

KIRC MISSION STATEMENT

Our mission is to implement the vision for Kaho'olawe, in which the kino of Kanaloa is restored, and na po'e Hawai'i care for the land. We pledge to provide for meaningful, safe use of Kaho'olawe for the purposes of traditional and cultural practices of the native Hawaiian people, and to undertake the restoration of the island and its waters.



Volunteers installing gabions at the Hakioawa Watershed Project Site.



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Kūkulu Ke Ea A
Kanaloa

Habitat Restoration in the Hakioawa Watershed of Kaho'olawe: Reducing Excessive Sedimentation



Kaho'olawe Island Reserve Commission
March 2019

HISTORY

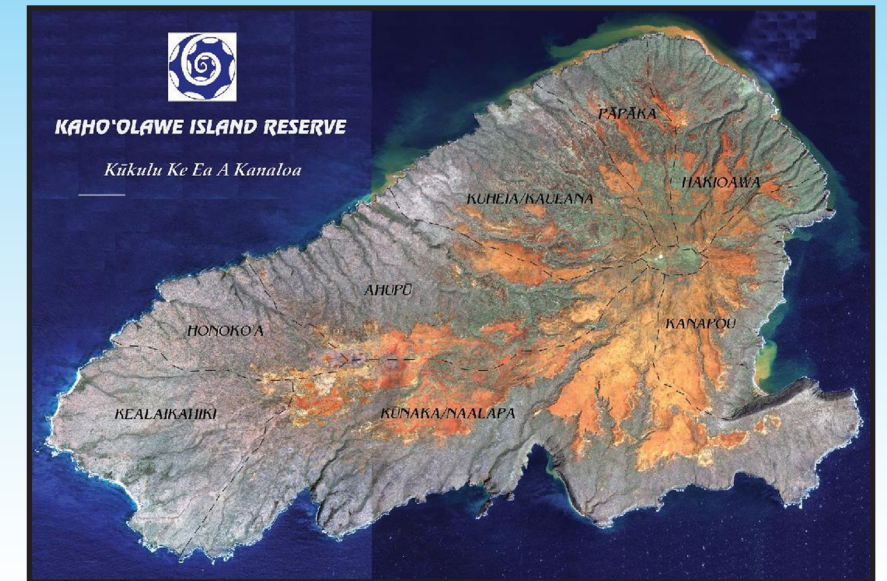
Kaho'olawe is a single shield volcano located 7 miles southwest of the island of Maui. The island is approximately 11 miles long and 7 miles wide, encompassing roughly 28,800 acres (45 square miles). Kaho'olawe is a cultural treasure, possessing unique archaeological sites. The entire island is on the National Register of Historic Places.

In recent history, the island underwent a harsh evolution. It was used briefly as a penal colony, then for goat, sheep and cattle ranching, and eventually as a military live fire and bombing training site. In 1976, members of the Protect Kaho'olawe 'Ohana (PKO) began a series of occupations of the island and filed suit in Federal court in an effort to halt the military training activities and exercises. In 1990, in response to the actions of PKO and the results of litigation, President George H.W. Bush ordered a stop to all military live fire training on Kaho'olawe. Three years later Congress voted to end military use of the island and at that time, the island was established as a Reserve, and placed under the administration of the Kaho'olawe Island Reserve Commission (KIRC). The Kaho'olawe Island Reserve includes the entire island and its surrounding ocean waters in a two mile radius from shore.

Today, the KIRC is responsible for the environmental restoration and sustainable management of the island, as well as providing for the meaningful and safe use of Kaho'olawe for the purpose of traditional and cultural practices of the Native Hawaiian people. The restoration of the Native Dryland Forest in the Hakioawa Watershed is one of many projects that are part of the KIRC's efforts to revitalize Kaho'olawe.



