
2014 DAR NOAA Final Report

Release 1.0

Diane Kanealii

October 29, 2014

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PROJECT INFORMATION

- **NOAA Grant Number:** NA11NOS4820006
- **Project Title:** Ungulate Fencing and Sediment Reduction
- **PI and Staff:** Diane Kanealii
- **Award Period:** November 14, 2013 to September 30, 2014
- **Award Amount:** \$93,995.36

EXECUTIVE SUMMARY

Our goal was to reduce local erosion and its effects with ungulate-proof fencing and by propagating and out-planting native plants.

In the process of building the fence line, we took all precautions to insure no historical or cultural trails or sites were disturbed. We used plants as the main erosion control measure to keep as much sediment out of the ocean as possible via natural means. This replaced our initial strategy to use straw waddle, as we learned from our partners (and our own experience) that using straw waddle for erosion control was very expensive, labor intensive, and finally unsuccessful.



Figure 2.1: Runoff after heavy rainfall.

With the help of the Pelekane Bay Watershed Project team, we learned how to build and did build a sediment dam with the large rocks from the area, shade cloth material, and hog wire with the help of some very strong men and women. The purpose of the dam is to catch the sediment from one stream that flows to the ocean on the project site with heavy rains. As sediment builds up over time, it can be collected and used for planting.

Within the fenced areas we built three paddocks: one to preserve historical sites for possible restoration, another as an ungulate trapping area, and the final for out-planting. We planned to lure the goats in with food and water but

thus far have only caught one. We will continue to experiment with other foods, traps, etc. to try to be more successful.

We propagated and out-planted a minimum of 1200 native plants and scattered a half gallon of seeds that were collected to self-propagate during the rainy season. We also replanted an additional 100 or so plants that did not survive the first two weeks after being out-planted.

All of the activities of this project served to educate our neighbors, community members, and volunteers on the importance of protecting our watershed. As part of our outreach, a public presentation was made to the members and attendees of the South Kohala CDP meeting and volunteers manned a booth to share information about this project at the Makali'i festival as well as the Wiliwili festival.

The UH Hilo KUULA marine science class was comprised of young adults who participated on the first community workday. This set us on the right path to reach the target audience, for they will be the next group of people to work on these types of projects. Starting here gives them the opportunity to see the issues first hand and learn how little steps can have big, positive impacts.

We also targeted the students of the Youth Challenge Academy under the direction of the Hawaii National Guard. Forty-seven "at risk youth" volunteered to come out at 5AM from Hilo and work in the hot sun for hours on this project. Our purpose was to engage them in a project that could provide a sense of accomplishment, help connect them to the land, and help them to understand the bigger picture of resource management - showing them how small differences they make now can result in big differences in their future. At the end of the day, 90% of the youth participants asked to come back and continue to work on this project and related projects. Arrangements and partnerships are being created to coordinate routine workdays and year-round participation for students of this program as well as similar projects with partner organizations along the North and West coastline.

One of our partners the Waikoloa Dry forest initiative made arrangements students from Cornell University to

participate in Kailapa's efforts by propagating and donating 500 native plants to this project.

This project has given us hands-on experiences which highlight the importance of our native plants, gathering and seeding techniques, and best practices of re-potting, out-planting, and maintenance. We are currently exploring the options for natural fertilizers to decrease chemicals on the land which can enter the ocean via runoff. It is a tiny but critical first step in the bigger picture.

For this project, there were 15 community workdays including two days for workshops to learn how to propagate plants from seeds and cuttings. The number of volunteers for all of the workdays totalled 198 (not including those from Cornell University).

PURPOSE

Management problems addressed:

- Instituted erosion control and sediment reduction measures with native plants.
- Installed water diversion and dispersement with rocks to decrease the cutting of grooves on the land from water running downhill during heavy rains.
- Created a ungulate free area to protect the plants and installed irrigation lines for current and future planting.
- Ungulate trapping area was established and we continue to try different strategies to trap and remove the ungulates.

