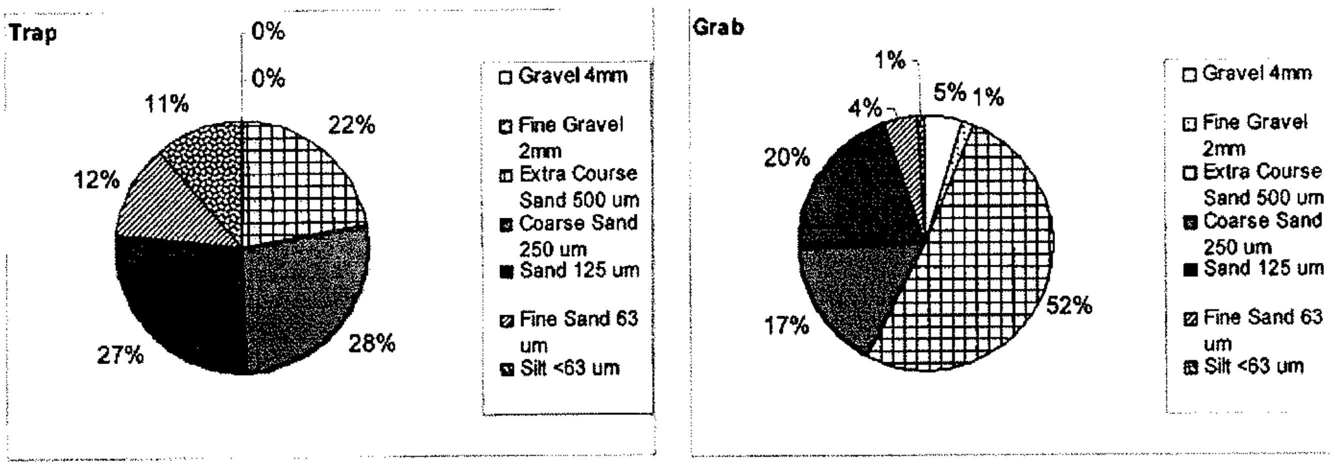
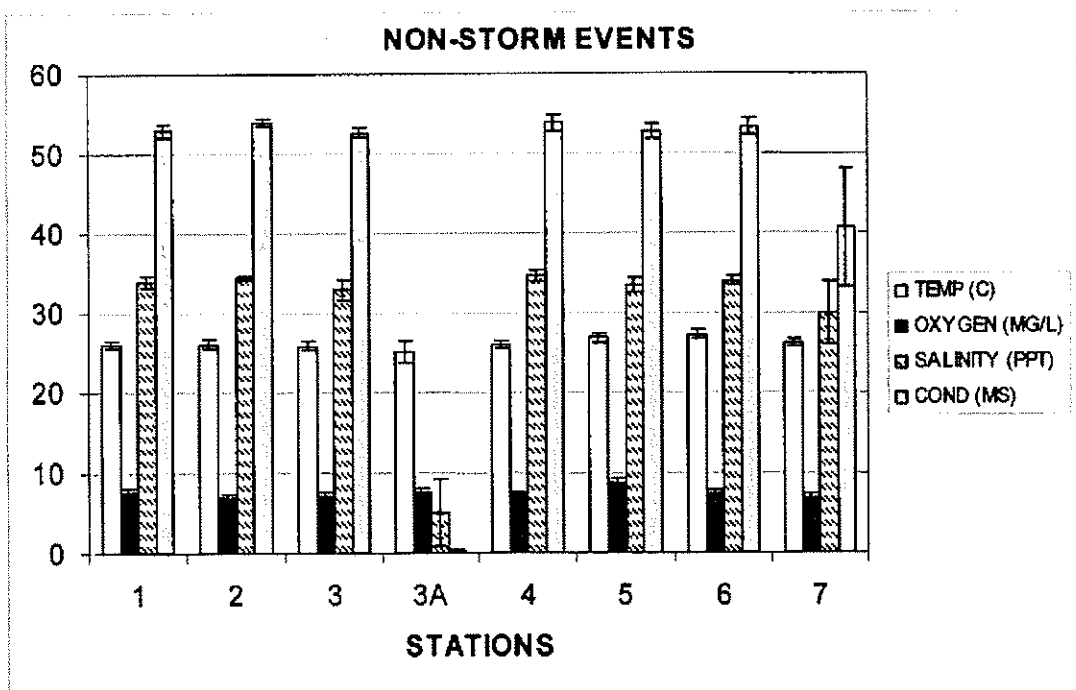


Figure 2. Percent grain size of sediments found at Olowalu.
The graphs represent 4 separate collection dates for the trap samples and 1 for the grab samples.



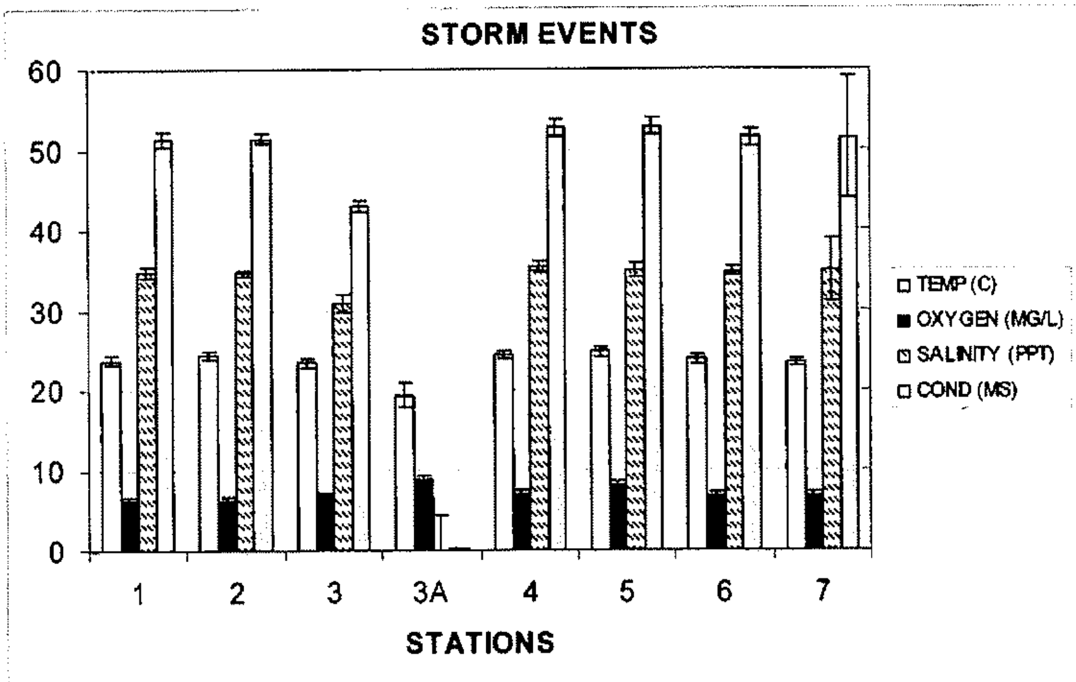


Figure 3. Water Quality Parameters for Oluwalu During Ambient and Storm Conditions.
Parameters were measured during 8 sampling events for non-storm events and during 2 sampling events for storm events. Error bars represent one standard error.

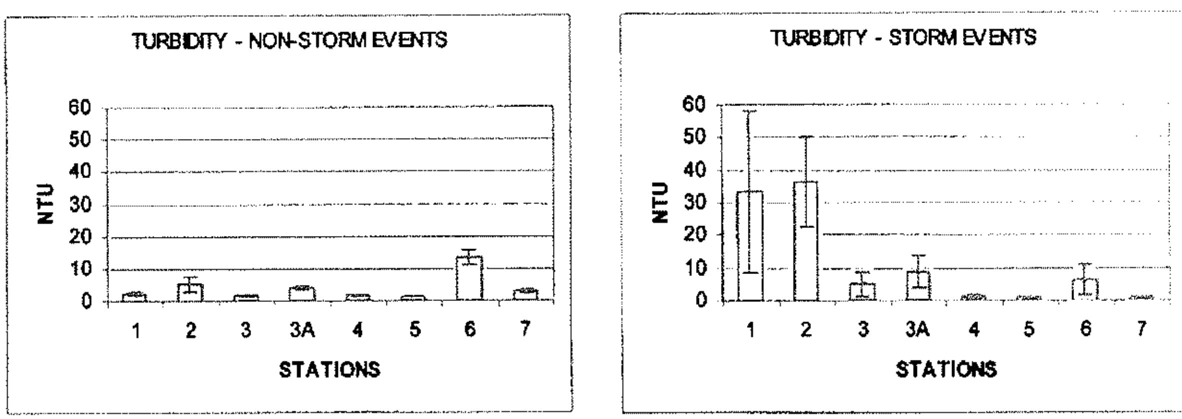


Figure 4. Turbidity during Normal and Storm Conditions
Turbidity was measured during 9 sampling events for non-storm conditions and during 2 events for storm conditions. Error bars represent one standard error.

