360. Ecological and Native Dryland Forest Restoration on the Island of Kaho□ olawe

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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.

Kaho‘olawe has been degraded by 200 years of ungulates trampling and uprooting vegetation and 52 years of bombing by the U.S Navy after the World War II attack on Pearl Harbor. This degradation has lead to very little plant coverage resulting in an estimated 1.9 million tons of soil lost per year.

The Kaho‘olawe Island Reserve Commission (KIRC) is responsible for the environmental restoration and sustainable management of the island until a sovereign Hawaiian entity is recognized by the U.S Federal and Hawaii State government.

Purpose

Erosional runoff from Hakioawa after a heavy rain. Kaho‘olawe has an estimated 1.9 million tons of soil lost per year.
Subsurface Exploded ordnance (UXO).

The purpose of this 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.

Best Managment Practices (BMP)

BMPs are used to control Non Point Sources (NPS) of 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.

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.

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.

Out-Planting Strategy

An assembly line of volunteers ready for out-planting (Left). Volunteers collecting seed from 'Ohai and Ma'o in a previous established corridor (Right).

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.

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

Figure 1: Hakioawa Watershed Mean (+/-SE) Soil Infiltration Rates (1 liter, N=3).

Figure 2: Mean Differences (+/-SE) in Soil Erosion Pin Transects 2018 to 2019 Non Restored versus Restored (p=0.019)

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.

Observations over time indicate that the watershed restoration project is positively impacting sediment retention with 2.8 mm less erosion in restored areas compared to non restored (restored 1.4 mm ± .05; non restored: 4.2 mm ± .07) . The project also saw a significant increase of native vegetation in the watershed from .5% to 2.5% (p=0.04).

This project has been jointly funded by the U.S. Environmental Protection Agency (EPA) under Section 319(h) of the Clean Water Act, and the Hawai‘i State Department of Health (DOH). Although the information in this document has been funded wholly or in part by a Federal grant to the Hawai‘i State Department of Health, it may not necessarily reflect the views of the EPA or DOH and no official endorsement should be inferred.