Overarching goal(s) and objective(s) of the project:

- Decrease erosion.
- Sediment reduction.
- Promotion of native plants.
- Educating broad community.
- Outreach to future leaders of our islands.
- Beginning of protecting the watershed.
- Water quality monitoring.
- Strengthening partnerships with other organizations with similar visions and goals.



Figure 3.1: Target project area in relation to the Kailapa homestead.



Figure 3.2: Fence line as determined by GPS coordinates.

APPROACH

4.1 Ungulate proof fencing

A fencing contractor installed ungulate-proof fencing with three paddocks and multiple gates to accommodate a historical trail that runs through the southern end of the property. The fence includes breakaway fences where possible flood waters carrying large debris potentially increase the risk of water backing up and causing property damage. The fence line was cleared of large rocks thanks to a volunteer operator and a donated excavator. A volunteer kupuna who is an archeologist from Kailapa did multiple visits to weed whack and confer with the fencing contractor to ensure that work on fence line did not negatively impact any cultural sites or trails.

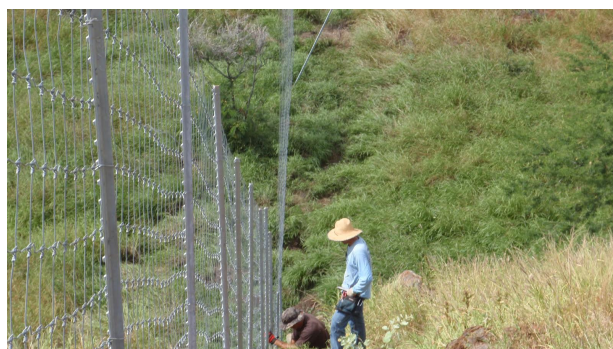


Figure 4.1: Installing the fence.

4.2 Ungulate monitoring and removal from the land

When the fence was completed, food and water bins were placed in the center paddock and monitored by community volunteers at least every other day for activity. There had not (and has not) been any food eaten from the bins. Many goat footprints could be seen on the Honokoa side of the unfenced property but no goats entered into the trapping area. We did get one goat which tried to stick its head through the fence and got stuck by its own horns. That

goat was removed from the area and disposed of. Different types of foods were tried to lure the goats including straw, grain, corn, fresh vegetables/fruits, ti leaves, etc.

4.3 Erosion control measures instituted

High erosion runoff could be seen on several areas on the northern side of the property. Erosion pins were installed and rocks were placed in the gullies and spread out approximately two feet all along the sides. Native plants were populated from seeds or cuttings that were gathered from the Kawaihae area and cared for at volunteers' until mature enough to out-plant. The land was prepped by weed-whacking the entire target planting area. Irrigation lines were laid out and connected to the water source and holes were dug for the plants. When the plants were ready, over 1200 of them were out-planted over a six week period of time in erosion-prone areas.

4.4 Near and off-shore baseline water quality analyzed

As part of their community outreach program, Liquid Robotics Inc. outfitted a Wave Glider to collect and analyze water samples to monitor the water quality of the offshore waters. Due to the fact that the Wave Glider does not have a motor, it is not capable of navigating near shore waters and remained about 40ft off shore. Samples were collected in four regions between the Honokoa and Kaimaki gulches. Kailapa contracted the UH Analytical Lab to analyze the near shore samples. The analysis gives us baseline measurements and will be shared on the South Kohala Coastal Partnership and Kailapa websites. Monitoring will be on-going so that we can compare data and monitor the waters for changes.

4.5 Sediment dam created

There is one large ravine on the site that runs when there is heavy mauka rain. Based on what has successfully been done in the Pelekane bay watershed project, Kailapa decided to install a sediment dam to try to catch the sediment that is carried downstream.



Figure 4.2: Sediment dam underway.