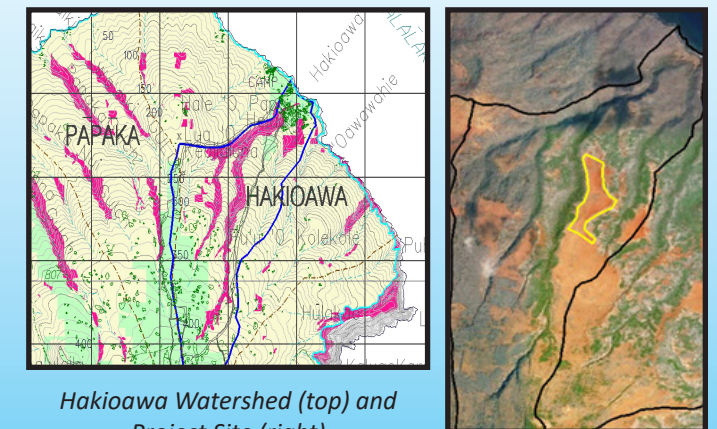
Erosional runoff from Hakioawa after a heavy rain.



Map of the Kaho'olawe Island Reserve

PROJECT PURPOSE

The purpose of the Hakioawa Watershed project is to restore the 37 acre area by establishing a healthy native dry forest ecosystem, while also improving the near shore marine environment. The traditional Hawaiian approach of mauka-to-makai (ridge to reef) maintains the philosophy that restoration on land will improve the environmental conditions of the surrounding coastal ecosystems. Restoring vegetative cover in the watershed will help to reduce runoff and sedimentation into the ocean.



Hakioawa Watershed (top) and
Project Site (right)

PROJECT BACKGROUND

Decimated of its natural environment through years of over foraging by ungulates and military bombing, roughly 30% of the island is barren due to severe erosion. An estimated 1.9 million tons of soil is lost annually as a result of erosion, with the resultant sediment runoff choking the Reserve’s pristine coral reefs and negatively impacting the coastal marine ecosystem.



The stream gage at Hakioawa helps to measure sediment load and runoff rate.

Previous projects in the area determined that the annual suspended sediment loads averaged 1880 tons at the Hakioawa Stream Gage. Reducing the excessive sedimentation, a Non-Point Source (NPS) pollutant, will diminish the negative ecological impact to the near-shore coral reef communities, and help to improve and maintain their structure.



Volunteers collecting seed from ‘Ohai (*Sesbania tomentosa*) and Ma’o (*Gossypium tomentosum*) in a previously constructed and established corridor.

Soil erosion is not the only challenge. Digging is prohibited due to the presence of Unexploded Ordnance (UXO). Despite an extensive cleanup by the Navy, removal was primarily conducted on the terrestrial surface and UXO still remain subsurface. Also, newly planted vegetation must be irrigated due to the island’s limited average annual rainfall of only 10 to 25 inches.



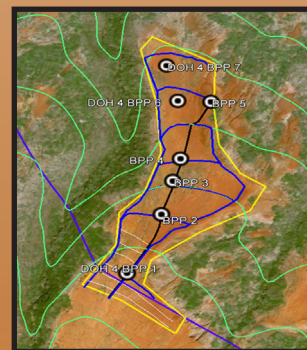
Subsurface UXO.



Wattles (left) and Raised Planting Bed Corridors (right).

BEST MANAGEMENT PRACTICES (BMPs): Erosion Control

BMPs are used to control NPS pollution and can be correlated to decreased rates of soil erosion through monitoring. BMPs include the use of **Gabions**, **Wattles** and **Raised Planting Bed Corridors**; irrigation with soil amending and conditioning; permanent photo points to measure vegetation cover; out-planting 10,000 native plants; removing invasive alien species of non-native plants; monitoring results.



Locations of photo points, irrigation lines, and contours of the Project Site.

Gabions are “catch dams” made from geotextile baskets filled with rocks, and placed in rivulets to slow the flow of water, while capturing valuable soil in the process.

Wattles are erosion and sediment control devices made from rocks wrapped with geotextiles and burlap, that shorten slope lengths, reduce water flow velocities, and trap sediment on site.

