

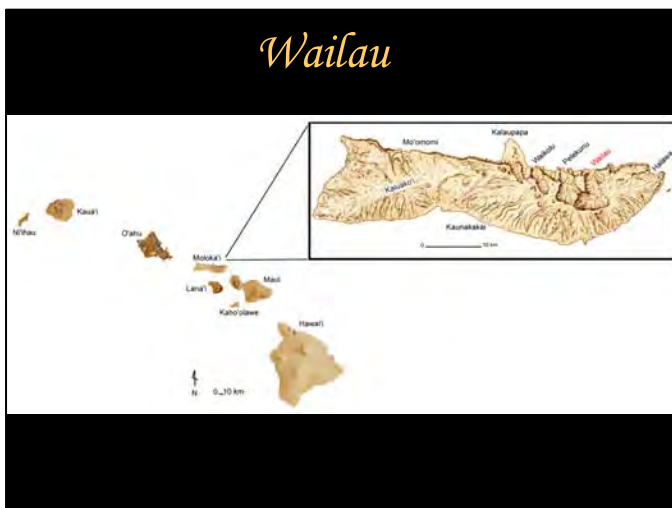
# *Merging Archaeology with the Local Community: The Moloka'i Archaeological Training Program and Wailau Archaeological Research Project*

*Windy K. McElroy*

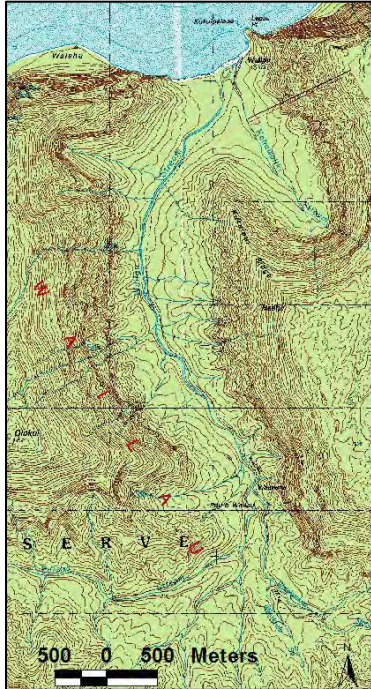


Involving the local community in archaeological research should be an important part of all archaeological work. Community support, or the lack thereof, can make or break a project, but public involvement benefits both the archaeologist and the community. Community involvement can introduce local people to the field of archaeology and demonstrate that archaeology is a viable career option. The public often has misconceptions about what archaeology really entails, and utilizing local volunteers exposes them to what our field is really about, helping to bridge the gap between archaeologists and concerned community groups. In this presentation I'll give you an example of how I

was able to involve the Moloka'i community in my dissertation research in Wailau Valley and a training program in Kamalo.



Wailau is the largest of four valleys on the wet windward coast of Moloka'i, that stretches from Hālawā Valley on the east to Kalaupapa Peninsula on the west.



Wailau is made up of a smaller broad valley on the east and a deeper valley on the west, with two major streams flowing down – Kahawai'iki Stream and Wailau Stream.

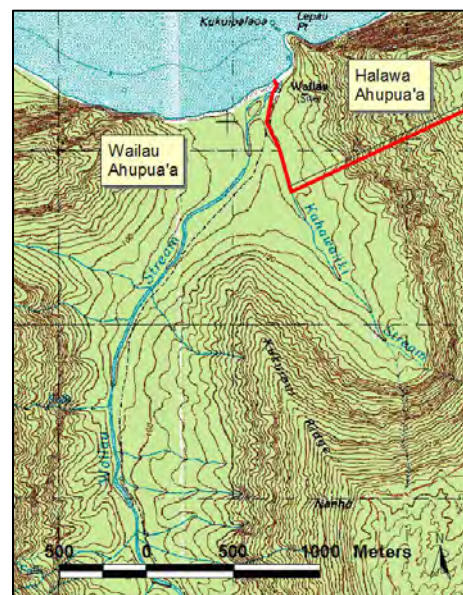


The two streams converge near the coast, where the terrain opens up to a boulder beach,

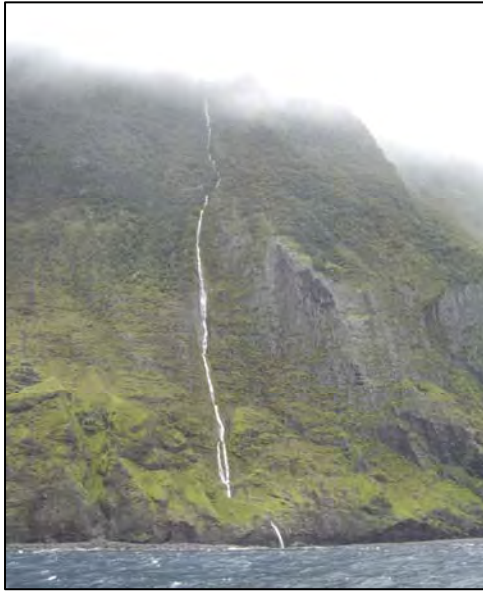


with a small black sand beach on the west side.

A unique thing about Wailau is that the valley is made up of two *ahupua'a*. The large western portion comprised Wailau Ahupua'a, while a small strip of land on the east was part of Hālawā Ahupua'a, which extends east all the way to Hālawā Valley.







Vehicular access ends at Hālawā, so Wailau is only accessible by a long and dangerous hiking trail, by helicopter, or by boat during the calm summer months. The valley is set between rugged cliffs that rise 1,000 m from the ocean, and these are listed as the tallest sea cliffs on earth in the Guinness Book of World Records.

Wailau was a major area of taro production in the pre-contact era until the 1930s when the valley was abandoned due to a combination of factors including flooding and unfavorable economic conditions. A series of intact *lo‘i*, or taro terraces, forms an agricultural system distributed across almost the entire 936-ha valley. Trails, habitation remains, and ceremonial structures are part of the cultural landscape as well.



Because of its inaccessibility, Wailau hosts few year-round residents and has escaped the widespread development that has destroyed many of the archaeological resources in other parts of our state. It is this rare condition that makes the valley a prime source of information about the past, although surprisingly little archaeology has taken place there.



decided to return to Wailau later that summer to look at the archaeological landscape in terms of a prospective dissertation topic.

I only stayed a few days during that second trip of 2004, but I explored enough of Wailau to realize what an exceptional place it was. The valley had never seen a bulldozer. There were no buildings, no roads, nothing to disturb the archaeological sites. Walking through the mazes of stone walls, it was almost like the ancient people just picked up and left yesterday. What a fantastic opportunity for research. But why had the valley not been studied before?



