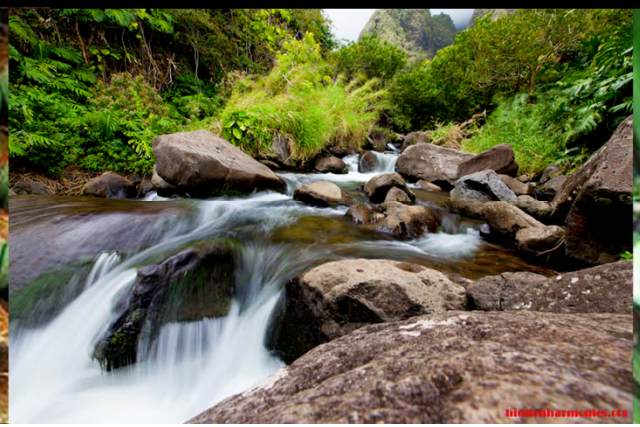
Waiwai Ola Waterkeepers Hawaiian Islands




Waiwai Ola means: "Living Wealth"

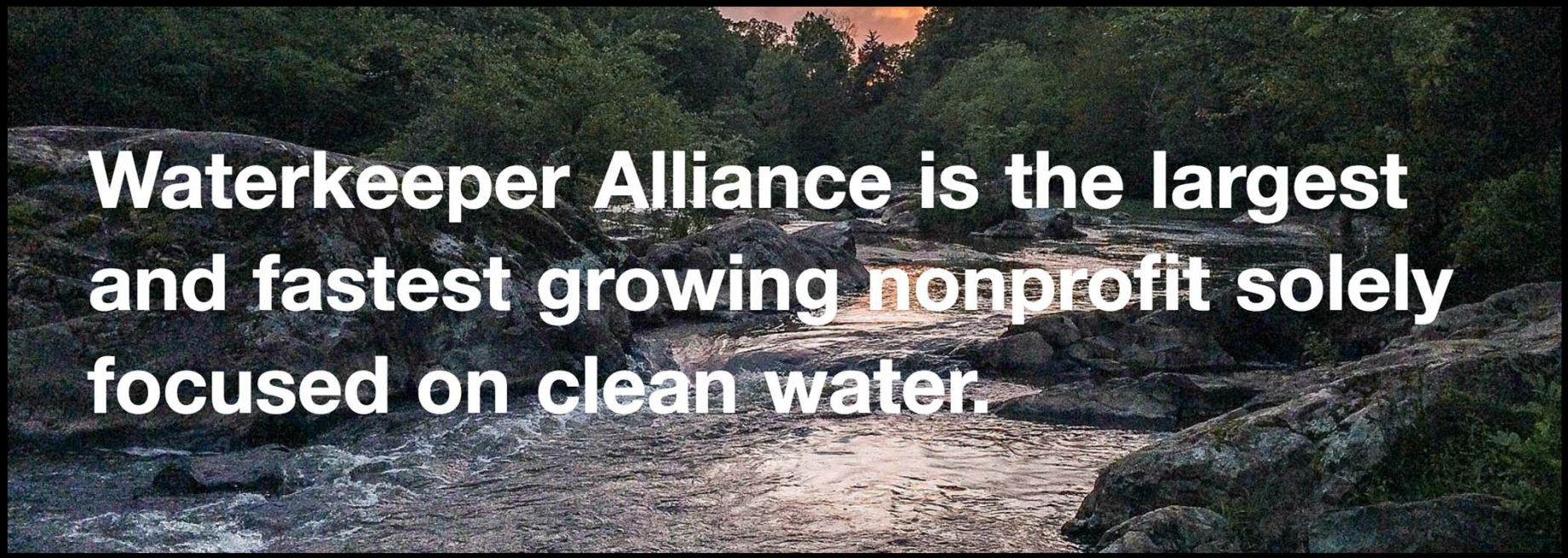
Hawai'i is home to more than 10,000 native species, many of which are found nowhere else on Earth.

Natural Resources are Cultural Resources

- He aliʻi ka ʻāina; he kauwa ke kānaka.
  The land is a chief; man is its servant.

Freshwater Streams and Healthy Nearshore Ecosystems Are Important Natural and Cultural Resources


Waterkeeper Alliance is the largest
and fastest growing nonprofit solely
focused on clean water.