4.6 Outreach and education

Through our volunteer workdays, workshops were held to teach and learn about proven propagation, out-planting, and watering techniques specific to dryland plants. Presentations, photos, and brochures were provided to the larger community at the South Kohala Community Development Planning meeting (CDP), both the Makali'i and Wiliwili festival, and the North Kohala Access and CDP groups. The Kailapa Community newsletter article helped others in the broader community understand the problems and purpose. The newsletter was shared with all Hawaiian Homestead associations as well as our email contacts and partners. We continued to provide updates on the project via partners and volunteers to provide insight on what we are trying to do and raise awareness about the erosion problems of this area and how this project is taking the steps in addressing the problem using techniques that were used for centuries before development and land clearing began. This project offered some erosion mitigation solutions that everyone can use and demonstrated how small communities can make a difference in the large picture of watershed protection and restoration.

We included the UH and Youth Challenge students in our problem cases and implemented solutions, providing the opportunity to reach those who will be carrying on this work in the next two to ten years. This might turn out to be the project's biggest investment.



Figure 4.3: Volunteers helping install irrigation lines.

PROJECT MANAGEMENT

- Diane Kanealii, Project manager
- Kailapa Community Association
- Big Country Fencing
- Big Island Botany
- Waikoloa Dry Forest Initiative
- Pelekane Bay Watershed Project
- Liquid Robotics
- UH Analytic lab
- UH Marine Science students, “KUULA” program
- Members of the S. Kohala CDP
- Youth Challenge Academy
- UH Sea Grant
- Nawahi’okalani’opu’u mala’ai program
- Ala Kahakai Trails Association
- Larger Community and family volunteers
- Cornell University student volunteers
- Kaleo Bertelmann, heavy equipment operator

RESULTS

- Fenced in approximately 13 acres of land with ungulate proof fencing.
- Gathered seeds from the area, propagated and out-planted 1200+ native plants, taught volunteers to propagate and care for the native plants.
- Designed and installed irrigation lines for 2100 plants, built sediment dam, installed water diversion techniques. Stopped erosion gullies.
- Partnered with Liquid Robotics to outfit a wave glider to be able to get he and analyze water samples, obtained baseline water analysis near and off shore.
- Contracted with the UH analytic lab to analyze the near shore water samples.
- Identified historical trails and preserved the trails and access, shared project findings through presentations for the general community.
- Landscaped the future pavilion site with native plants, to help the perpetuation of native plants.
- Created future seed bank for perpetuation of native plants.
- Created partnership with the Youth Challenge Academy to build curriculum for community service on the North and West coastline projects.



Figure 6.1: New fence, irrigation lines, and plants..

APPLICATIONS

Outputs achieved:

- Offshore and near shore baseline water quality studies report to be posted on the UH Sea Grant and the Kailapa Website.
- Ability for community members to do workshops to teach basic propagation techniques starting from cuttings and seeds as well as transplanting and out-planting techniques for successful growth.
- Ability of a few community members to do training workshops on creating irrigation plans as well as how to install and repair irrigation lines.

Outcomes achieved:

- Learned the difference between chemical and natural fertilizers and how to make fertilizers out of compost and learning how to make IMO fertilizers that are safe for humans and the environment, ecosystem.
- Learned landscaping techniques to mitigate erosion and provide alternative methods of planting and rock planting.
- Learned that goats are smart and not that easy to trap and that alternative methods are needed for their removal.

How did your project benefit resource managers?

As the project manager, I learned that I knew almost nothing about native plants and erosion control. I have increased my knowledge by 100%+ and continue to learn more each day that I work on this project. For example:

- The huge numbers of different dry land native plants, propagation methods, survival rate, and watering needs.
- The value of gathering seeds and cuttings and landscaping with plants native to the area in which they will be grown.
- Issues working with rare and endangered plants, including the permitting process.

- What other people and organizations with similar visions are doing in their projects.
- Confidence in being able to share with our community and beyond.
- More clearly understand the erosion process, sediment reducing methods, and how sediment impacts the ocean and our resources.
- The costs and benefits of natural alternatives to chemical fertilizers.

How has your project led to societal improvements, if any?

The project has engaged not just members of Kailapa but a broad range of volunteers who participated in our organization's efforts. The efforts highlighted the fact that whatever is done on land will affect what happens in the ocean. The project emphasized our social responsibilities and the positive effects of small changes we can make.