I first visited Wailau in 2004 when I was contracted through the CRM firm I was working for to do an archaeological inventory survey for a woman that wanted to build a small cabin there. I immediately fell in love with the valley and was in awe of the multitude of intact archaeological resources that had never been documented. This first small scale project produced promising results. I mapped part of a well preserved *lo'i* system and found a buried *lo'i* wall beneath the one visible on the surface. I recovered charcoal for radiocarbon dating, and Bayesian calibration placed the upper wall at AD 1635–1914 and the lower wall at pre-AD 1724. I

One reason of course was its inaccessibility. Yes, it's inconvenient to have to take a boat to the site, swim all your equipment in, build your own camp, and live in isolation. But that's not enough to stop an archaeologist from working at a prime site like Wailau. So I started asking around and what I found was more than a little discouraging.





beach. Needless to say, they turned around and went home.

I recently came across this newspaper article from 1977 detailing a biological and archaeological project funded by the National Science Foundation that was thwarted by community opposition. It was a UH project, directed by Lisa Croft. I'll read you a couple of quotes:

Croft described Wailau Valley on the north coast as pristine, rich in vegetation, very prime with excellent stream life. Archaeologically it has some of the most fantastic site complexes...Croft and several others on the 13 member team traveled to Molokai in April to meet with Dr. Emmett Aluli of Hui Alaloa, a Molokai-based group. She said although their group was greeted hostilely and suspiciously, after two hours of emotionally draining communication, she felt the Molokai people were trusting.

She was obviously mistaken, and I'm going to read you my favorite quote of the article from Walter Ritte, who is still very active in Moloka'i issues:

Ritte retorted that Croft and the other project members "started ass-backwards. They got the grant... and then they came to tell us they were coming in. We don't want the valley opened up like a book. With a government grant you've got strings attached. Our kupuna tell us the value of the aina (land). There is no scientific value. Only cultural and spiritual value."

Another part of the article states:

It was said that the valley is a flourishing locale for marijuana growing by persons who come in on helicopters or land at the shoreline from boats. One resident said this is cause for tension because of the potential for danger.

Because of its isolation, the locals highly value Wailau for its hunting and fishing resources. Outsiders, even Hawaiians from other islands, were generally not welcome if they weren't friends with someone who has ties to the valley. My O'ahu fishermen friends told me stories about fishing or picking 'opihi in the area and being yelled at to go home, and sometimes this even involved physical altercations. And the remote location was also the perfect place to conduct certain illegal activities. I heard stories about archaeologists in the 1970s who were met on the Wailau shore by a contingent of locals with shotguns threatening to kill them if they set foot on the

## UH survey blocked, student director says

By KAREN HORTON  
Advertiser Staff Writer

A \$20,000 National Science Foundation project to conduct a biological survey of Wailau Valley on Molokai has been thwarted by community opposition, according to a student project director.

Student project director Lisa Croft said yesterday her group was told to "take your money and go somewhere else."

The group is in an undeveloped location on the Big Island.

Croft singled out Walter Ritte, of the Project Kaho-o-lawe, as threatening possible intervention if the biological and anthropological excavation of the valley originally planned for this summer was carried out.

The members of this project feel that it is deplorable that a single individual with a small group of followers can, with a threat of physical intervention or even violence, thwart a project which has support from many levels of the community.

Croft said.

Ritte retorted that Croft and the project members "started ass-backwards. They got the grant, did the whole trip and then they came to tell us they were coming in. We don't want the valley opened up like a book. With a government grant you've got strings attached."

"Our kupuna tell us the value of the aina (land). There is no scientific value. Only cultural and spiritual value."

A highly disappointed Croft said in a separate interview, "Walter Ritte's lack of information, ignorance and unwillingness to compromise is going to kill the movement. People don't speak their minds when he's around."

Croft described the Wailau Valley on the north coast as "pristine, rich in vegetation, very prime, with excellent stream life. Archaeologically it has some of the most fantastic site complexes."

She stressed that Ritte's attitude could harm the valley in the long run, in that without scientific documentation of plant and animal life, people in power could have their hands turned to development.

"Substantiation is needed because that's what lawmakers listen to," Croft said, "not emotions and feelings. I've been in too many public hearings to believe otherwise."

The grant was received from the National Science Foundation. It was one of 40 approved out of 216 other nationwide proposed projects seeking money.

Croft and several others on the 13-member team traveled to Molokai in April to meet with Dr. Emmett Aluli of Hui Alaloa, a Molokai-based group. She said although their group was greeted "hostilely and suspiciously," after two hours of "emotionally draining" communication, she felt the Molokai people were trusting.

However, major concerns were that the re-

search might be detrimental to the valley, that there had been little community input and that the youth of Molokai had been ignored. A second meeting took place with Ritte and several others and the breakdown occurred. Aluli was not present.

"I thought the group was going in with honest intentions originally," Aluli said yesterday, "but there was always the question of who would get hold of the report. That kind of science doesn't validate our aiaa aiaa."

One source said there was more to the opposition than was being publicly acknowledged.

It was said that the valley is a flourishing locale for marijuana growing by persons who come in on helicopters or land at the shoreline from boats.

One resident said this is cause for tension because of the potential for danger.

Croft said she was particularly hurt that the scientific project was put on the same level as developers by Ritte.

"That really hurt," she said.

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A 1988 newspaper article describes another project slated for Wailau that fell through. This one was going to be a joint project put together by our very own Bion Griffin and Yoshi Sinoto of the Bishop Museum, aimed at comparing Wailau with Papenō'o Valley in Tahiti. In the article, Bion said that Wailau is "probably is full of taro fields, houses and heiau, but no archaeological work has been done there." Pat Kirch commented that the project "brings together the best of French and American approaches." But nothing was ever heard about the project after that. It's unclear why the project never came to fruition, but I'm guessing that community opposition might have played a role.

This took place in the '70s and '80s, but the view that outsiders shouldn't be there is still prevalent today. Not too long ago a woman built this cabin on the east side of the valley and lived there and raised her kids in Wailau. She was accepted by the community and people still speak fondly of her. But in the early 2000s or so she moved out and sold the cabin to a family from Alaska.



In 2005, during the first field season of my dissertation research, the cabin was burned down by arsonists who didn't want foreigners in the valley. Of course not all were agreed that this was the best tactic and many locals were outraged by the violent act. It did serve its purpose, however -the Alaskan family didn't rebuild and the property went up for sale.

I'm going to leave Wailau there for the moment and jump to the Moloka'i Training Program in Kamalo.





## The Moloka'i Archaeological Training Program

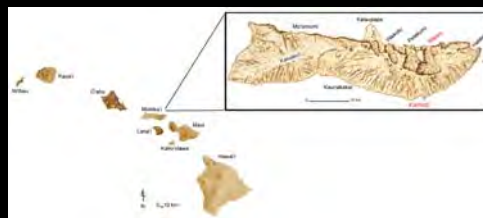
The Moloka'i Training Program was the brainchild of former UH professor Michael Graves and Moloka'i Island Burial Council Chair Malia Akutagawa. The project was co-sponsored by the University of Hawai'i and the Moloka'i Rural Development Project, in collaboration with Kamehameha Schools Bishop Estate and the Society for Moloka'i Archaeology. The objective of the program was to teach basic archaeological methods to local and non-traditional students for possible future employment as archaeological field technicians. The success of this project

demonstrates the value and benefits of establishing archaeological training programs for local students and it had a direct effect on the success of my work in Wailau.