- Waterkeeper Alliance is a global movement to protect water resources, currently uniting 347 Waterkeeper organizations throughout 41 countries in the Americas, Europe, Australia, Asia and Africa, all focused on the vision of swimmable, fishable, drinkable waters.
- Together, Waterkeepers advocate for the health of approximately 2.5 million square miles of rivers, streams, and coastlines.

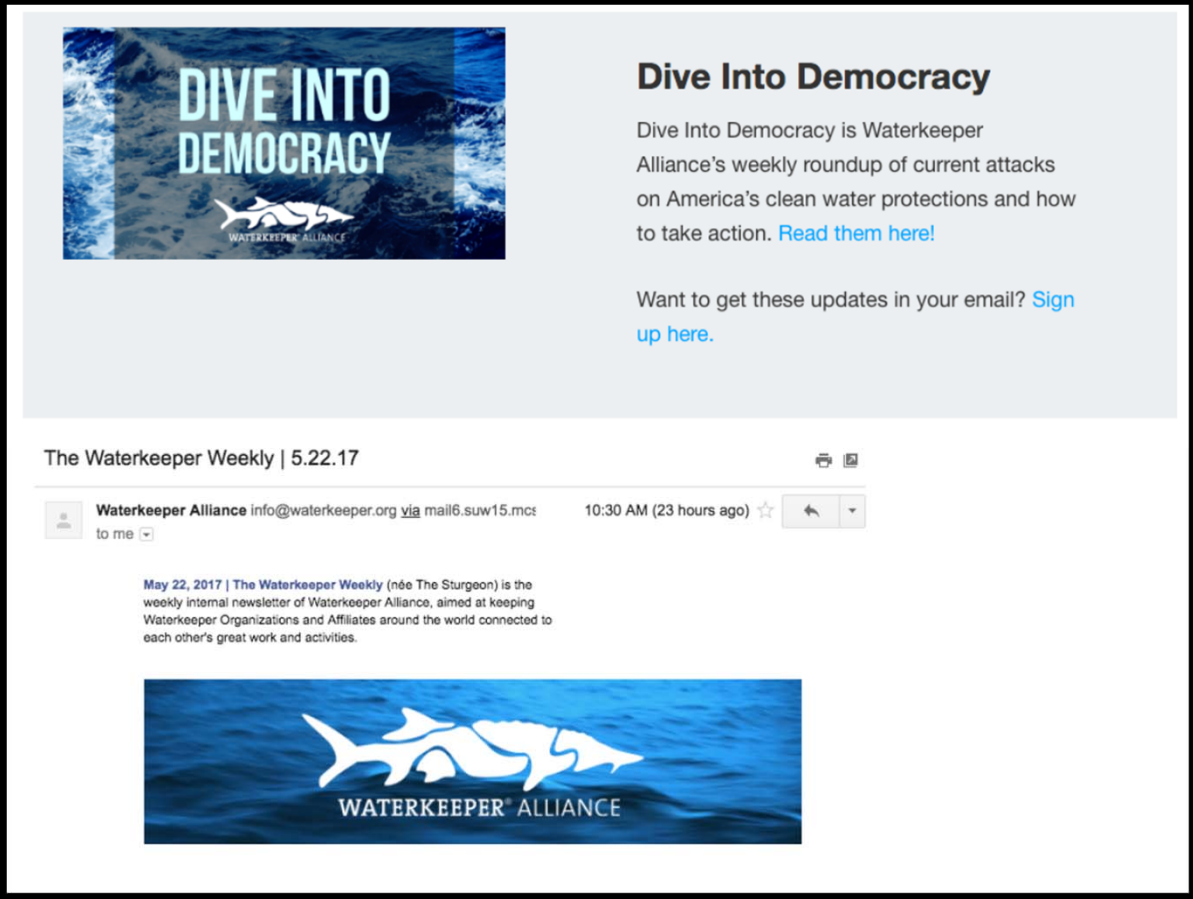

WATER IS LIFE
WATERKEEPER ALLIANCE
WATERKEEPER Alliance
2017 conference
The flags of the nations we represent

In June 2018, over 300 water advocates from around the world met and exchanged ideas in Buffalo Niagara, New York.

WATERKEEPER® MEMBER

Waterkeeper Alliance connects and supports local Waterkeeper organizations to provide a voice for waterways and their communities worldwide.