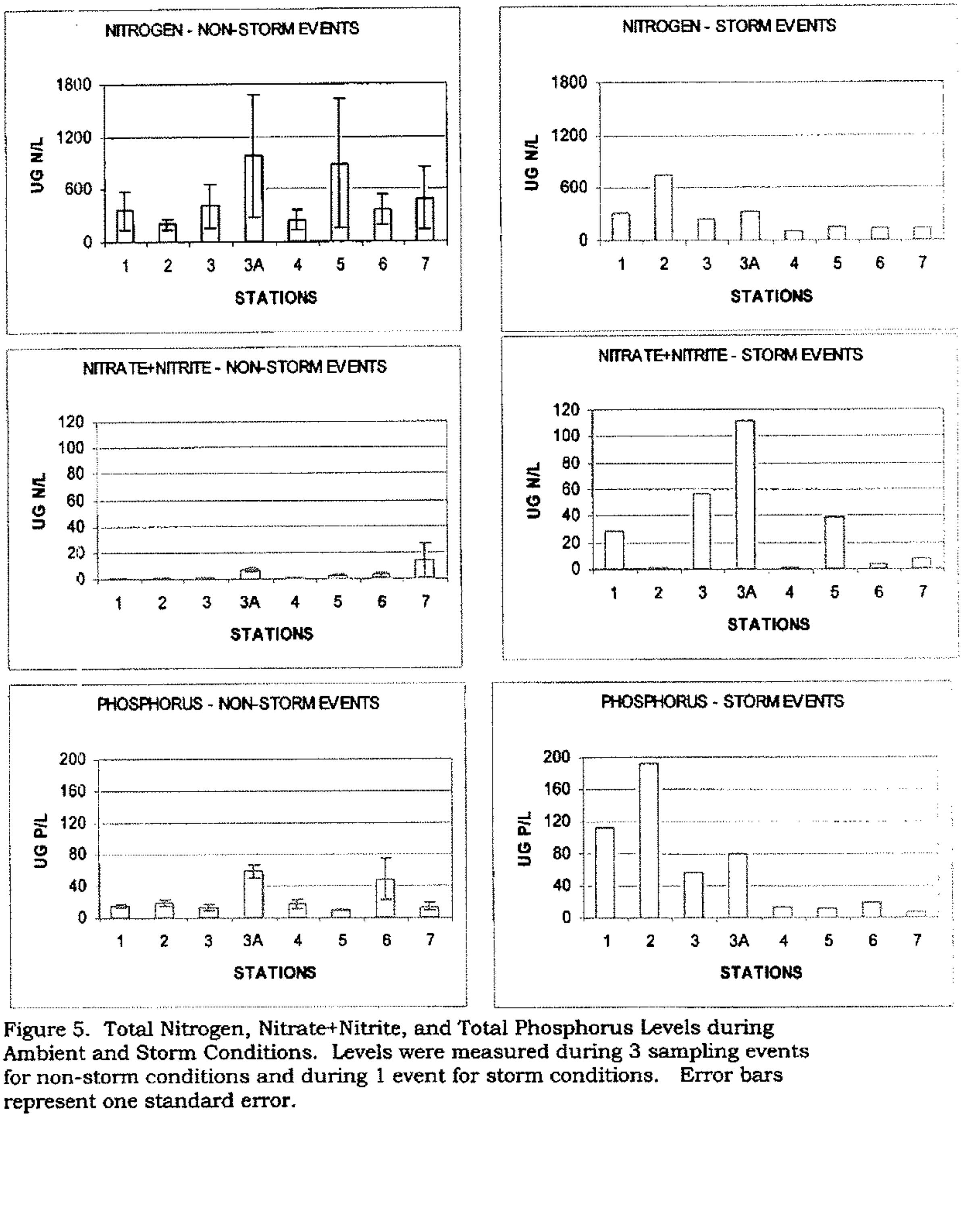


Figure 5. Total Nitrogen, Nitrate+Nitrite, and Total Phosphorus Levels during Ambient and Storm Conditions. Levels were measured during 3 sampling events for non-storm conditions and during 1 event for storm conditions. Error bars represent one standard error.

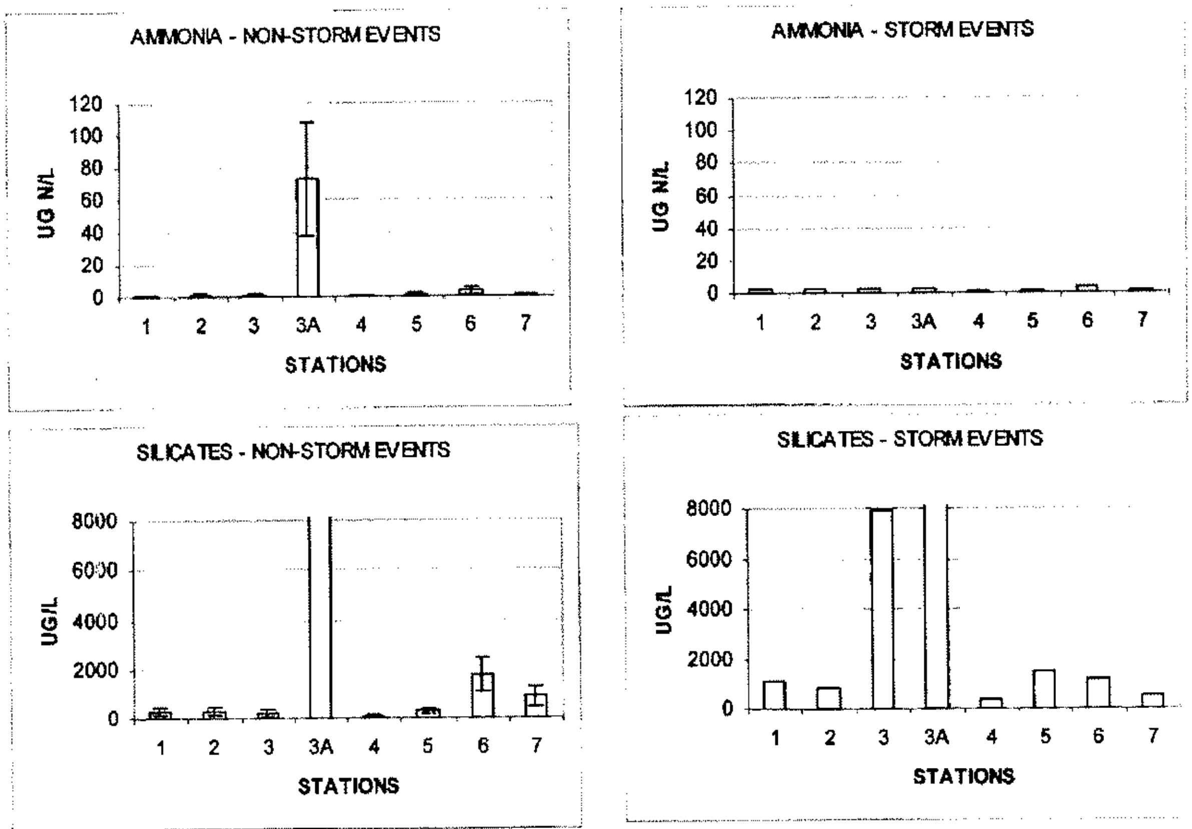


Figure 6. Ammonia and Silicate Levels during Ambient and Storm Conditions Levels were measured during 3 sampling events for non-storm conditions and during 1 event for storm conditions. Error bars represent one standard error.

Coral Communities at Hekili Point, Maui

INTRODUCTION

In Hawai'i, coral reefs are subjected to a variety of natural and anthropogenic stresses at several spatial and temporal scales (Grigg and Dollar 1990). The intensity and duration of these factors can both directly and indirectly alter the physical and biological structure of the reef (Connell et al. 1997). Natural factors, such as acute wave disturbances (Dollar and Tribble 1993), freshwater inputs (Jokiel et al. 1993), and predator outbreaks (Done 1992) can affect the shallow water reef communities at small spatial and temporal scales. Chronic disturbances, such as nonpoint source pollution and nearshore development, are more difficult to detect because changes to the community landscape are subtle and occur over longer time periods (Pastorok and Bilyard 1985). Quantifying different types of disturbance and the processes that influence coral community structure is only beginning to be understood (Edmunds 2000).

Disturbances can lead to a deteriorating or "unhealthy" coral population if recovery of the community does not occur or the community is replaced by another perceived to be less desirable. DeVantier et al. (1998) defined a "high quality" or "healthy" reef as one with high diversity of corals and associated biota and a strong reef-building capacity. The reef-building capacity is usually represented by high species richness and high absolute percent cover of hard corals (DeVantier et al. 1998). Szmant (1996) has incorporated temporal changes in her definition by stating that shifts from reefs dominated by corals to areas dominated by macroalgae signal the decline of a reef from a healthy state to an unhealthy one. Unfortunately, these definitions tend to depict reefs as static, steady state systems without incorporating cyclical variations in coral cover, colony growth or recruitment. In addition, categorizing reefs as "healthy" based primarily on high coral cover ignores areas with low to moderate coral cover such as Hawaii that are perceived to be in good condition compared to other regions of the world (Wilkinson 2000). Long-term monitoring programs can clarify natural cycles present in the system over a few time scales and provide an overview of population trends in the reef community. In addition, long-term monitoring is necessary to understand the role of natural and anthropogenic processes on changes in assemblages (Hughes and Connell 1999).