The training project was carried out over three semesters. 1) In Fall 2004, fieldwork was conducted in lower Kamalō, led by Theresa Donham, who is now the State archaeologist for the Big Island. 2) I taught the course the following semester, in Spring 2005, and UH grad student Cy Calugay served as the teaching assistant. That semester consisted of classroom lectures and fieldwork in upper Kamalō. 3) Then in Summer 2005, I offered an advanced archaeological training course in Wailau, which continued fieldwork training in survey and excavation while collecting data for my dissertation. The map pictured here shows the locations of both Kamalō and Wailau on Moloka'i. They're almost directly across from each other on the wet and dry sides of the island.

## Program Overview

- *Fall 2004—fieldwork in lower Kamalo (Theresa Donham)*
- *Spring 2005—classroom lectures and fieldwork in upper Kamalo (Windy McElroy & Cyril Calugay)*
- *Summer 2005—advanced fieldwork in Wailau (Windy McElroy)*



Eight students completed the training in 2004, and enrollment jumped to 17 for the 2005 course, five of them returning from the previous semester. For the advanced course in Wailau, a total of 17 students and volunteers participated, six continuing on from the previous semester. The Wailau work continued through 2007, although 2005 was the only year I ran it as a fieldschool.

This is the Spring 2005 class photo. Not everyone is pictured here, but you can see it was a very diverse group, with a wide range of ages and backgrounds represented. There were a couple teachers, a firefighter, a couple

high school students, a few retirees, a pregnant teenager, and a mother and daughter. For most of the students, it was their first introduction to the subject of archaeology, and all were very enthusiastic; many wanted to continue doing archaeology after the course and several brought family members along to help out on the field days.

The classroom instruction portion of the training project was taught as an outreach course through Maui Community College. Students received college credit for Anthropology 290. High school juniors and seniors were also allowed to enroll for college credit.

The course covered a variety of basic issues confronted by archaeologists, with a focus on those issues that pertain to archaeology in Hawai'i. Lectures were supplemented with lab-work, videos, guest-lecturers, and small-group activities and discussions. Students were required to take two exams, make two presentations, complete in-class assignments, and participate in the field training.

## *Field Methods*

- *Survey*



### **Field Methods**

Some of the field methods that were taught to students included:

- survey

- GPS

## *Field Methods*

- *Survey*
- *GPS*



## *Field Methods*

- *Survey*
- *GPS*
- *Field photography*



- field photography



## Field Methods

- Survey
- GPS
- Field photography
- Tape and compass mapping



- tape and compass mapping (2004)

- plane table and alidade mapping (2005)

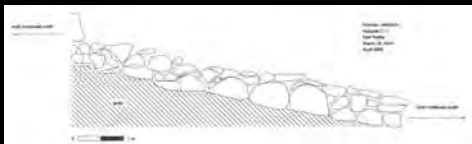
## Field Methods

- Survey
- GPS
- Field photography
- Tape and compass mapping
- Plane table and alidade mapping



## Field Methods

- Wall profiling



- wall profiling

- cross-section drawing (Wailau advanced course)

## Field Methods

- Wall profiling
- Cross-section drawing



## Field Methods

- Wall profiling
- Cross-section drawing
- Excavation



- excavation (Wailau advanced course)

## Kamalo Results

I'm going to briefly go over the results of the Kamalō fieldwork and then jump back to Wailau.

The 2004 work took place in lower Kamalō, while the 2005 session focused on a portion of upper Kamalō.



## Lower Kamalo Fieldwork

- 10 features documented
- multiple component
- agricultural complex



The fall 2004 class relocated and documented a site complex previously identified by Ross Cordy. Theresa and the students found that the complex was larger than originally defined, and they were able to map additional features in detail. They also determined that it was not a habitation complex, as previously believed, but rather an agricultural complex with terraces and walls constructed to form an integrated agricultural area next to the stream. One small habitation shelter was also identified, and this contained surface artifacts and midden.

This is a photo of the SW side of the complex, showing one of the C-shapes. Three hammerstones, a whetstone, and a basalt core were found in the vicinity.

## C-Shape

- SW corner of complex
- 3 hammerstones,
- 1 whetstone, and
- 1 basalt core found in the vicinity





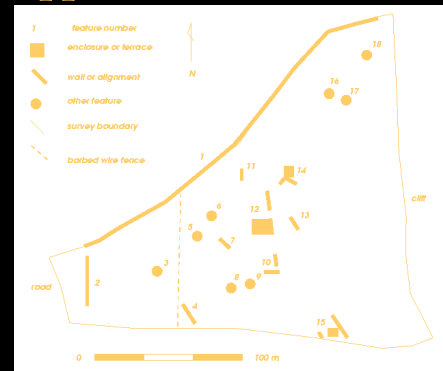
## Main Wall



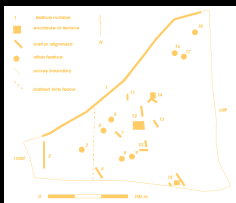
This is a profile portion of the most prominent feature of the complex. It is an L-shaped wall whose total length is 131 m and rises to more than a meter in height. In sum, 10 features of the site were examined during the 2004 phase of fieldwork. Many of these consisted of multiple components, and additional features of the site remain undocumented.

In Spring 2005, we surveyed a roughly 18,000 sq meter area where no work was done previously. We documented 18 features, ranging from simple stone clearing mounds to complex religious structures. There were five stone walls, one with a petroglyph at its base, one terrace, two stone mounds, a boulder alignment, a modified bedrock outcrop, and six multiple-component features. All features were measured, photographed, described, and mapped by GPS, and four were mapped in detail. This was the map that was generated from the GPS data.

## Upper Kamalo Fieldwork

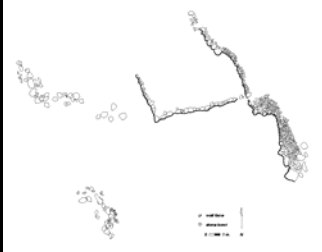


## Kamehameha Wall



The long prominent wall along the upper boundary of the site is known as the Kamehameha Wall. It was built by Kamehameha V to control cattle and is said to extend all the way to Kawela. It is uncertain whether or not the other features are associated with this wall.

## Multi-Component Feature



Medicine bowl?

This is a map of one of the multiple component features. It has a substantial wall here and branching off of it are two smaller wall segments. A stone bowl was found on one of the smaller wall segments. This bowl might have been used for medicinal purposes and may be related to the function of this feature.

This is another of the mapped complexes. It consists of an enclosure and a long wall extension. Several pyramidal uprights, possible cupboards, and adze blanks are among the artifacts and features found. Midden was also observed.