Dive into Democracy:
Helping Local Waterkeepers to be Effective Advocates




Additional Support
• Development and Organizational Capacity Building
• Legal Advice
• Policy Issues
• Mentor Program
• Discounts / pro deals
• Rapid Response
• Trademark

Communications: Social Media

O‘ahu Waterkeeper’s mission is to protect present and future generations’ ability to drink, swim, fish and otherwise use and enjoy the waters of O‘ahu that support the land, people, and culture of Hawai‘i.

Through partnerships, O‘ahu Waterkeeper will implement projects to mitigate the impacts of stormwater and wastewater in nearshore areas.

Stormwater and Wastewater Compromise the Quality of Nearshore Ecosystems

The health of the State's water resources is directly related to the health of the economy, the land, and its people. Clean water supports subsistence, recreational, and commercial fishing, world-class surfing and diving locations, and is vital to the State's marine tourism industry.

Water Quality Remediation Projects

- Modeled after, several successful water quality remediation projects using oysters on the U.S. continent, O‘ahu Waterkeeper is partnering with the U.S. Marine Corps as well as local government agencies, businesses, and community groups to undertake Hawai‘i’s first large-scale ecological restoration using native oysters to improve water clarity and quality.

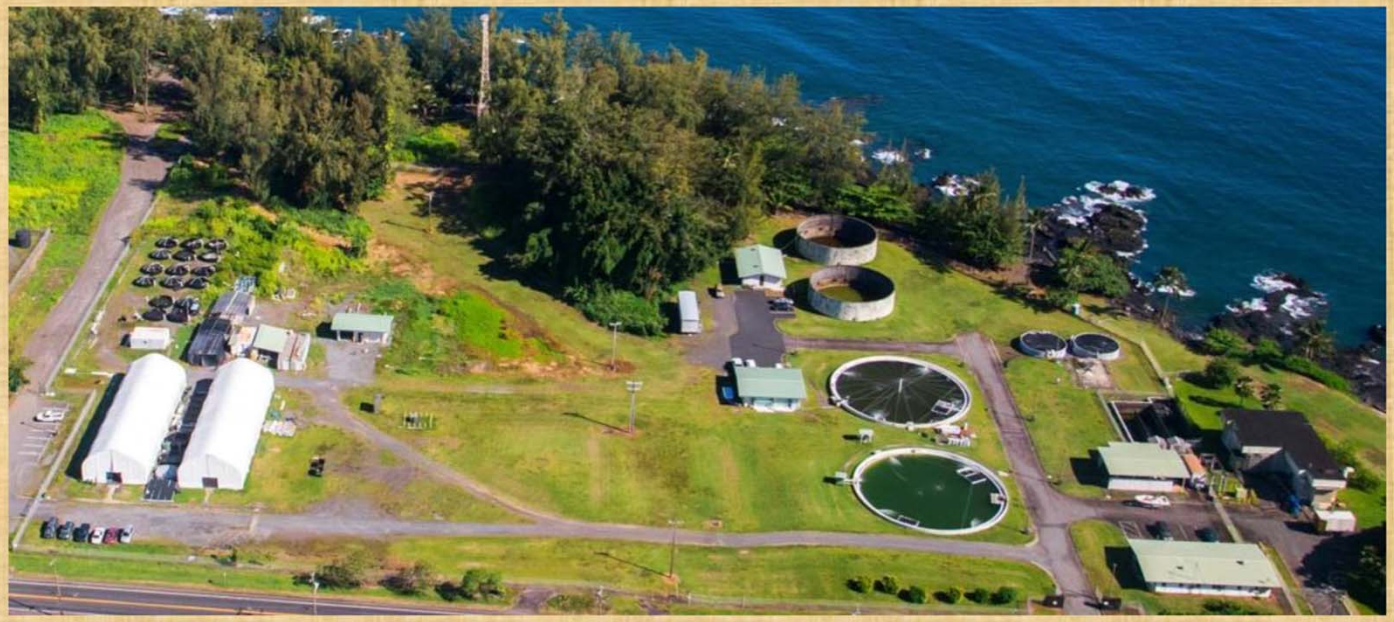
- The restoration will initially incorporate two species of native oysters: (1) *Dendostrea sandvicensis* (Hawaiian Oyster) and (2) *Pinctada margaritifera* (Black-Lipped Pearl Oyster).

Native Oysters Improve Water Quality

- Native oysters filter between 20 and 45 gallons of water per day depending on their size, removing harmful pollutants including sediment, bacteria, heavy metals, PCBs, oil, microplastics, sunscreen chemicals, and nutrients from the water column, which improves water clarity and quality.