It taught us that the efforts made to use more natural fertilizers and products to control insects and provide plant nutrition and planting with native species that have adapted to the Kawaihae area reduces the need for watering and fertilizing.

Those involved in this project from its inception have an enhanced awareness and appreciation of the plants that can thrive in these very harsh conditions.

Goats have been cited as being the culprits in much of the erosion that has taken place over many years and have been the target for eradication. However, looking at the watershed from mountain to makai made it clearer that it is not only the goats to blame but other hoofed animals as well as the clearing of mauka lands for ranching today and historic sandalwood trade.

As these issues become clearer to those living in the area today, it helps us all realize that we need to take a more proactive role in protecting and improving our environment.

The following are examples of the project impacts social changes:

- Improved our understanding of the impact that goats and other hoofed animals have on the land.
- Simple erosion control techniques such as planting in steep areas and dispersing water over larger areas to give it time to absorb.
- Realization that our homestead has only 13 of over 10,000 acres of a watershed with zero recharge.
- Reaching out to Hawaii's future leaders by inviting the Youth Challenge Academy to participate in the planting project. This is an investment in our youth: getting those who are at risk to feel welcome and know they can contribute to the larger picture and to help them to understand that this is *their* land, *their* ocean and *their* future.

What partnerships were established with other federal, state, or local agencies, or other research institutions (other than those already described in the original proposal)?

Additional partnerships (not previously listed) were established with the UH Analytic lab and Youth Challenge Academy under the direction to the Hawaii National Guard.

EVALUATION

Describe the extent to which the project goals and objectives were attained.

The project area was secured to re-vegetate native plants. 1200+ native plants were propagated and out-planted with an 80% survival rate for plants that were planted eight weeks ago. Seeds gathered and scattered will begin in areas where the initial plants are thriving and areas that the plants did not survive will be re-planted with recently started plants. The irrigation lines are installed and prepared for the next out-planting for an additional 1300 plants. Community members are trained to maintain and repair the irrigation lines if needed and to monitor the plants' water needs, cutting back on the water as the plants mature.

Erosion visibly decreased in areas that the water had cut gullies, where erosion pins were eventually installed. The technique of using rocks to disperse the water over a larger area was successful. There was no measured change at the pin sites after they were installed because no strong rains followed their installation.

Community awareness of the importance of watershed and resource management was improved not just for Kailapa, but all participants, partners, and volunteers. We secured water quality monitoring partners and obtained the baseline measurements. The data will be posted online at the UH Sea Grant and Kailapa websites.

Provide an explanation for the modification of goals and objectives or problems that developed which resulted in less than satisfactory or negative results.

During this project timeframe, we were unable to remove as many goats as anticipated. It appears that a large number of goats were removed through another eradication effort which resulted in fewer goats coming to the lower areas. The trapping area has not been as successful in luring in the goats as anticipated.

Describe the need, if any, for additional work.

- Caring for the plants is going to require a full time person.
- The plants need to have room to grow which means



Figure 8.1: Propagated plants at volunteer's house.

constant weeding of invasive grasses that can choke the native plants until they gain a foothold.

- The irrigation lines need to be monitored for blockages and or leaks and adjusted as the plants mature and need less water.
- Natural fertilizers need to be created out of compost or the IMO process to ensure no harmful chemicals enter the ocean.
- Ground cover plants will be needed as companion plants to reduce the invasive grasses and weeds, and to help prevent erosion.
- Propagation and put-planting must continue to insure total success of this project.
- Continued monitoring of the water quality should continue indefinitely so that any source pollution can be identified early on and mitigation efforts can be deployed.