## Multi-Component Feature



-artifacts and features found include pyramidal uprights, possible cupboards, and adze blanks



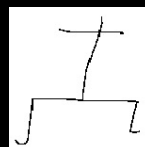
## C-shaped Structure



This is one of the C-shapes in Feature 5 after clearing, which revealed an embedded upright on the south end. A lot of vegetation clearing had to be completed before any of these maps could be drawn. One of the students organized a team, which was hired by the Moloka'i Rural Development Project, to clear outside of class so that we wouldn't lose too much field time to it.

These are sketches of the two petroglyphs found in the survey area. The first was found on a boulder at the base of the Kamehameha Wall, and the second was found on a natural boulder a little down slope from the wall.

## Petroglyphs





## Upper Kamalo Fieldwork Summary

- 18 archaeological features
- Likely multiple activities: cattle ranching, water management/agriculture, habitation and tool-making, and ritual
- Not all features contemporaneous
- Kamehameha Wall post-dates other features

In sum, 18 archaeological features were found in the survey area, and many of these consist of multiple components. It is likely that multiple activities took place at the site, including cattle ranching, water management/agriculture, habitation, tool making, and ritual. It's not likely that all features are contemporaneous. The Kamehameha Wall is thought to have been constructed and/or used during the historic era and may post-date the surrounding features, which are consistent with traditional Hawaiian architecture.

### The Wailau Archaeological Research Project

The students were all very much interested in participating in the Wailau portion of the project. As Moloka'i residents, they were all well connected on the island and helped me get in touch with the appropriate people I should talk to before working there. There are a few main families who are still tied to Wailau, and I hired some of them as boat drivers for the project and welcomed the family members to participate in the archaeological work. The students that were not physically able to come to Wailau volunteered to help with logistics, picking up equipment that was shipped over, storing things at their houses, and shuttling people over the hour and a half drive from the airport to the boat dock in Hālawā. It was truly a group effort, and I couldn't have done the work without the generous support of the Moloka'i community.



So the Wailau portion of the project was much more logistically challenging than the Kamalo fieldwork. We took the students in by boat, but even during the summer, the sea is so rough that you can't land in Wailau. That meant waterproofing all the equipment and food and swimming everything in. We set up our camp near the confluence of the 2 streams, and this is also very close to the ocean which would be off to the right in the photo.



We built our kitchen and lounge area from scratch, so we cut down bamboo, tied them together to make a frame, put tarps over it, and anchor it down with stones.

This is the finished kitchen from our 2005 season.



There's no electricity or running water in the valley – our only power source was a set of solar panels we used to charge the GPS units.

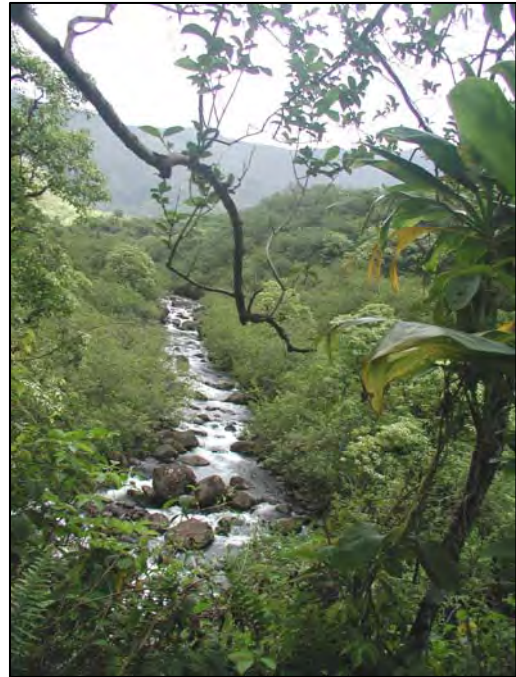
We get our drinking water from a spring, bathe in the river,







and wash dishes & laundry in the river.



We use all biodegradable soaps so we don't disturb the delicate stream ecosystem that includes *hihiwai* & *o'opu* found in abundance. We also use only biodegradable flagging tape, so we don't leave any rubbish behind.

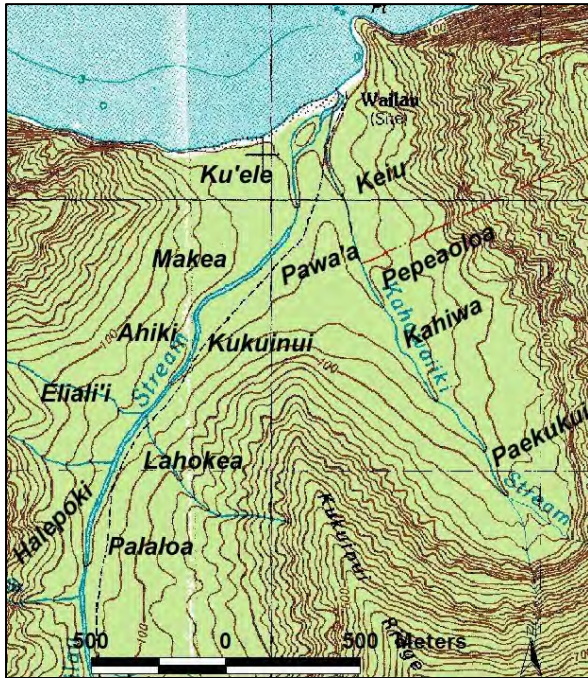


There is one family that lives in Wailau permanently. Their place is about 1.5 km inland & they've reinstated the old *lo'i* on their land.



We were fortunate enough to work on their property & it was really nice because they already did the vegetation clearance, which made it easier to map, compared to the other *lo'i* systems, that are severely overgrown with bamboo, *hau*, or *clidemia*.