Pacific Aquaculture and Coastal Resources Center (PACRC)

College of Agriculture, Forestry and Natural Resource Management (UHH)



Bivalve species with potential in Hawaii

Dendostrea sandvicensis

Hawaiian Oyster

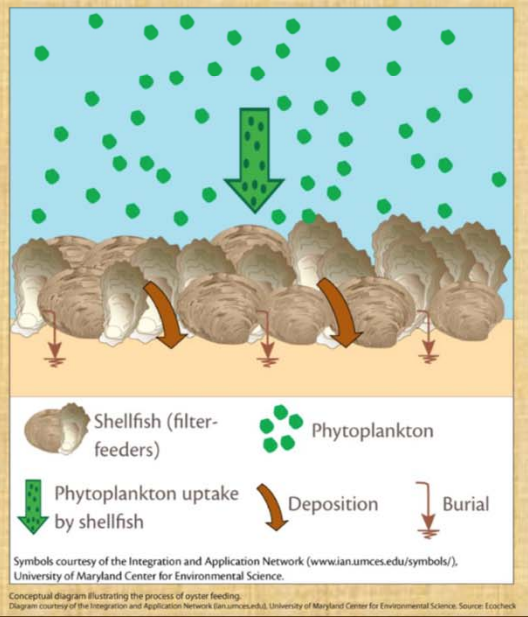
Pinctada margaritifera

Black-lip Pearl Oyster

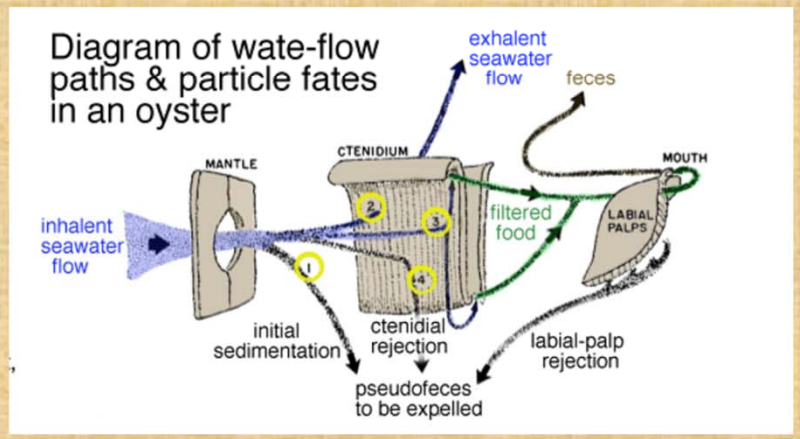
Native Oyster Species after selective breeding

Ecological services provided by bivalves
Improvement of water quality

- **Reduction of turbidity through filter feeding**
- **Biodeposition of organics containing plant nutrients**
- **Induction of denitrification associated with organic deposition**



Conceptual diagram illustrating the process of oyster feeding.
Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science. Source: Ecocheck



National Academy of Science, 2012
Ecosystems Concepts for Sustainable Bivalve Mariculture
http://www.nap.edu/openbook.php?record_id=12802&page=123

Removal of organic nutrients

- 1 million 76 mm oysters can remove:
  - 132 kg of nitrogen
  - 19 kg of phosphorus
  - 3,823 kg of carbon.

  (Higgins et al., 2011)

Source: DNR South Carolina

On a smaller scale

- Oyster gardening:

  200 oysters/week harvest = nutrient inputs of one septic tank (Rice et al. 2001)

- Commercial harvest:

  10,000 oysters/week = nitrogenous waste of 40-50 residents (Golen 2011)