The purpose of this report was to examine the reef communities adjacent to Olowalu stream and Hekili Point on Maui and establish baselines for the benthic assemblage structure. Changes in the reef community could then be evaluated within the context of the current reef community. Digital video transects were used to document percent cover of the various benthic components of the assemblage and provide an archive for future comparisons.

METHODS

Benthic cover data was collected at a back reef site neighboring Hekili Point on October 8, 2001 and at a fore reef site adjacent to Olowalu stream on November 6, 2002. The Hekili point site was set up in 1m of water. This site was approximately 750 meters from the Olowalu stream site which was established at a depth of 3m (Figure 1). The sites were surveyed using an abbreviated Hawaii Coral Reef Assessment and Monitoring Program (CRAMP) protocol, which utilized digital video to document coral cover by surveying five permanent (fixed) transects (Brown et al. 2004). Each transect was 10m in length and videotaped from a perpendicular angle at a height of 0.5m above the substrate. The transects were initially selected at random from a pool of 50 possible starting points located in a 2m X 50m grid along the 3m depth contour. To assist in relocating the transect grid a central spine of 6 pins was installed at 10 meter intervals with GPS marks at the beginning and end. Total area sampled across the 5 transects was $17.5m^2$.

Image analysis was conducted using Photogrid software on 15 randomly selected non-overlapping video frames per transect with 50 randomly selected points per frame. Percent cover was tabulated for coral (by species), macroinvertebrates, and other benthic substrate types (coralline algae, turf algae, macroalgae/*Halimeda* spp., and sand). Total mean percent coral cover, mean percent coral cover by species, and species richness (number of species per transect) were used as dependent variables in this study. Average error (average observer error 1.9%, measurement error 2.7%) for estimating total coral cover using the digital video transects was estimated to be approximately 5% (Brown, 2004).

DATA ANALYSIS

Mean percent cover for benthic components at each site was calculated using transects as replicates (N=5) and the randomly selected frames as subsamples. The rationale for using the transect as the sampling unit rather than the multiple quadrats was that the quadrats were dependent on the placement of the transect line and therefore not independent of each other. Thus, individual quadrats did not have an equal probability of sampling any given sector of the site but instead were constrained by the transect.

Comparison with other benthic assemblages from the 64 CRAMP sites across the state was conducted using a Bray-Curtis similarity dendrogram in Primer 5.0 (Clarke and Gorley 2001, Clarke and Warwick 2001). Percent cover of coral species was arcsin-square root transformed and aggregated by site which was then plotted to reveal similarities/dissimilarities of faunal assemblages among all sites. Cluster analysis used group average to construct the dendrogram. Only coral species were used in the analysis because the CRAMP data set did not differentiate algal substrate types due to high observer variability (Brown 2004).

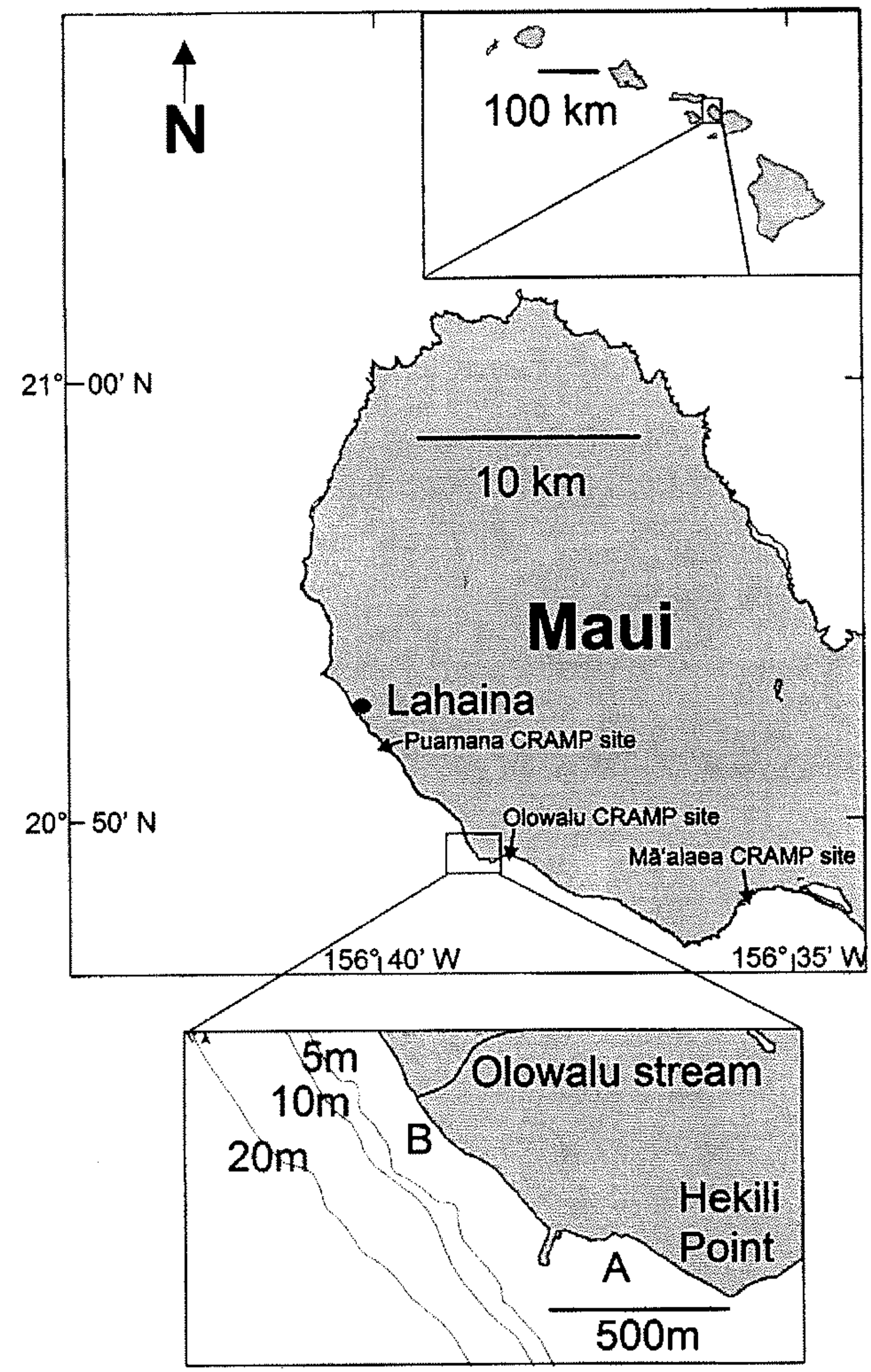


Figure 1. Map of West Maui showing the Hekili Point site (A) and the Olowalu stream site (B).

RESULTS

At the 1m Hekili Point site, turf algae was the most abundant substrate covering 67.0% ± 5.4% SE of the benthos. Percent live coral was 16.8% ± 5.0% SE followed by sand (10.7% ± 0.9% SE), macroalgae (2.9% ± 0.9% SE), coralline algae (2.3% ± 0.9% SE), and macro invertebrates (<1%) (Figure 2). Six coral species were observed and *Porites lobata* was the most abundant with percent cover at 10.3% ± 4.0% SE. Percent *Porites compressa* cover was 3.2% ± 0.8% SE followed by *Montipora capitata* (2.2% ± 0.6% SE), *Porites evermanni* (0.8% ± 0.8% SE), *M. patula* (0.3% ± 0.2% SE), and *Pocillopora meandrina* (0.03% ± 0.01% SE).

Turf algae (67.3% ± 2.9% SE) was also the most abundant substrate at the 3m Olowalu stream site followed by live coral (20.8% ± 2.8% SE), coralline algae (9.1% ± 0.7% SE), sand (1.4% ± 0.6% SE), macroalgae (1.0% ± 0.3% SE), and macro invertebrates (<1%) (Figure 3). A total of 9 coral species were documented on the transects with *Porites lobata* being the most abundant (14.5% ± 3.4% SE). *Pocillopora meandrina* was the next most abundant (4.3% ± 0.8% SE) followed by *Montipora patula* (1.2% ± 0.2% SE). The remaining 7 species covered an average of only 0.8% of the benthos.

In comparison to the other 64 CRAMP sites, the 1m Hekili Point site is most similar to the 1m Kanahena Bay site on Maui (Figure 4). Both sites are south facing and protected from wave exposure by either a reef crest (Hekili Point) or a sheltered embayment (Kanahena Bay). Total coral cover was lower at Kanahena Bay (11.5% vs. 16.8% at Hekili Point) but the ranking and relative proportions of the coral species generated a high similarity coefficient of 78% (Table 1). *Porites lobata* was the most abundant coral at both sites followed by *Montipora capitata. Pocillopora meandrina,* however, was more prevalent at Kanahena Bay compared to Hekili Point. Sites in close proximity such as the 3m Olowalu stream site and the two Olowalu CRAMP sites were quite different with lower similarity coefficients less than 60 (Table 1). This was primarily due to the lower percent coral cover, low species richness, and the lack of *P. meandrina* at Hekili Point.