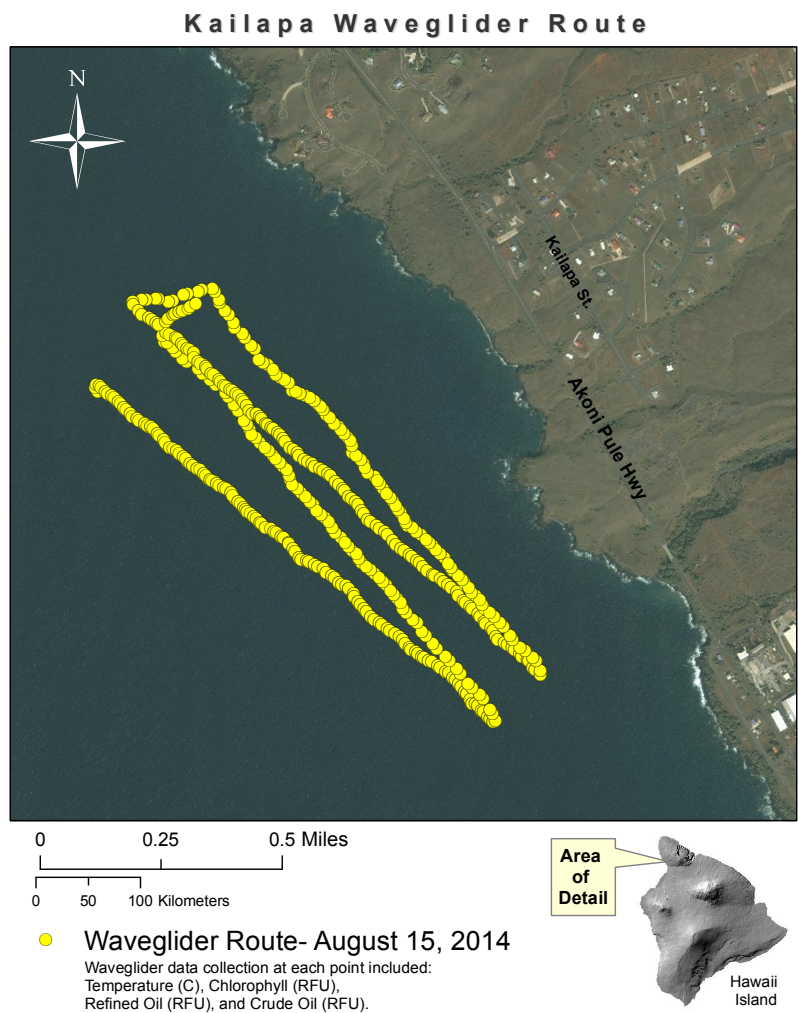
Final Report Prepared by: *Kelaine Kanao Iii*

Date submitted: *10/29/14*

Signature of Point of Contact:

DATA GATHERED

B.1 Liquid Robotics Wave Glider route



B.2 Liquid Robotics Wave Glider sample readings

The following are samples of the data collected by Liquid Robotics Wave Gliders. Complete spreadsheets are available online at:

- <http://www.kailapa.org/wp-content/uploads/2014/10/waveglider-data-F1-20141508.xlsx>
- <http://www.kailapa.org/wp-content/uploads/2014/10/waveglider-data-F2-20141508.xlsx>