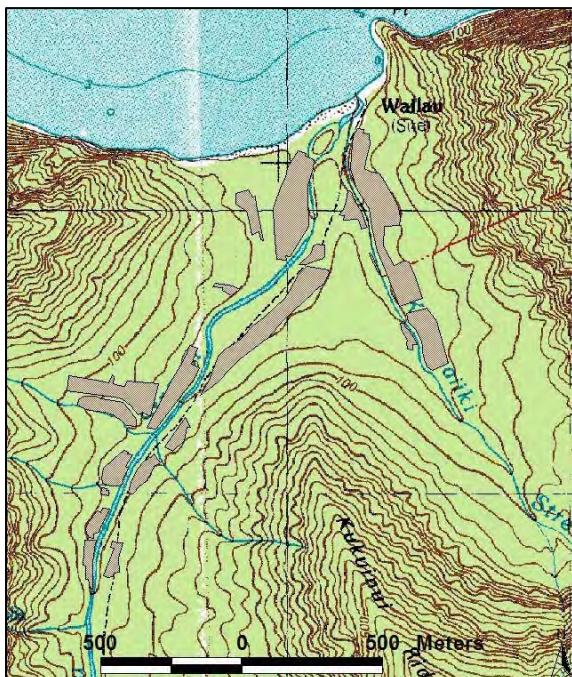
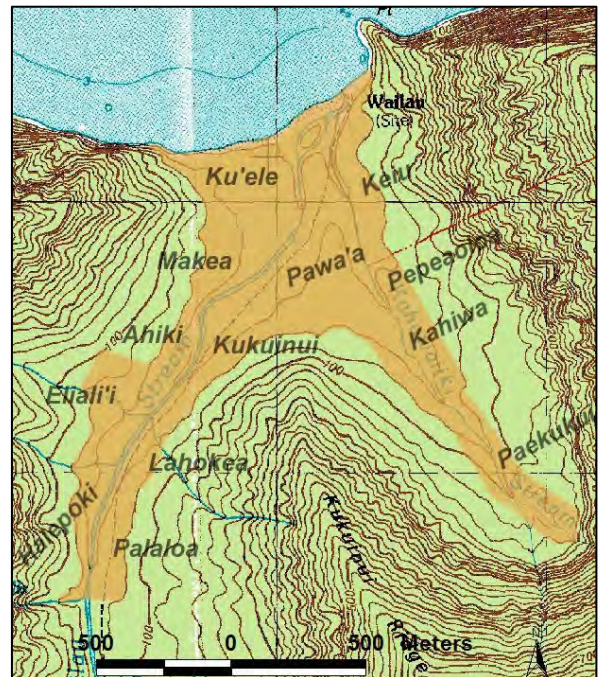




I'm going to get into the Wailau results in a little more detail, since it was a pretty complicated project, and I want to show you what the students and I were able to accomplish.

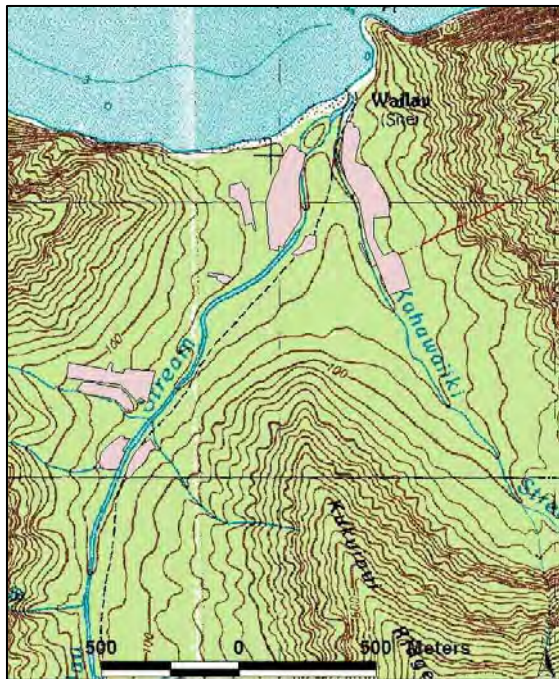
For the Wailau fieldwork we did reconnaissance, intensive survey, mapping, and excavation. We used the traditional place names for our survey areas, and those are the names you see here.

For the reconnaissance, I wanted to get a general idea of where the *lo'i* systems were located throughout the valley, so we did a quick walk through of pretty much the entire valley to about 2.5 km inland, and that's the brown area you see here.



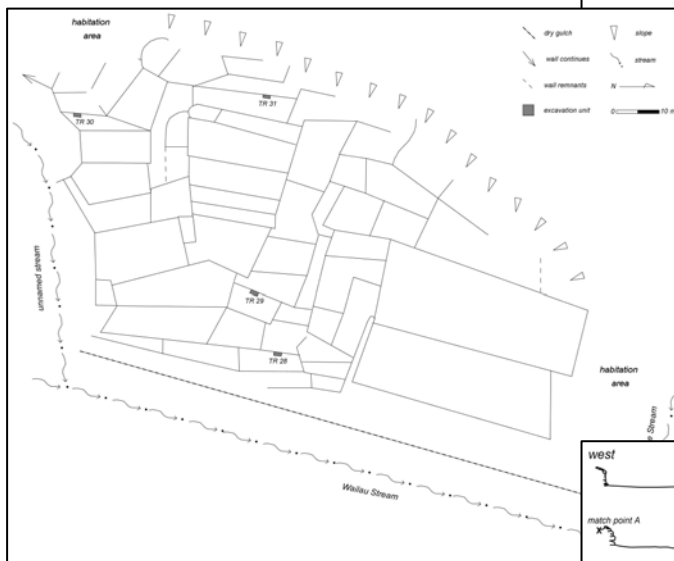
What we found is that there are *lo'i* just about everywhere & they continued farther inland along Wailau Stream as well. We were able to get GPS points for all the *lo'i* systems we found on the recon, and that's what these 19 polygons are.





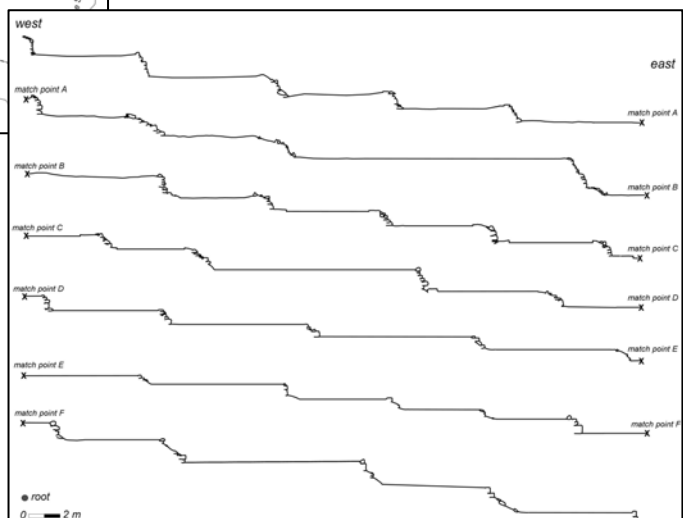
-plane table and alidade map

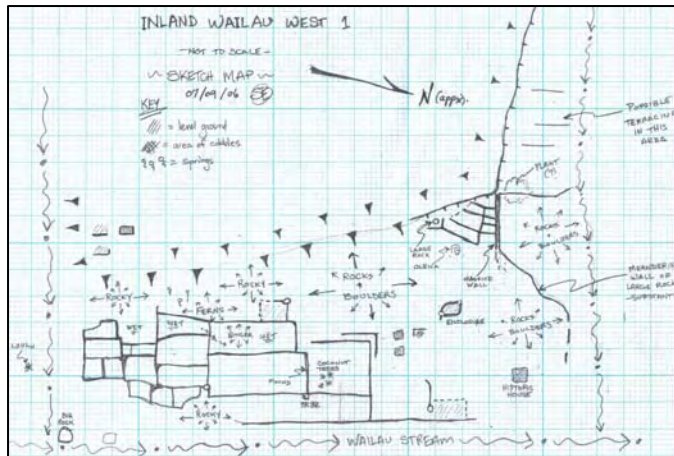
I selected these 10 *lo'i* systems for intensive survey. For these we did either plane table and alidade mapping or tape and compass line maps. These are some examples of our maps.