The 3m Olowalu stream site is most similar to 3m sites on Hawaii (La'aloa-HaLaa03, Ka'apuna-HaKpn04, Laupāhoehoe-HaLau03), Maui (Puamana-MaPua03), and Oahu (Kahe Point-OaKpo03) (Figure 4). All of these sites except Laupāhoehoe on Hawaii are characterized by a southern wave exposure (Figure 4). The coral community at these other sites is also dominated by *Porites lobata* and *Pocillopora meandrina,* but the percentage of cover varies by species at each site (Table 2). La'aloa is the most similar site to Olowalu stream with 27% total coral cover and a similarity coefficient of 81%. La'aloa, however, has a higher percentage of *P. meandrina* relative to *P. lobata* than the Olowlau stream site. Of the sites grouped in close proximity on the plot, the Ka'apuna 3m site is the most dissimilar (64) with lower total coral cover (10.7%) and higher *P. meandrina* cover (6.8%) relative to *P. lobata* cover (3.2%).

Several sites in close proximity are intriguing due to their dissimilarity. The 3m Olowalu stream site which is the closest CRAMP site (1.6km) to the study reef is not very similar in terms of the coral assemblage (Table 1). The low similarity (54) is due primarily to the high percent cover of *Montipora capitata* (8.1%) and *Porites compressa* (3.5%). The Olowalu 7m site has higher total coral cover (50.9%) than the stream site which is attributed to the abundance of *Montipora patula* (14.1%) and *M. capitata* (19.5%) (Table 1). In contrast, the Mā'alaea 3m site is 12.4 km away but more similar (80.4) to the Olowalu stream site than the Olowalu sites in terms of total coral cover (19.9%) and species coverage patterns (Table 1). The dendrogram plot, however, did not group the Mā'alaea 3m site near the Olowalu stream site (Figure 3). Reasons for this pattern are unclear, but might be attributed the low species richness at Mā'alaea.

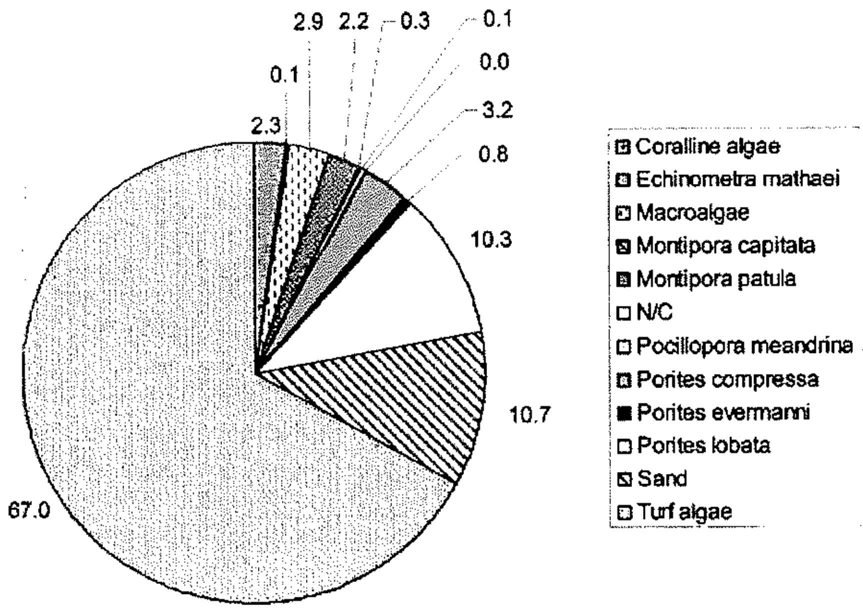


Figure 2. Mean percent coral cover at the 1m Hekili Point site surveyed on October 8th, 2001. N=5 transects.

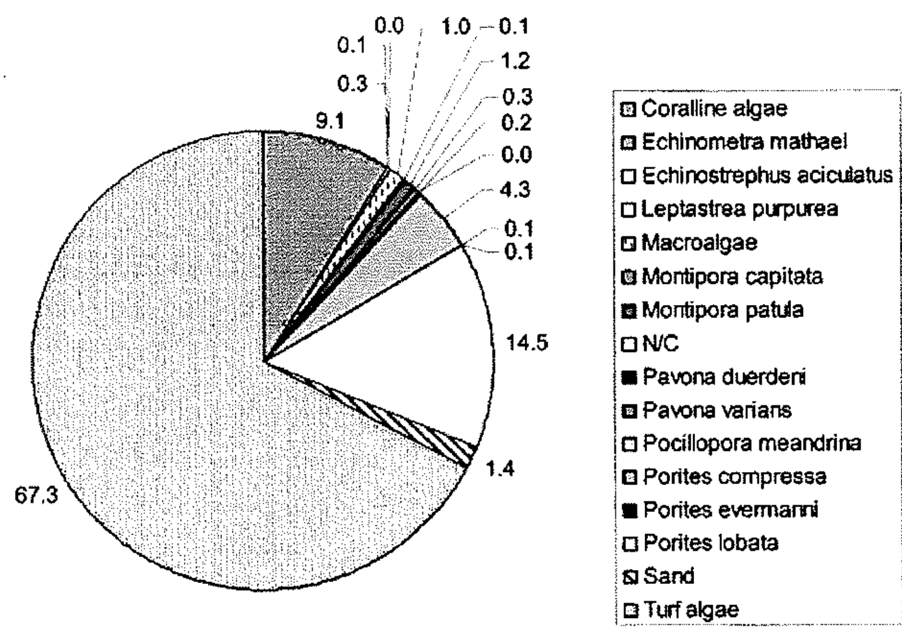


Figure 3. Mean percent coral cover at the 3m Olowalu stream site surveyed on November 6, 2002. N=5 transects.

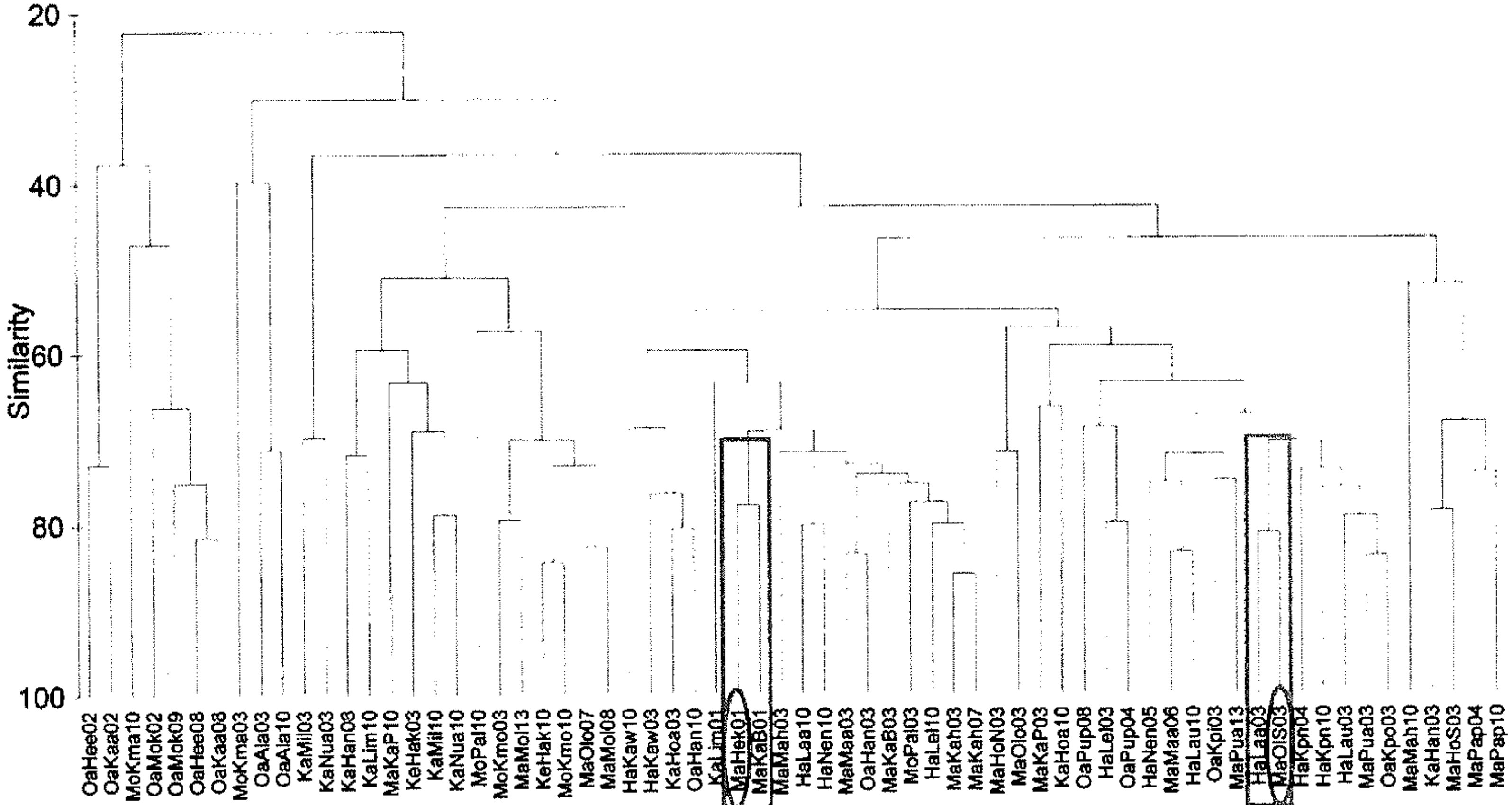


Figure 4: Bray-Curtis similarity dendrogram for coral assemblages at 66 sites around Hawaiʻi. The 3m Olowalu stream site (MaOlS03) and the 1m Hekili Point site (MaHek01) are circled in red with similar sites outlined by the red rectangle. Sites are coded as follows (IISSSDD) where II = island (Ka=Kauaʻi, Oa=Oahu, Mo=Molokaʻi, Ma=Maui, Ke=Kahoʻolawe, Ha=Hawaiʻi), SSS = site abbreviation (e.g. Hek= Hekili), and DD = depth in meters.