Ecological services
Combating climate change

Sequestration of Carbon

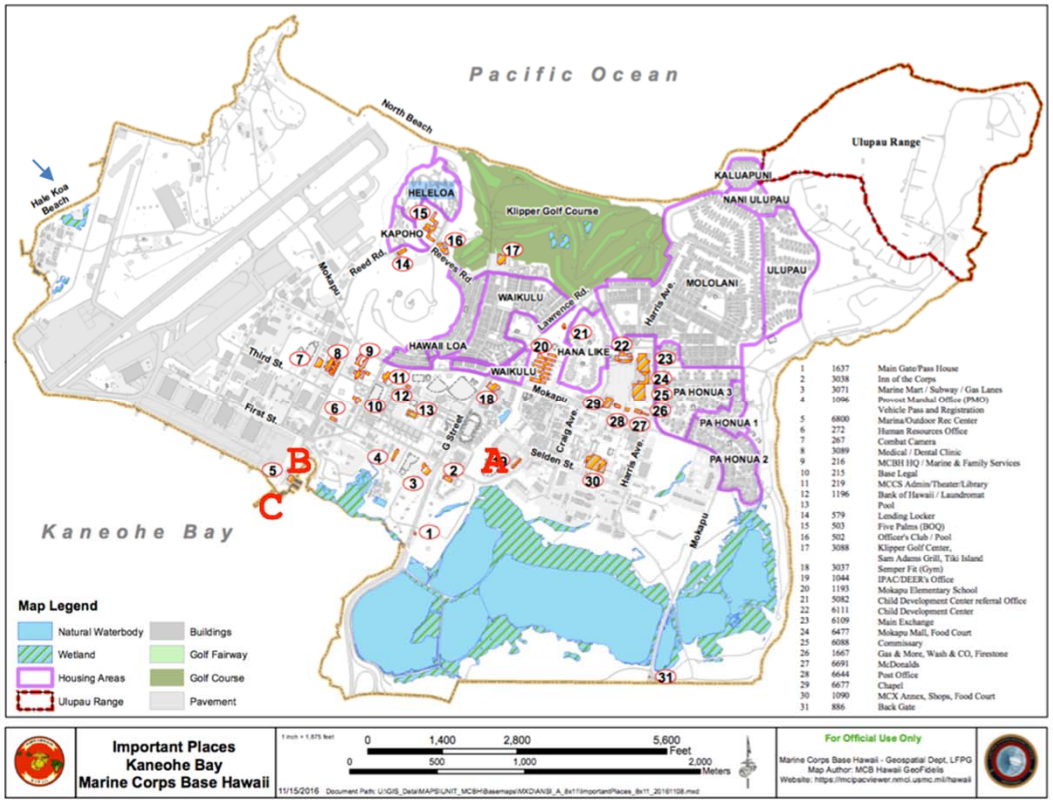
Gulf of Mexico Foundation-making oyster reefs

NOAA-middens in South Carolina

Ecological services
Structural effects

- Provision of structural habitat that promotes epibiotic diversity and fish and crustacean production
- Habitat and shoreline stabilization

Marine Corps Base Hawai‘i, Kāne‘ohe Bay
Native Oyster Restoration to Improve Water Quality



The Marine Corps Base has identified three sites for water quality remediation using oysters. Each site is different, which allows O‘ahu Waterkeeper to test a variety of restoration techniques that may be employed in other communities. The pilot project will begin with the out-planting of 500 – 1,000 oysters at Site A (labeled in the diagram on the left) to assess conditions and conduct baseline water quality monitoring.

Once successful, the project will expand to restore water quality in the following areas:

Marine Corps Base Hawai‘i, Kāne‘ohe Bay Native Oyster Restoration

Site B: The restoration will continue in the marina to enhance water quality. Here, hanging plastic cages can be attached with polypropylene rope to the underside of the old boat gas dock in the marina. Also, in the northern section of the marina area there is a small cove area where boats do not enter and oysters may be deployed in oyster bags using floats. Similarly, oyster cages can be deployed under the small floating dock in the boat mooring area of the marina.

Site C: In this area, oysters can be contained between the underwater pillars.

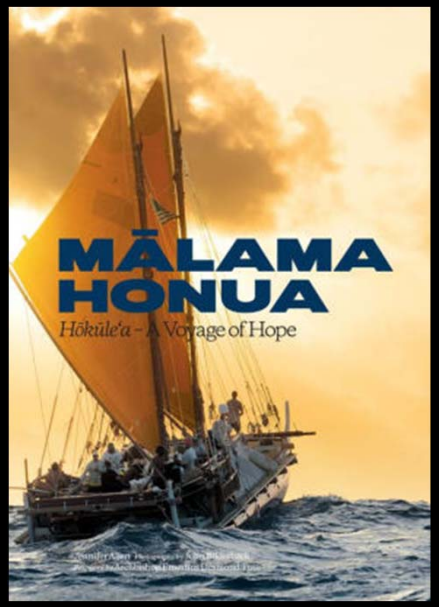
Improving Water Quality in Kāneʻohe Bay

- The fishpond at Heʻeia, in Kāneʻohe Bay, has already been successful in cultivating oysters from seed stock to restoration size in approximately six months.
- Oʻahu Waterkeeper will provide economic support to the fishpond for maintenance of the seed oysters until they are large enough to out-plant in the waters around Kāneʻohe Bay Marine Corps Base.
- Other communities around the state are already excited to follow this model and undertake oyster restoration in their nearshore waters. All potential locations are in restricted waters to prevent people from harvesting and consuming the oysters.