-tape and compass line map

-cross-section map





For the *lo'i* that were not selected for intensive survey we did rough sketch maps, like this one drawn by Steven Eminger.

## Research Design

For my research design, I asked 2 basic questions: What is the sequence of development of the irrigated agricultural systems in Wailau Valley; and What factors were important in choosing locations for the earliest systems. There are two general models for wetland agricultural development in Hawai'i, and I wanted to see if either model was applicable to Wailau. The models involve factors of effort, risk, and production output,

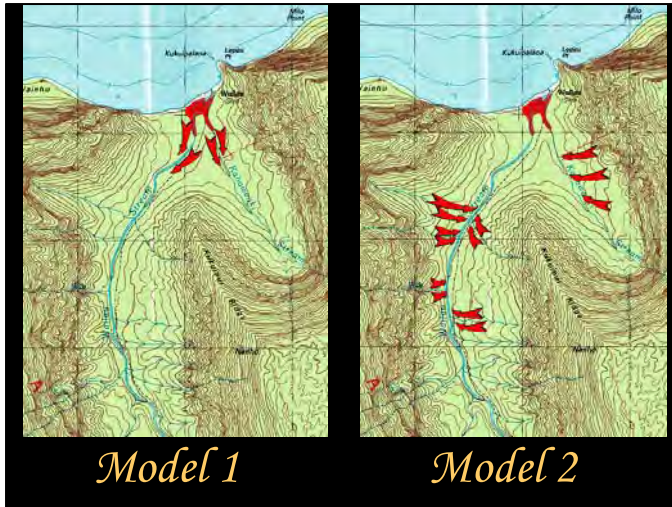


## Research Design

- *What is the sequence of development for lo'i systems?*
- *What factors were important in choosing locations for the earliest systems?*
- *Two models of agricultural development*
  - *effort*
  - *risk*
  - *production output*

and both start with the earliest fields near the coast, where marine resources can be easily exploited, and where fields can be constructed in naturally-occurring low, wet spots with minimal effort.





From there, the first model sees expansion starting along the main streams where the largest areas would be next developed. Agricultural complexes on the large flats along the main streams would be more difficult to build and maintain because of their size, and they would also be more risky, because of the danger of flooding. The returns, however, are equally large.

The second model sees the earliest expansion out of the valley bottom, along side drainages and shorter watercourses. Fields would be smaller here, easier to maintain, and less subject to flooding. These systems on the

slopes would require the least effort to build and maintain and involve lower risk, but output would be less than larger fields near the main streams.

So, in short, this study will determine if fields were extended directly inland from the coast to optimize production despite increasing effort and greater risk; or if farmers first extended their fields to the valley slopes, which involved less risk and effort to construct and maintain terrace systems but produced lower crop yields.

## Excavation

A total of 66 test units were excavated throughout the valley. They were generally small units, 1 x 1 m in area and smaller.

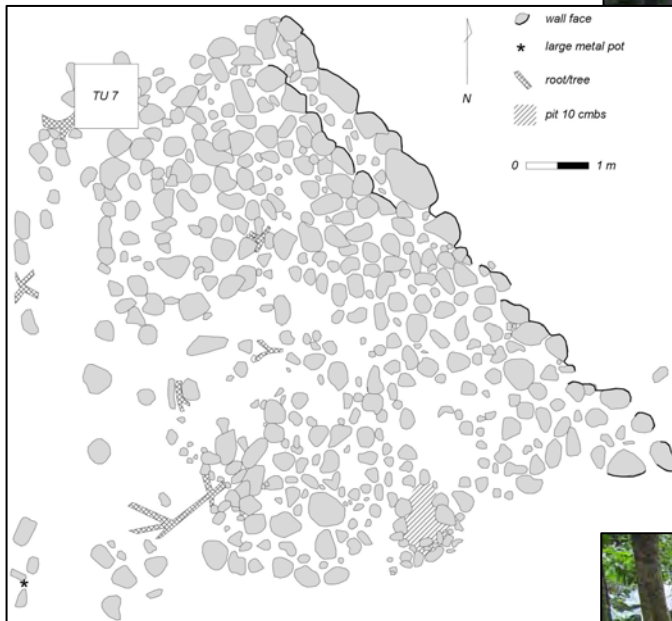


The emphasis was clearly on the *lo'i*, with 60 units placed along *lo'i* terrace walls.



two units at hearths that we identified on the surface,

two units at possible habitation structures, like this enclosure,



one at this historic house platform,



and one just outside a *heiau*.



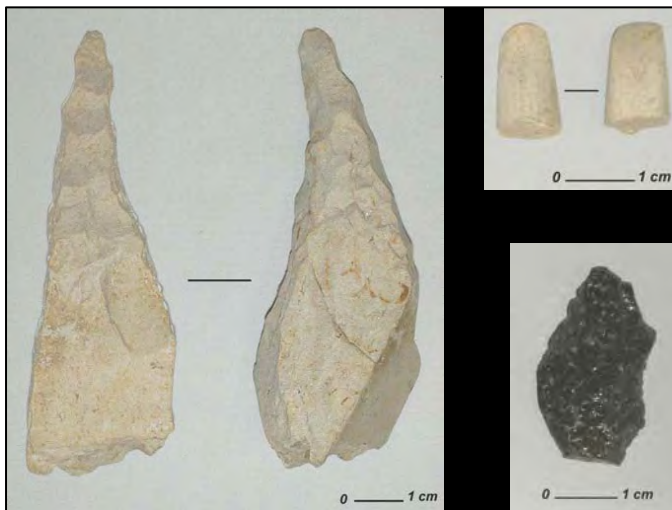
## Laboratory Analysis



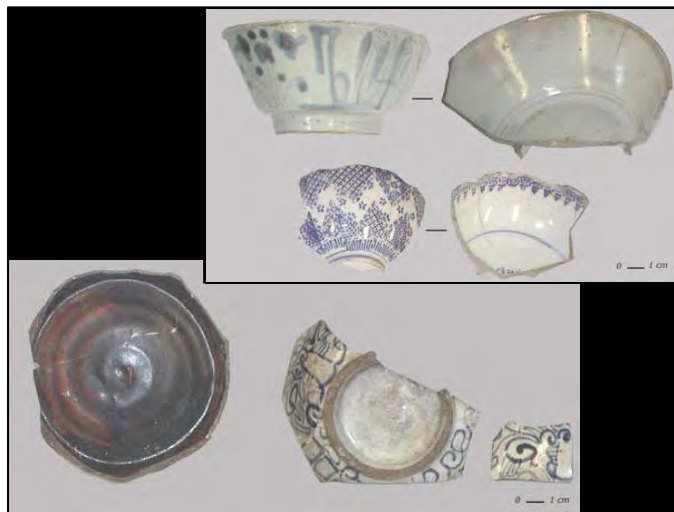
## Laboratory

We recovered a variety of artifacts, including lots of basalt flakes,

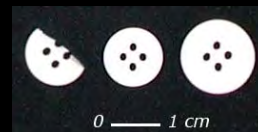
an adze and adze blanks;