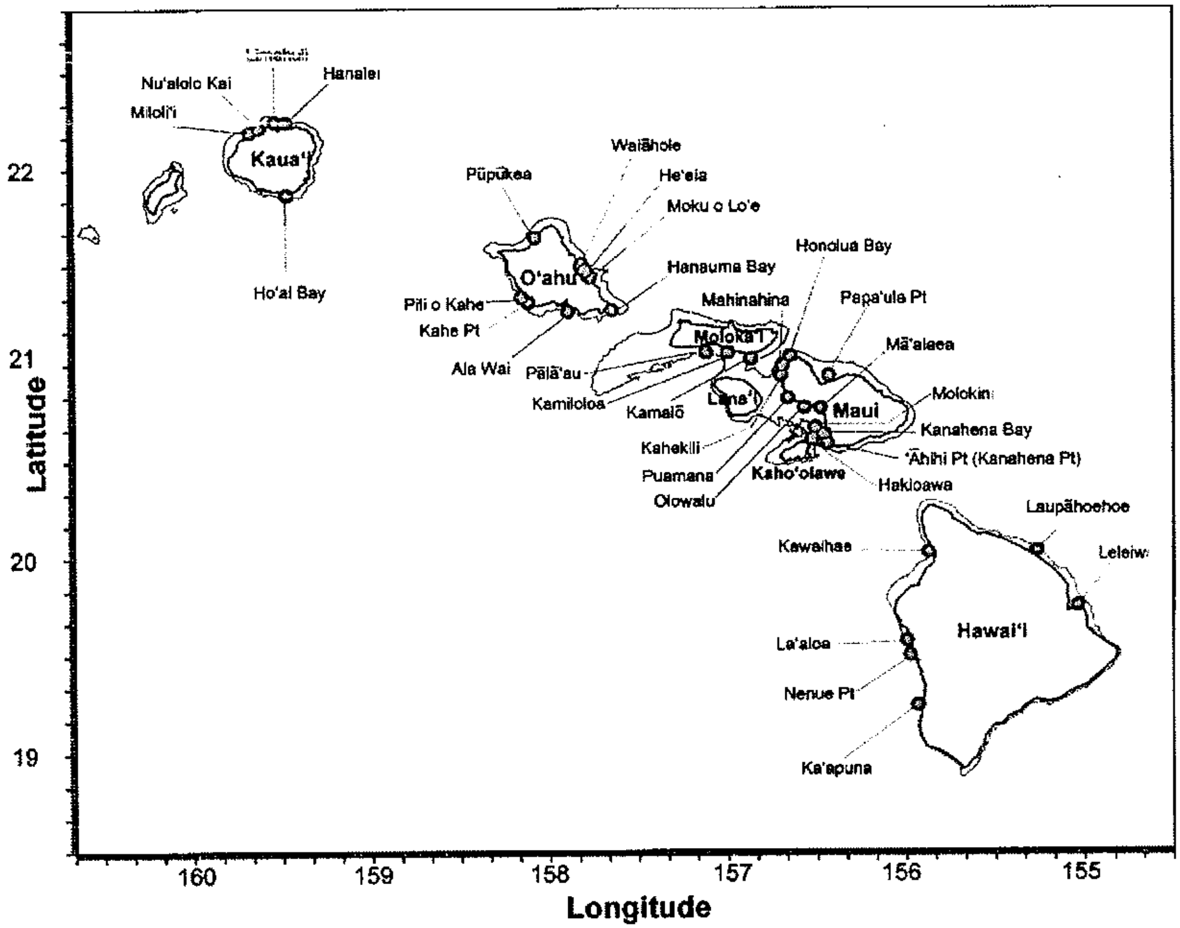


Figure 5: Hawaii Coral Reef Assessment and Monitoring Program study sites. At each monitoring site there are two stations, one in shallow water (generally 3m) and one in deep water (generally 10m).

Table 1: Percent coral cover by species at the 1m Hekili Point site compared to CRAMP sites with similar community assemblages (>75 similarity branch in dendrogram) or in close proximity (<5km) to the study site. Species codes as follows; Coce=*Cyphastrea ocellina*, Lpur=*Leptastrea purpurea*, Mcap=*Montipora capitata*, Mpat=*Montipora patula*, Pbri=*Porites brighami*, Pcom=*Porites compressa*, Pdam=*Pocillopora damicornis*, Pdue=*Pavona duerdeni*, Peve=*Porites evermanni*, Plic=*Porites lichen*, Plob=*Porites lobata*, Pmal=*Pavona maldivensis*, Pmea=*Pocillopora meandrina*, Pnie=*Psammocora nierstraszi*, Prus=*Porites rus*, and Pvar=*Pavona varians*.

Island	Maui	Maui	Maui	Maui	Maui
Site	Hekili Point	Kanahena Bay	Olowalu Stream	Olowalu	Olowalu
Depth (m)	1.0	1.0	3.0	3.0	7.0
Coce	0.0	0.0	0.0	0.0	0.0
Lpur	0.0	0.0	0.3	0.2	0.0
Mcap	2.2	1.5	0.1	8.1	19.5
Mpat	0.3	0.2	1.2	1.9	14.1
Pbri	0.0	0.0	0.0	0.1	0.0
Pcom	3.2	0.1	0.1	3.5	1.2
Pdam	0.0	0.1	0.0	0.0	0.0
Pdue	0.0	0.0	0.0	1.7	0.1
Peve	0.8	0.2	0.1	0.0	0.0
Plic	0.0	0.0	0.0	0.2	0.1
Plob	10.3	9.0	14.5	4.8	14.1
Pmal	0.0	0.0	0.0	0.0	0.0
Pmea	0.0	0.4	4.3	1.8	1.5
Pnie	0.0	0.0	0.0	0.2	0.0
Prus	0.0	0.0	0.0	0.1	0.0
Pvar	0.0	0.0	0.2	0.5	0.2
Total Coral	16.8	11.5	20.8	23.1	50.9
Richness [1]	5	6	9	14	10
Similarity [2]		77.8	56.1	56.5	54.6

[1] Species richness is the total number of coral species documented at a site.
[2] Similarity is the Bray-Curtis similarity coefficient. Higher numbers represent a greater similarity among coral assemblages.

Table 2: Percent coral cover by species at the 3m Olowalu stream site compared to CRAMP sites with similar community assemblages (>75 similarity branch in dendrogram) or in close proximity (<5km) to the study site. Species codes as follows; Coce=*Cyphastrea ocellina*, Lpur=*Leptastrea purpurea*, Mcap=*Montipora capitata*, Mfla=*Montipora flabellata*, Mpat=*Montipora patula*, Pbri=*Porites brighami*, Pcom=*Porites compressa*, Pdue=*Pavona duerdeni*, Pedy=*Pocillopora edyouxi*, Peve=*Porites evermanni*, Plic=*Porites lichen*, Plob=*Porites lobata*, Pmal=*Pavona maldivensis*, Pmea=*Pocillopora meandrina*, Pnie=*Psammocora nierstraszi*, Prus=*Porites rus*, and Pvar=*Pavona varians*.

Island	Maui	Hawai'i	Hawai'i	Hawaii	O'ahu	Maui	Maui	Maui	Maui	Maui
Site	Olowalu Stream	La'aloa	Laupāhoehoe	Ka'apuna	Kahe Point	Puamana	Olowalu	Olowalu	Mā'alaea	Mā'alaea
Depth (m)	3	3	3	4	3	3	3	7	3	6
Coce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lpur	0.3	0.0	0.0	0.1	0.1	0.1	0.2	0.0	0.0	0.0
Mcap	0.1	0.1	0.3	0.4	0.5	0.9	8.1	19.5	0.4	1.0
Mfla	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Mpat	1.2	0.2	0.9	0.1	1.2	1.1	1.9	14.1	1.2	0.6
Pbri	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Pcom	0.1	0.0	0.4	0.0	0.1	0.1	3.5	1.2	0.1	0.1
Pdue	0.0	0.0	0.0	0.0	0.0	0.1	1.7	0.1	0.0	0.0
Peyd	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Peve	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plic	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
Plob	14.5	15.7	5.7	3.2	5.3	5.8	4.8	14.1	17.0	4.1
Pmal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pmea	4.3	10.8	3.2	6.8	7.6	5.0	1.8	1.5	1.2	0.7
Pnie	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Prus	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Pvar	0.2	0.2	0.6	0.0	0.0	0.1	0.5	0.2	0.0	0.0
Total Coral	20.8	27.1	11.1	10.7	14.9	13.4	23.1	50.9	19.9	6.4
Richness [1]	9	6	8	6	8	11	14	10	5	5
Similarity [2]		81.1	74.1	64.3	75.8	80.0	53.8	58.1	80.4	59.6

[1] Species richness is the total number of coral species documented at a site.
[2] Similarity is the Bray-Curtis similarity coefficient. Higher numbers represent a greater similarity among coral assemblages.