TimeStamp	Vehicle	Latitude(deg)	Longitude(deg)	Refined Oil	Crude Oil	Chlorophyl	temperature	Task Id
6/30/2014 17:44	MOBY	20.05618	-155.85648	8.4	45.08	31.12	29.89	1
6/30/2014 17:43	MOBY	20.05614	-155.85642	9.12	36.04	40.12	29.89	1
6/30/2014 17:43	MOBY	20.05603	-155.85629	12.88	65.48	31.36	29.89	1
6/30/2014 17:42	MOBY	20.05598	-155.85624	7.64	30.24	34.68	29.89	1
6/30/2014 17:42	MOBY	20.0559	-155.85611	11.88	49.08	40.76	29.89	1
6/30/2014 17:41	MOBY	20.05584	-155.85604	6	57.96	33.16	29.89	1
6/30/2014 17:41	MOBY	20.05575	-155.85591	7.08	49.12	36.52	29.89	1
6/30/2014 17:40	MOBY	20.05569	-155.85585	6.2	16.52	32.28	29.9	1
6/30/2014 17:40	MOBY	20.05558	-155.85575	10.72	47.76	37.8	29.9	1
6/30/2014 17:39	MOBY	20.05552	-155.85568	10.16	55	32.48	29.9	1
6/30/2014 17:39	MOBY	20.05541	-155.85555	7.84	67.16	36.44	29.9	1
6/30/2014 17:38	MOBY	20.05534	-155.85549	7.08	67	35.56	29.9	1
6/30/2014 17:38	MOBY	20.05527	-155.85535	10.92	51.16	31.96	29.9	1
6/30/2014 17:37	MOBY	20.05521	-155.85529	9.08	29.2	35.68	29.89	1
6/30/2014 17:37	MOBY	20.05512	-155.85512	6.8	88.68	40.36	29.9	1
6/30/2014 17:36	MOBY	20.05507	-155.85505	7.16	29.72	38.96	29.9	1
6/30/2014 17:36	MOBY	20.05502	-155.85493	8.12	54.32	31.24	29.9	1
6/30/2014 17:35	MOBY	20.05498	-155.85487	7.72	82.52	39.6	29.89	1
6/30/2014 17:35	MOBY	20.05484	-155.85474	10.44	53	36.64	29.89	1
6/30/2014 17:34	MOBY	20.05479	-155.85469	4.52	55.48	33.08	29.89	1
6/30/2014 17:34	MOBY	20.05466	-155.85455	5.36	75	35.08	29.89	1
6/30/2014 17:33	MOBY	20.0546	-155.85451	6.68	42.32	27.08	29.88	1
6/30/2014 17:33	MOBY	20.05446	-155.85436	8	40.24	33.72	29.89	1

B.3 UH Analytic Lab findings

	UHH Analytical Laboratory Marine Science Department University of Hawai'i at Hilo Hilo, Hawai'i 96720	For:	Diane Kaneali'i Kailapa Community Association dkanealii02@gmail.com
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Laboratory Test Results

Description: 4 water samples for chlorophyll *a*, turbidity and CDOM
Job 742-Kailapa

<u>ID</u>	<u>DATE</u>	<u>UHH ID</u>	<u>Chl <i>a</i> (µg/L)</u>	<u>Turbidity (ntu)</u>	<u>CDOM</u>
Honokoa	9/9/2014	742-1	0.075	0.230	
Kailapa	9/9/2014	742-2	0.102	0.290	
Kailap Kai'opae	9/9/2014	742-3	0.138	0.350	
Kai'opae	9/9/2014	742-4	0.138	0.210	

Equation for Chlorophyll <i>a</i> calibrated for Turner Fluorometer
$2.137 * \frac{[(\text{fluorescence before acidification} - \text{fluorescence after acidification}) * \text{Volume acetone}]}{\text{Volume filtered (L)}}$
Modified from USEPA method 445.0

Photos to support grant activities



Propagation workshop 4/18/14



Propagation workshop 5/9/14



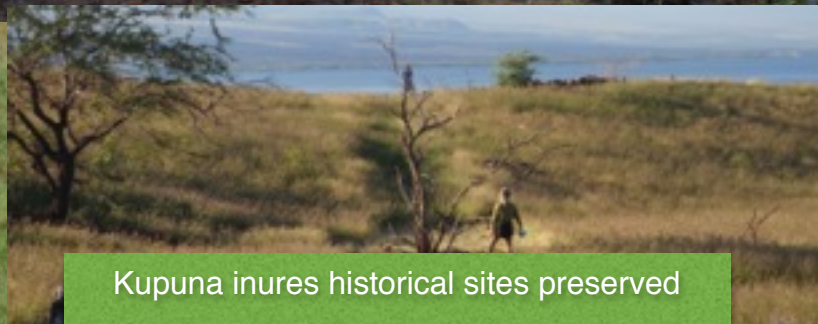
Land prep tp clear fence line of rocks/debris