an awl that was fashioned out of a broken adze, the tip of a basalt chisel, volcanic glass flakes,



and all kinds of historic items, such as Chinese and Japanese ceramics,



buttons and bottles,



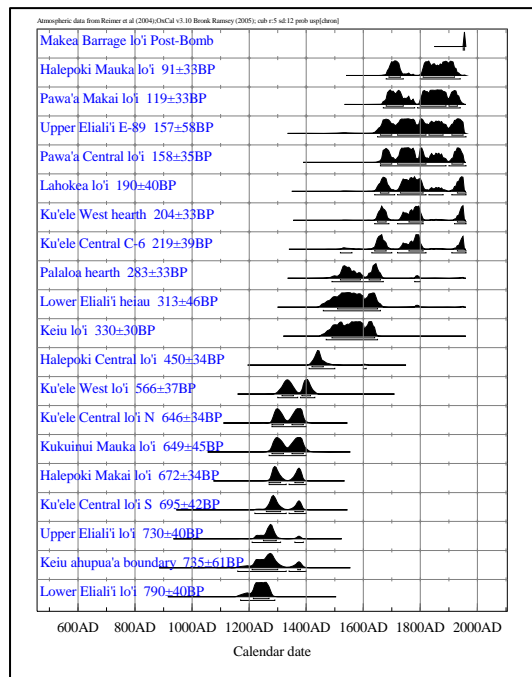
a metal horse bit, an engraved brass doorknob, and pieces of a slate chalkboard. Most of the historic items dated from about 1870 to 1920.

We recovered charcoal from almost every excavation unit and I had 41 samples taxonomically identified. It turned out to be a very diverse charcoal assemblage, with 31 taxa represented. 15 were native, 5 were Polynesian introductions, 2 were historic introductions, 3 could have been either native or introduced, and 6 were unidentified. This table is ordered with the most frequently occurring taxa at the top, so the most common were *kōpiko* and *kukui*, which were each found in 14 samples, and everything from 'a'ali'i down were only found in a single sample. Most charcoal was from native

Taxa	Common Name	Origin
<i>cf. Psychotria</i> sp.	<i>Kopiko</i>	Native
<i>cf. Aleurites moluccana</i>	<i>Kukui</i>	Polynesian Introduction
<i>cf. M. polymorpha</i>	' <i>Ohī'a lehua</i>	Native
<i>cf. C. trigynum</i>	' <i>Olapa</i>	Native
<i>cf. Bobea</i> sp.	' <i>Ahakea</i>	Native
<i>cf. O. anthyllidifolia</i>	' <i>Ulei</i>	Native
<i>cf. Antidesma pulvinatum</i>	<i>Hame</i>	Native
<i>cf. Pittosporum</i> sp.	<i>Hō'awa</i>	Native
<i>Diospyros sandwicensis</i>	<i>Lama</i>	Native
<i>Syzygium</i> sp.	<i>Java Plum, etc.</i>	Native + Introductions
<i>Chamaesyce</i> sp.	' <i>Akoko</i>	Native
<i>cf. sandwicensis</i>	<i>Olomea</i>	Native
<i>cf. Rauvolfia sandwicensis</i>	<i>Hao</i>	Native
<i>cf. Dodonaea viscosa</i>	' <i>A'ali'i</i>	Native
<i>cf. Ochrosia compta</i>	<i>Holei</i>	Native
<i>cf. Scaevola</i> sp.	<i>Naupaka</i>	Native
<i>Sida fallax</i>	' <i>Ilima</i>	Native
<i>cf. Antocarpus altilis</i>	' <i>Ulu</i>	Polynesian Introduction
<i>Cordyline fruticosa</i>	<i>Ti leaf, Ki</i>	Polynesian Introduction
<i>cf. Cocos nucifera</i>	<i>Coconut, niu</i>	Polynesian Introduction
<i>cf. Calophyllum inophyllum</i>	<i>Kamani</i>	Polynesian Introduction
<i>cf. Hibiscus</i> sp.	<i>Hibiscus</i>	Native + Introductions
<i>cf. Senna</i> sp.	<i>Kolomona</i>	Native + Introductions
<i>cf. Rhizophora mangle</i>	<i>Mangrove</i>	Historic Introduction
<i>Pinacea</i>	<i>Pine</i>	Historic Introduction

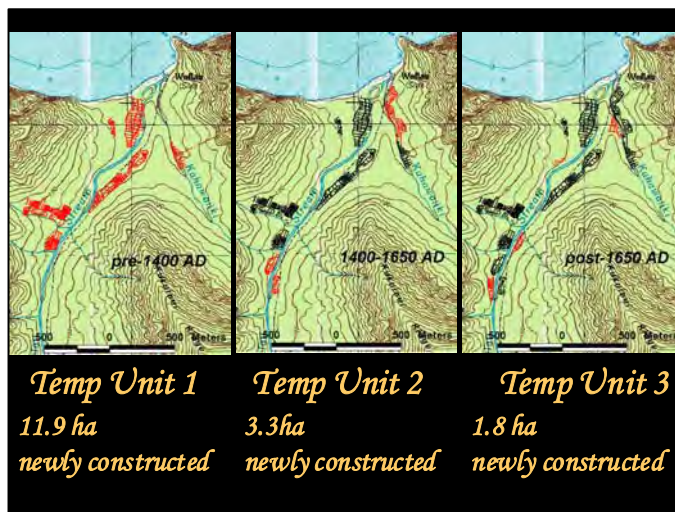


taxa, and this is consistent with burning to clear the native forest before cultivation. The Polynesian introductions were mostly from the hearths, which dated to a little bit later in time, when the large *lo'i* systems were already established.



The dates for the agricultural systems fall into three temporal units: the earliest is before AD 1400, the next is from AD 1400-1650, and the most recent is after AD 1650. These maps show the field complexes that would have been present in the valley during each time period. The systems in red are the new ones that were constructed during that temporal unit, with the values at the bottom showing their area. Clearly, the largest area of *lo'i* was constructed early on, relative to later expansion.

I got 19 AMS RC dates for the valley, and they range from 790 BP, or about AD 1200, to modern. So the earliest dates are at the bottom and they get more and more recent toward the top. Aside from the *lo'i* systems, I dated several non-agricultural features, including two hearths, a habitation terrace near the coast, one of three ceremonial sites recorded for the valley, and the *ahupua'a* boundary wall.



## Lo'i Attributes

- number of terraces
- number of irrigation ditches
- total area
- slope
- water source
- elevation

## Lo'i Attributes

To test which model of agricultural development applies to Wailau, the first thing I did was to look at these attributes for the different *lo'i* systems: number of terraces, number of irrigation ditches, total area of a complex, the slope of the land that the system is on, water source, and elevation.