DISCUSSION

Coral community assemblage and comparison to other sites

The sheltered 1m Hekili Point site is similar to another sheltered site on Maui at Kanahena Bay in the ʻĀhihi - Kīnaʻu Natural Area Reserve. Both sites have a southern exposure but the 1m Hekili Point site is in a back reef environment with species (e.g. *Montipora capitata* and *Porites compressa*) indicative of calmer waters (Jokiel et al. 2004). The Kanahena Bay site had a lower proportion of *P. compressa* cover and did not have the same reef geomorphology as the Hekili Point site. Instead the protection from wave exposure at this site was due to the orientation of the embayment which did not have a direct opening to typical swell patterns in the area. Consequently, the 1m Hekili Point site appears to be unique among the sites compared in this study. Perhaps evaluations of other back reef habitats in the Hawaiian archipelago with southern exposures (e.g. south shore Molokaʻi) would yield similar coral assemblages. Limihuli on Kauaʻi (Figure 5) was the one northern exposure CRAMP site in a back reef environment. As seen in Figure 4, however, the Limahuli site (KaLim01) was relatively unique compared to Hekili Point and had a low similarity coefficient (51.7). This low similarity was due to the presence of *Montipora flabellata* (3.2%) and overall higher percent coral cover (22.8% vs. 16.8%) at Limahuli.

In comparison, the 3m reef adjacent to the Olowalu stream is similar in the coral assemblage to other Hawaiian reefs with a southern exposure. The most abundant corals in terms of percent cover are *Porites lobata* and to a lesser degree by *Pocillopora meandrina*. Dollar (1975, 1982) reported similar coral community structure at reefs along the southeast coastline of Hawaiʻi. He described a zonation pattern oriented by depth and influenced by wave energy. *P. meandrina* colonies inhabited the shallowest depth (<10') with the highest wave action. As depth increased (10-40'), *P. lobata* colonies became the most abundant coral until they were replaced by *Porites compressa* colonies at depths (>40') with minimal water motion (Dollar 1975). Coral communities that exhibited this pattern would continue to grow until a large storm would reset community development (Dollar and Tribble 1993).

Surveys on other Hawaiian coral reef communities describe a wider gradient of assemblages depending on water motion (Storlazzi et al. 2001, Jokiel et al. 2004). Jokiel et al. (2004) reported that coral communities on the north shore with the most extreme water motion had predominantly encrusting *Montipora flabellata* and *M. patula*. In low water motion environments, such as Kāneʻohe Bay and the south shore of Molokaʻi, coral communities included an abundance of *Porites compressa* and *Montipora capitata* (Jokiel et al. 2004). The 1m Hekili Point site did indicate a calmer environment at one end of the gradient, but the presence of *Porites lobata* colonies suggested that water motion could be higher during periods of south swells. Therefore, as mentioned earlier this site is relatively unique compared to the other CRAMP sites in the Jokiel et al. (2004) study.

In contrast, the 3m Olowalu stream site fell roughly in the middle of the gradient with more robust, high-energy corals (e.g. *P. meandrina* and *P. lobata*). These species have been shown to resist mechanical breakage in higher water motion (Rodgers et al. 2003) and occur in reef zones with moderate to high wave energy (Storlazzi et al. 2001). Consequently, the species present at the Olowalu stream site describe an area with moderate to high wave energy. The same wave energy regime appears to be influencing sites with similar assemblages on other islands. At present, these species patterns are consistent with areas primarily impacted by natural factors.

Examining the disturbance history at these sites can help differentiate natural versus anthropogenic impacts and the relative role in structuring the coral assemblage. The following discussion focuses on the CRAMP Puamana and Olowalu sites which are approximately 10km apart, contain long-term (10 years) information on the coral assemblages, and border the Hekili Point and Olowalu stream sites. Connell et al.

(1997) noted on the Great Barrier Reef, over a smaller spatial but longer temporal scale, that variation in the benthic community assemblage was due to the type, intensity, and spatial scale of the disturbances.

Disturbance history

Hurricane history of each site is an important factor influencing coral community assemblages. At present the known hurricanes to cross land in Hawai'i include Dot (August 1959) and Iniki (September 1992) (National Weather Service, Central Pacific Hurricane Center: http://www.prh.noaa.gov/hnl/cphc/pages/hurrclimate.html). Other notable storms that have approached Hawai'i include Hurricane Nina (November 1957), tropical storm Iwa (November 1982), and hurricane Estelle (July 1986). Each of these storms produced southerly waves that would have impacted the Puamana and Olowalu reefs to a greater or lesser degree. Only a handful of marine monitoring studies in Hawai'i, however, have been able to document the impact from these storms (e.g. Dollar and Tribble 1993). S.L. Coles and E.K. Brown (unpublished manuscript) noted the decline in coral cover at 4 stations around Kahe Point, O'ahu following Hurricane Iniki. The overall community development, however, varied at spatial scales of 200-300 meters with some sites already in decline prior to the hurricane. Other sites, however, continued to increase in coral cover despite the temporary setback from the hurricane.

Monitoring data at Puamana and Olowalu also showed spatial differences in the coral community response to Hurricane Iniki (Brown 1999). Puamana declined in coral cover to almost zero (From ~11-12% coral cover in 1992 to <1% at Puamana 13m, Brown 1999) while Olowalu remained relatively unaffected. Differences in bottom topography, colony sizes prior to the storm, and coastal geomorphology (e.g. presence of Hekili Point in Figure 1) may explain the differential impacts of the storm between the two sites and the resulting size frequency distributions. The Olowalu stations have a more extensive reef structure than the stations at Puamana (Coyne et al. 2003). This topography would have dissipated the wave energy over a broader expanse of reef thus possibly reducing destructive wave forces at the Olowalu CRAMP stations (e.g. Young 1989). The Olowalu stream site, however, has a narrow fringing reef that slopes down to a deeper depth of 20m within a short distance of shore (Figure 1). The reef structure (slope and width) at this site more closely resembles the Puamana site which helps explain the similarity between the sites compared to the CRAMP Olowalu site. In comparison, the 1m Hekili Point site was in a back reef habitat with a reef crest that would have shielded the site from the strong southerly waves. This would help explain the uniqueness of the assemblage (*Porites lobata* mixed in with *Montipora capitata* and *P. compressa*) at this site compared to the other sites in the CRAMP study. Modeling storm waves moving into shore at both sites would clarify this pattern but it is beyond the scope of this study.

The larger colony sizes of *Montipora capitata, M. patula, Porites compressa*, and *P. lobata* colonies at the Olowalu stations (Figures 4 and 5) (Brown 2004) suggest that colony sizes may have been large enough to survive the storm waves during Hurricane Iniki (e.g. Woodley et al. 1981). Another possibility is that storm waves produced higher mortality in small colonies at the Olowalu stations resulting in the left skewed distributions (Brown 2004). Woodley et al. (1981), however, found that large colonies that survived hurricane Allen off Jamaica provided shelter for smaller adjacent colonies in their lee. Therefore, it is possible that left skewed distributions with a few small colonies were present prior to hurricane Iniki. In addition, the presence of larger colonies at the Olowalu stations for all 5 abundant species suggest that the disturbance regime is lower than at Puamana otherwise large colonies would seldom appear in the size frequency distribution (Karlson 1999). Colony size was not measured at either the Hekili Point or Olowalu stream site but cursory analysis of the video suggests that the Olowalu stream site had similar sized colonies to the Puamana site. In addition, the presence of *Pocillopora meandrina,* which tends to reach maximum diameters of 40-50cm, indicates that the Olowalu stream site has a different wave regime than the CRAMP Olowalu 3m and 7m sites. The Hekili Point site, however, had small to medium sized *P. lobata* colonies that would have protected the other species and would be more similar to the Olowalu CRAMP sites. The shallower depth of the Hekili Point site coupled with the dissimilar assemblage (Figure 4, Table 1) suggests that the Hekili Point site was intermediate or even unique in the wave energy regime.

Finally, coastal features such as Hekili Point (Figure 1) may have deflected the southwesterly hurricane waves providing more shelter for the Olowalu stations compared to the Puamana stations. Wave models from the Naval Oceanographic website have displayed lower wave heights at the Olowalu stations depending on the swell direction (e.g. May 4, 2003 nowcast). The Olowalu stream site is west of Hekili point and therefore more likely to experience the same wave energy regime as the Puamana site. In contrast, the Hekili Point site while still west of the actual point is located in a different reef environment which appears to change at the artificial jetty (Figure 1). Not only does the reef geomorphology broaden out going east but preliminary drogue data indicates that current patterns differ depending on the location relative to the jetty (Figure 6). Thus, it appears that all three factors (bottom topography, large colony sizes prior to the storm, and the presence of Hekili Point) explain the differential impacts from hurricane Iniki between Olowalu and Puamana. In addition, these factors indicate that the Olowalu stream site is more closely linked to the Puamana site while the Hekili Point site appears to be unique due to the back reef habitat.