Environmental Education Curriculum: Oysters to the Rescue!

- In conjunction with native oyster restoration projects, Waterkeepers will engage the community in watershed education to reduce the flow of pollutants towards the nearshore waters.
- The oysters provide a unique opportunity to discuss complex environmental issues including stormwater, wastewater, water quality, and fishing safety. Oysters and plants used for bioremediation are super heroes with special skills that protect us.

Educational Partners:
Polynesian Voyaging Society & the University of Hawai‘i



We are working with PVS to develop a curriculum that teaches youth about native oysters, water quality, and the marine environment. PVS will use this curriculum for the thousands of school children that visit the sailing canoe Hokule'a each year. Oysters produced at UH Hilo will go to a “native oyster garden” at the UH Marine Education and Training Center (METC) to support educational programs for the children that visit Hokuleʻa.

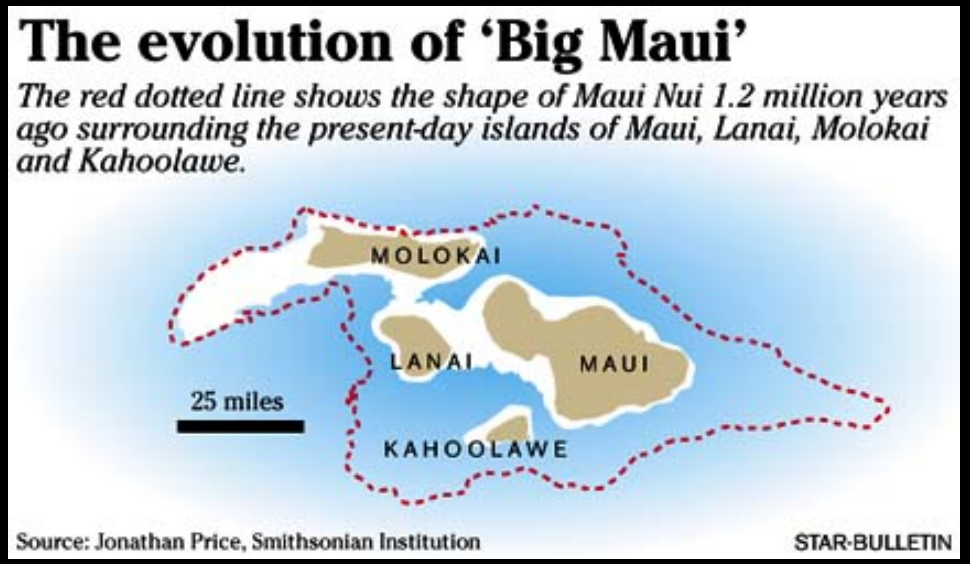
MAUI NUI
MARINE RESOURCE COUNCIL

An Affiliate of Waterkeeper Alliance

Maui Nui Marine Resource Council is a Maui-based nonprofit whose mission is to restore the health of Maui's coral reef ecosystems. Through collaboration, education, and advocacy, we work to bring human actions into balance with ecological principles and, in doing so, ensure that our near-shore waters will be restored and sustained for future generations.

Water Quality Issues in Maui Nui

- Like on O‘ahu, the waters of Maui Nui face growing pressure from a wide range of threats. The primary threats include: wastewater, stormwater runoff of land-based pollution, marine-based pollution, overfishing, recreational overuse, invasive species, and climate change.



MNMRC's Focus Areas

- MNMRC's current efforts focus on addressing land-based, anthropogenic sources of pollution affecting water quality which include:
- (1) sediment runoff from coastal development, road construction, agricultural lands, and watershed erosion
- (2) excess nutrients from human and animal waste (injection wells, cesspools, and leaking septic systems and wastewater pipes), and
- (3) toxins and pollutants from chemical runoff (e.g., fertilizers and pesticides used in agricultural and landscaping practices).

Maui's First Water Quality Study Using Oysters Will Take Place in Ma‘alaea Bay

- MNMRC will conduct a pilot study using Pacific Oysters (*Crassostrea gigas)* to determine whether Ma‘alaea Bay's nearshore waters would be suitable for a subsequent expanded native oyster restoration to improve water quality and clarity in Ma‘alaea Bay.