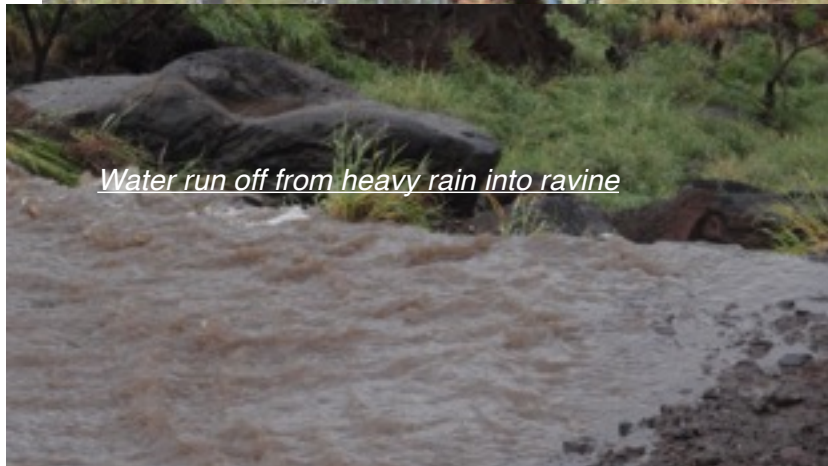
Fence installation beginning



Fencing installation progress



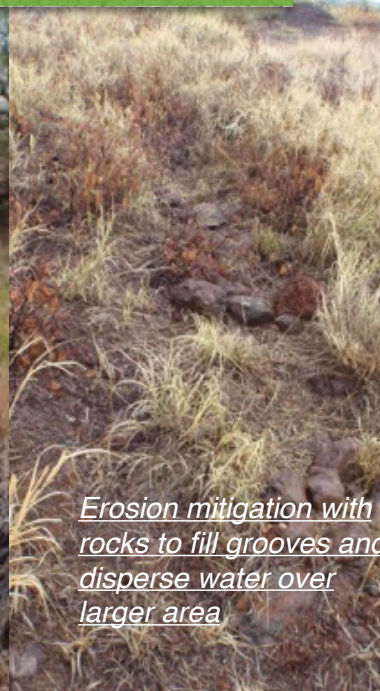
Kupuna inures historical sites preserved



Water run off from heavy rain into ravine



Erosion caused by running water cutting grooves



Erosion mitigation with rocks to fill grooves and disperse water over larger area

Photos to support grant activities

Water running through ravine to ocean



Building sediment dam



Completed sediment dam showing sediment collected from most recent rain



Volunteers digging holes for plants on hill above ravine



Laying out the irrigation lines



Irrigation supplies delivered to site



Installing spider lines for irrigation
Never too old or too young



First phase out-planting



Out-planting demonstration



Installed and working irrigation



Out-planting community work day



Company B , volunteers from Youth Challenge Academy learning how to install spider lines



First phase of planting completed with fully functional irrigation lines



Land prep for out-planting



Volunteers working on very steep area to prepare for out-planting



Watering by hand until lines can be



Out-planted 'a'alii and naupaka



Plastic welding to join irrigation lines



Installing timers for irrigation



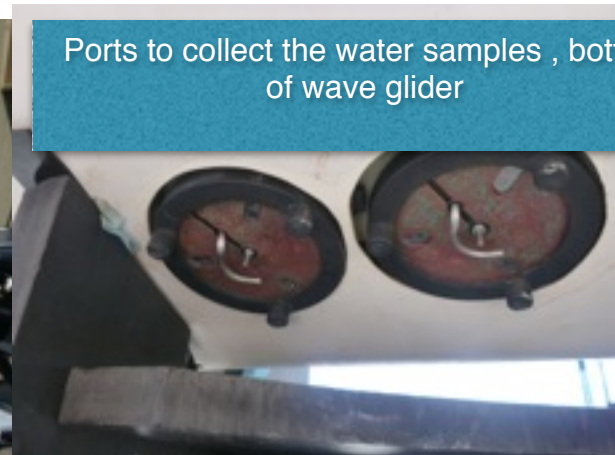
Sierra brings colleagues to observe and participate in out-planting



Photos to support grant activities



Wave glider outfitted to collect and analyze water samples



Ports to collect the water samples , bot
of wave glider