Since hurricane Iniki in 1992, the percent coral cover at both of the Puamana reefs showed a marked recovery compared to the reefs at Olowalu which have remained relatively stable (Brown 2004). Based on the similarity with the Puamana reef, one might infer that the Olowalu stream site has followed a similar pattern of decline during Iniki with subsequent recovery. At the Puamana 3m site there has been a slight downturn in recent years which has been attributed to a shift in the community assemblage from *Pocillopora meandrina* to a reef dominated by *Porites lobata, Montipora capitata,* and *M. patula* (Brown 2004). This same pattern may be occurring at the Hekili Point and Olowalu stream site but without temporal data it is difficult to confirm this.

The reefs at Puamana and Olowalu have also been subjected to land based human activities (sugar cane and coastal development) during the past century yet the temporal patterns in coral cover at these reefs within the last decade have been very different. Each of the sites had historical streams (Kaua'ula stream for Puamana and Olowalu stream for Olowalu) that were diverted for sugar cane production around 1860 when Pioneer Mill began operations (Wilcox 1996). Subsequent sugar cane production at both sites and housing developments at Puamana have continued for nearly 140 years. Sugar cane production ceased in 1999 (Honolulu Star Bulletin, September 3, 1999). Efforts are underway to develop the agricultural land into housing tracts which would again alter the watershed. Six, 2 acre lots adjacent to the Olowalu stream site are slated for development and may influence the nearshore waters. At the Hekili Point site, one house has already been built since the survey but additional homes are unlikely in the vicinity due to a state of Hawai'i conservation easement (Reference **). Documenting changes at both the Puamana and Olowalu reefs during the land use transition will help clarify human impacts compared to natural factors.

Anthropogenic disturbances, as defined by the proximity to urban centers and human activities, varied for the similar sites. Puamana (Maui) and La'aloa (Hawai'i) were both adjacent to towns with projected development in the watershed. In contrast, Ka'apuna (Hawai'i) was the most remote site located several kilometers from the nearest settlement. All four Olowalu sites and Laupāhoehoe (Hawai'i) had sugar cane fields in the neighboring watershed. Mā'alaea (Maui) continues to have agricultural impacts (sugar cane, pineapple, and cattle) but the primary anthropogenic factor is the harbor fronting the reef sites. Kahe Point is unique due to the intake and outfall pipes from the H3 power generating station. Thus, the similarity in coral assemblages among sites despite the variation in anthropogenic activities would suggest that these factors do not play a large role in structuring these communities.

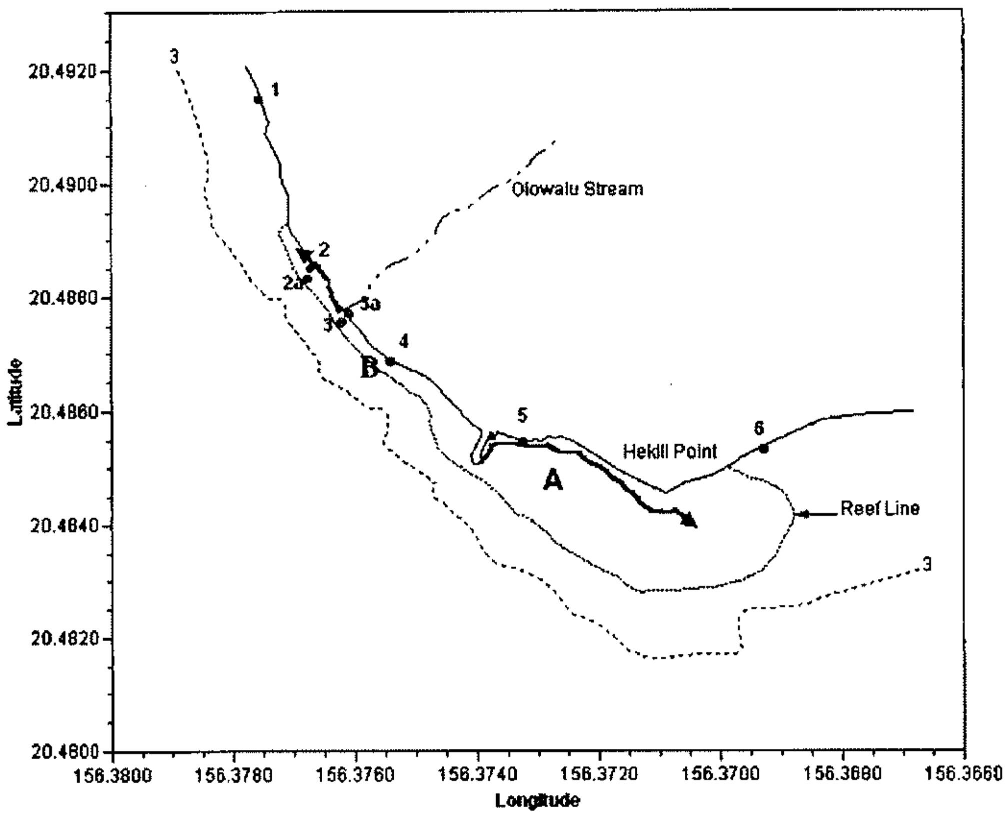


Figure 6. Generalized current patterns in proximity to the 1m Hekili Point site (A) and the 3m Olowalu stream site (B). **Data represent drogue tracks over 1 hour during an ebb tide.

Summary

- The 1m Hekili Point site is unique among the sites compared in this study but may be more typical of sheltered back reef areas along southern exposures.
- Turf algae was the most abundant substrate at the Hekili Point site covering 67.0% of the benthos followed by live coral (16.8%), sand (10.7%), macroalgae (2.9%), coralline algae (2.3%), and macro invertebrates (<1%).
- Six coral species were observed at Hekili Point in the following ranking of percent cover; *Porites lobata* (10.3%), *Porites compressa* (3.2%), *Montipora capitata* (2.2%), *Porites evermanni* (0.8%), *M. patula* (0.3%), and *Pocillopora meandrina* (0.03%).
- The 3m Olowalu stream site is characterized by a typical shallow water coral assemblage on the south shore of the Hawaiian Islands.
- At the 3m Olowalu stream site, turf algae covers the highest percentage of the benthos (67.3%) followed by live coral (20.8%), coralline algae (9.1%), sand (1.4%), macroalgae (1.0%), and macro invertebrates (<1%).
- A total of 9 coral species were documented at the Olowalu stream site. The most abundant species were *Porites lobata* (14.5%) followed by *Pocillopora meandrina* (4.3%) and *Montipora patula* (1.2%).
- The 1m Kanahena Bay site was most similar to the 1m Hekili Point site but varied in geomorphology and the presence of *Pocillopora meandrina.*
- Several sites on Oahu, Maui and Hawai'i have similar coral assemblages to the 3m Olowalu stream site and are characterized by a southern exposure. The one exception is Laupāhoehoe on Hawai'i which has a northern exposure.
- The lack of similarity of the Hekili Point site to sites in close proximity (e.g. Olowalu and Puamana) indicates the uniqueness of the coral assemblage in the back reef habitat.
- The similarity of the Olowalu stream site to the Puamana sites rather than the closer Olowalu sites suggest that the stream site is subjected to moderate to high wave energy.
- The range of anthropogenic impacts (low to high) for sites with similar coral assemblages suggests that both the Hekili Point and Olowalu stream sites have not been impacted by human activities but rather are influenced by natural factors (e.g. water motion).

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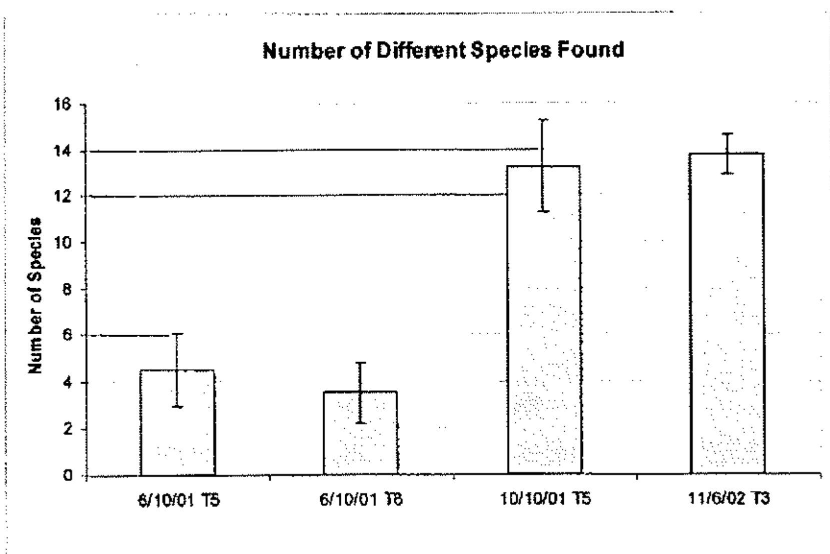
Fish Assemblage Structure at Hekili Point, Maui

METHODS

Fish Assemblage/Biomass

Fish assemblages at each location were assessed using standard underwater visual belt transect survey methods (Brock 1954; Brock 1982). A SCUBA diver swam each 25m x 5m transect at a constant speed (~ 15 min/transect) and identified to the lowest possible taxon, all fishes visible within 2.5 m to either side of the centerline (125 m^2 transect area). Transects were located along the centerline of the previously established CRAMP benthic survey grids. Four transects, separated by 5 m gaps, were conducted at each location. Total length (TL) of fish was estimated to the nearest centimeter. Length estimates of fishes from visual censuses were converted to weight using the following length-weight conversion: $W = aSL^b$ (the parameters a and b are constants for the allometric growth equation where SL is standard length in mm and W is weight in grams). Total length was converted to standard length (SL) by multiplying standard length to total length-fitting parameters obtained from FishBase (www.fishbase.org). Length-weight fitting parameters were available for 150 species commonly observed on visual fish transects in Hawaii (Hawaii Cooperative Fishery Research Unit unpublished data). This was supplemented by using information from other published and web-based sources. In the cases where length-weight information did not exist for a given species, the parameters from similar bodied congeners were used. This data was then used to estimate total biomass for the area. Finally, fish taxa were categorized into 6 trophic categories (herbivore, mobile invertebrate feeder, sessile invertebrate piscivore, zooplanktivore, and detritivore) according to Randall (1996) and Friedlander, *et. al.*, (1997) for comparisons among sites.