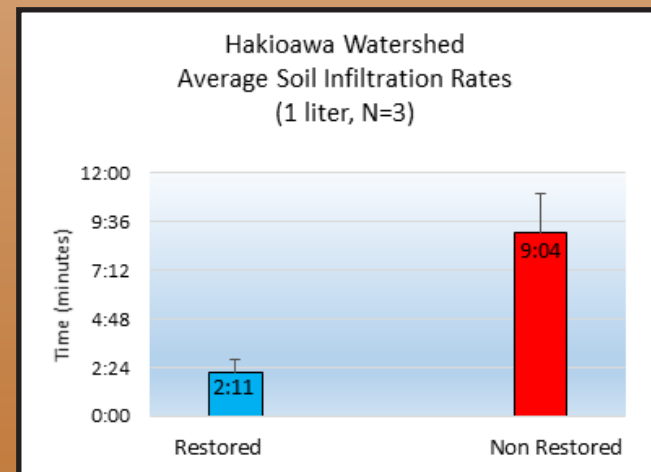
Out-Planting Strategy

The Out-Planting Strategy reduces NPS pollution in the Hakioawa Watershed through two goals: slowing overland sheet flow and establishing native plants. **Wattles** are constructed along contours through the Project Site. The wattles are then transformed into **Raised Planting Bed Corridors**. Each wattle corridor is filled with a mixture of potting soil, amendments, fertilizer, and Kaho’olawe soil, planted with **Native Plants**, and watered through **Irrigation**. These structures capture sediment while revegetating the hardpan. Once established, the native plants allow for the natural dispersal of seeds by wind and water.



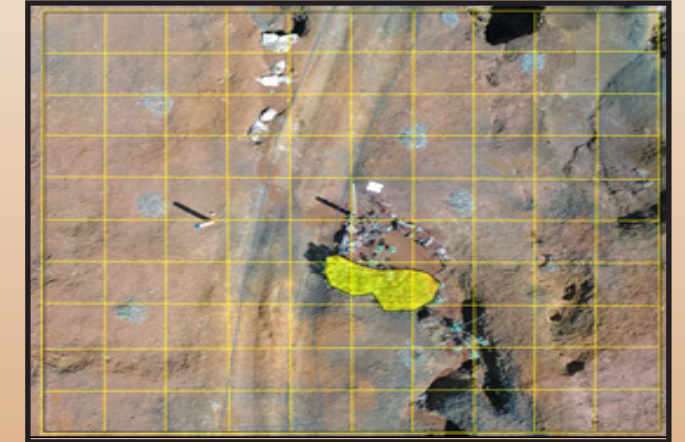
An assembly line of volunteers ready for out-planting.

Soil Infiltration rates are significantly faster in restored areas when compared to areas that have not been restored. Higher infiltration rates equates to less runoff and results in more freshwater recharge into Kaho’olawe’s water table.



Monitoring Techniques

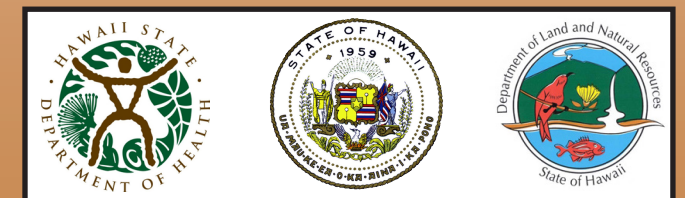
Monitoring and analysis are ongoing, and include: measuring **Stream Stage** (height) and rainfall, quantifying **Plant Survival Rates** and **Cover** with **Vegetation Plots**, measuring erosion control rates with **Soil Erosion Pin Transects**, and documenting change over time through **Permanent Photo Points** and **Drone Imagery**.



Measurement of vegetation cover using 10m x 10m grids.

Observations over time suggest that the watershed restoration project is positively impacting sediment retention and water quality, as well as both native vegetation in the watershed and coral health in the near-shore ocean environment.

Mahalo to the thousands of KIRC volunteers that have contributed to this project!



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