RESULTS



APPENDIX D.

Scientific Consultant Services, Inc. Letter Dated January 22, 2007

SCIENTIFIC CONSULTANT SERVICES, Inc.
711 Kapiolani Blvd., Suite 975 Honolulu, Hawai'i 96813

January 22, 2007

Bill Frampton-Manager
Olowalu Town, LLC
2073 Wells St., Suite 101
Wailuku, HI 96793

RE: Letter Report: Field Inspection of Previously Identified Sites within a Burned Area (Approximately 500-acres of a Total 660 Acres) in Olowalu Ahupua`a, Lahaina District, Island of Maui [TMK: 4-8-3: 10 por.].

Scientific Consultant Services, Inc. (SCS) was contracted to conduct an Archaeological Field Inspection of a large land tract cleared by a recent brush fire. The land parcel is an undeveloped land tract composing some 660-acres, with 500-acres of the parcel having been cleared by the fire. The property is located in Olowalu Ahupua`a, Lahaina District, Island of Maui [TMK: 4-8-3:10 por.] (Figure 1). The landowners should be commended for funding this rare opportunity for project archaeologists (re-survey of a cleared landscape) and for the community, to firmly establish the quantity and types of sites present in Olowalu..

<u>Background</u>

The Field Inspection was requested by Olowalu Town, LLC (Bill Frampton-Manager) following a fire that burned approximately ¾ of the parcel, creating ideal circumstances for visibility of surface archaeological sites and component features. The purpose of this work was to determine the presence/absence of previously undocumented archaeological sites and/or component features within the burned environs, taking advantage of the advanced degree of visibility and ensuring some degree of certainty of the completeness of recordation of the archaeological record for this area.

It is well known in the Hawaiian Islands that under normal field conditions, site visibility is often hampered by vegetative overgrowth and sites are non-obtrusive. Such a large tract of land also offers uneven conditions with much variability in project area topography, vegetation, and soil regimes. In short, the completeness of archaeological documentation is never guaranteed. Environmental factors, such as vegetation density, terrain, weather, decomposition of features, and host of other factors, impact the visibility of archaeological sites in the field. Often, significant surface features can be totally obscured by layers of vegetative detritus or heavy feature collapse/damage. The ideal conditions for archaeological visibility would be a landscape that is devoid of vegetation (but not a demolished landscape *ala* Kahoolawe). Recent archaeological studies have shown that site identification increases concurrent with increased landscape visibility (Holm and Kirch 2007, case study from Kahikinui, Maui). The rare opportunity to take advantage of such a condition was provided during July 2007, when a natural brush fire removed all vegetative detritus and living vegetation from the eastern ¾ of the present study parcel.

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Previous Archaeology

Previous Archaeological work in the project area was conducted in two phases by Xamanek Researches (Fredericksen and Fredericksen 2000). Using standard Inventory Survey methods (systematic pedestrian survey, recordation of sites and component features, mapping, photography and limited subsurface testing) Fredricksen and Fredericksen (200) documented a total of 30 sites with 78+ component features in the project area. Table 1 provides a description of these sites.

Table 1: Previously Identified Sites, Description, Comments, and GPS Points from the Present Field Inspection.

SIHP 50-50-08-	# Features	Description	Field Inspection Comments	GPS Point
4	1	*Heiau*	Some dozer push-piles noted near the northwest corner of the site. These were not documented in previous work.	e04748400, n2303972
1603	1+ (?)	Lanakila Hawaiian Protestant Church	not relocated during this work	-
3180	1	Rock wall	not relocated during this work	-
4699	9	8 rockshelters, 1 modified outcrop	not relocated during this work	-
4700	10	8 rockshelters, 1 rock wall, 1 C-shape	not relocated during this work	e0746592, n2304654
4701	1	Platform remnant	Site relocated, no comments	e0746649, n2304558
4702	1	L-shape	Site relocated, no comments	-
4703	3	U-shape, rock alignment, and modified outcrop	not relocated during this work	-
4704	7	Petroglyph Complex	not relocated during this work	-
4705	2	Rockshelters	not relocated during this work	-
4706	1	Rockshelter	Site relocated, no comments	e0748449, n2304374
4707	2	Rock wall and rock mound	Site relocated, no comments	e0748507, n2304388
*4708	3	Platform and two series of agricultural terraces	Newly documented feature: Feature C, a series of agricultural mounds located on the *makai* (west) side of Feature A	e0748476, n2304278
4709	4	Two concrete foundations, rock wall/terrace, and series of irrigation ditches	not relocated during this work	-
4710	7	Habitation Complex	Site relocated, no comments	e0748491, n2304141
4711	2	Linear rock pile and terrace	not relocated during this work	-
4712	2	Modified outcrop, rock pile	Site relocated, no comments	-
4713	1	Rockshelter	Site relocated, no comments	-

4714	1	Rockshelter	Site relocated, no comments	-
4715	1+ (?)	Burial ground	Site relocated, no comments	-
4716	2	Terrace and rock wall\	Site relocated, no comments	-
4717	4	Walls	not relocated during this work	-
4718	3	Heiau, consisting of enclosure and two burials	Site relocated, no comments	e0748050, n2303568
4719	1	Boundary marker	not relocated during this work	-
4720	1	Historic retaining wall	not relocated during this work	-
4721	1	Platform	not relocated during this work	-
4758	1+ (?)	Historic Cemetery	Some headstones have cracked and spalled in recent fire	e0747089, n2303787
4820	1+ (?)	Surface scattering of Human Remains	not relocated during this work	-
4821	1+ (?)	Surface scattering of Human Remains	not relocated during this work	-
4822	1	Pond	not relocated during this work	-
4823	1	Subsurface gleyed deposits	not relocated during this work	-
1200	1+ (?)	Petroglyph Complex	Some of the petroglyphs have been damaged by smoke and spall in fire	e0748369, n2304322
* newly documented feature				
(?) Precise number of features is not reported in Fredericshen and Fredericksen 2000				

Field Inspection Results

After the recent brush fire in July, 2007, SCS Archaeologist Ian Bassford was dispatched to perform an Archaeological Field Inspection of the burned area. The Field Inspection occurred intermittently between July 17 and August 6, 2007. During the Field Inspection, Mr. Bassford relocated only those sites which were within the burned area. He also recorded a GPS point for each of the newly relocated sites. This data is also presented in Table 1. Overall ground surface visibility was high, was expected.

In sum, only two sites were adversely impacted by the fire. At Site -4758, a Historic cemetery, several of the headstones became fire-cracked and spalled in the heat. Site -1200, a petroglyph complex located on the *mauka* (northeast) side of Pu`u Kilea, was partially damaged by smoke and some petroglyphs were spalled in the heat. Push-piles were noted off the northwest corner of Site -04, Kawaialoa Heiau. These push-piles were not specifically mentioned in Fredericksen and Fredericksen (2000) and may be modern, pertaining to fire fighting. Testing was not completed to determine their origin.

One new feature was identified during the Field Inspection. The feature consists of a series of agricultural terraces located to the northeast of Site -4708, a site that was originally documented as containing two features. Fredericksen and Fredericksen (2000) report Feature A as a faced retaining wall and Feature B as a series of agricultural terraces. The morphological similarity and geographic proximity of this newly identified feature has led it to be recorded as Site -4708 as Feature C. In other terms, the new agricultural terraces have been subsumed under Site -4708. All other sites/features noted during the Field Inspection were previously recorded.

Conclusions

All the sites previously documented on the parcel were assessed per varying levels of significance (Fredericksen and Fredericksen 2000:67). These significance evaluations remain unchanged after the current Field Inspection. Previously stated recommendations still apply to these sites as well.

Per the additional agricultural terraces identified during the current work, now designated as Feature C of Site -4708, the addition of another *lo`i* terrace complex does not change the original interpretation or significance of this site (see Fredericksen and Fredericksen 2000). The site was originally interpreted as a *heiau* with associated *lo`i*. The new features simply add to the breadth of the site. Site -4708 remains significant under Criterion E, due to its interpreted status as a religious site.

While the Field Inspection provided a tremendous opportunity to view the landscape in an unusual form (without vegetation), only one new agricultural complex was identified. The previous archaeology conducted within the project area proved to be quite thorough and accurate. We were fortunate to have had the opportunity to re-assess this landscape and more completely assure the client and community that all sites occurring on the parcel have indeed been documented and recorded.

Best Regards,

Donna M. Shefcheck, B.A.,
Michael F. Dega, Ph.D.