## *Agricultural Development*

*Effort*

*Risk*

*Production Output*

Effort refers to the amount of labor it takes to build and maintain a field. Effort is reflected by the size of a *lo'i* complex, the number of terraces within the complex, and slope of the system. Based on the values for these attributes, I devised two categories for effort: *High* and *Low*. 7 of the 19 complexes were classified as *High*, and 12 were *Low*.

## **Agricultural Development in Wailau**

Effort, risk, and production output are the critical factors in the two models of agricultural development. The models link these 3 factors together, with the complexes requiring the greatest effort and involving the most risk also producing the most output.

## *Agricultural Development*

*Effort:*

*amount of labor to build/maintain fields*

- *size*
- *number of terraces*
- *slope*

*High Effort: 7 complexes*

*Low Effort: 12 complexes*

## *Agricultural Development*

*Risk: likelihood of crop failure/low production*

- *water source*
- *elevation*

*High Risk: 10 complexes*

*Low Risk: 9 complexes*

Risk refers to the likelihood of crop failure or lower than expected production at different locales. Flooding is the greatest risk for irrigated agriculture in a wet valley such as Wailau, and this is directly affected by water source and elevation. Complexes fed by a side stream would be less prone to flooding than those watered by a main stream, while those located at lower elevations would be more subject to flooding than those at higher elevations. Two categories of risk were

generated: *High* and *Low*, based on values for water source and elevation. 10 of the complexes were classified as *High* risk, and 9 were *Low*.

Production output refers to the amount of taro a complex can potentially yield. Number of irrigation ditches and total area affect crop yields, and were therefore used as indicators of production output. Two categories of output were generated: *High* and *Low*, with 9

## *Agricultural Development*

*Production Output:*

*amount of taro a complex can potentially yield*

- *number of irrigation ditches*
- *total area*

*High Output: 9 complexes*

*Low Output: 10 complexes*



	<i>High</i> <i>Output</i>	<i>Low</i> <i>Output</i>
<i>High</i> <i>Effort</i>	6	1
<i>Low</i> <i>Effort</i>	3	9

complexes falling into the *High* yield group, and 10 classified as *Low*.

Effort was related to production output, with more *High* effort complexes categorized as *High* output, and more *Low* effort complexes falling into the *Low* output group. So large amounts of effort were invested in fields that could produce high yields.

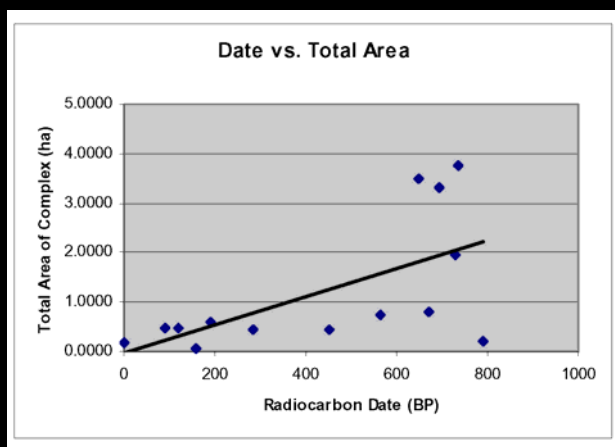
Effort and production output showed the strongest relationship with the temporal units, with all of the dated *High* effort complexes falling within Temporal Unit 1, and all but one of the dated *Low* effort complexes falling within Temporal Units 2 or 3. Thus, the most

effort was expended on the earliest systems, and less effort was invested in the complexes that were constructed later in time.

The temporal units are also clearly related to production output, with the *High* output complexes occurring earlier in time than those offering *Low* output. Note that the high yielding complexes were not necessarily built out completely during the first temporal unit in which they were established. Nevertheless, farmers were clearly assessing the likelihood of expansion of the terrace systems when they first selected areas for cultivation.

	<i>Temp</i> <i>Unit 1</i>	<i>Temp</i> <i>Unit 2</i>	<i>Temp</i> <i>Unit 3</i>
<i>High</i> <i>Effort</i>	6	0	0
<i>Low</i> <i>Effort</i>	1	2	5

	<i>Temp</i> <i>Unit 1</i>	<i>Temp</i> <i>Unit 2</i>	<i>Temp</i> <i>Unit 3</i>
<i>High</i> <i>Output</i>	6	0	1
<i>Low</i> <i>Output</i>	1	2	4



The raw data shows that total area corresponds well with the radiocarbon dates, with the largest field systems constructed early in time.

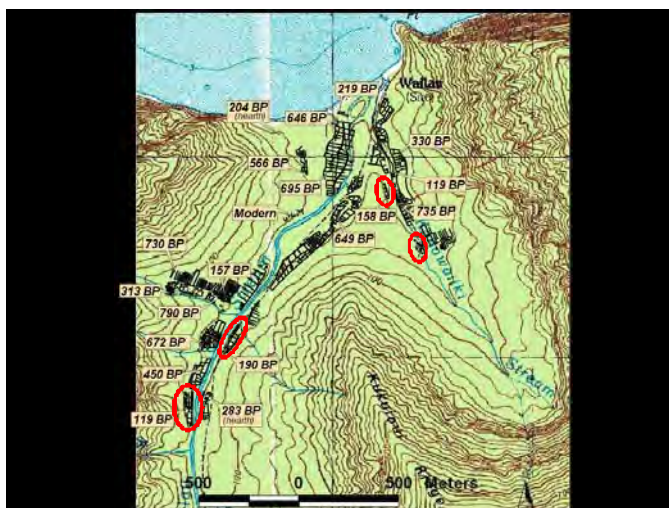
This analysis strongly suggests a pattern of agricultural development in which production output was a major consideration in initial *lo'i* construction, and large amounts of effort were invested in field systems that could produce high yields.



So to recap the Wailau results, the goal of this study was to evaluate two models of agricultural development: one in which fields were extended directly inland from the coast to optimize production despite increasing effort and greater risk, and another contending that farmers first extended their fields to the valley slopes, which involved less risk and effort to construct and maintain terrace systems but produced lower crop yields.

Effort and production output were determined to be the critical factors in the timing of *lo'i* construction in Wailau, which is consistent with the first model, although agricultural development was not as simple as the two models suggest.

The high output systems were not all found on the valley bottoms as originally assumed. They were found throughout the valley – in the lowlands along the main streams, inland along the main streams, and on the valley slopes watered by secondary drainages. Farmers first took advantage of any area capable of supporting a high producing *lo'i* system, regardless of risks of flooding or the amount of effort needed to construct a system or transport products to the coast.



After these large, high-yielding complexes were established, smaller *lo'i* systems were built, until every cultivable tract of land was under production. These small complexes are good examples, in which a tiny bit of flat land along a stream was converted into a *lo'i* system late in time.





series was designed to supplement the 7<sup>th</sup> grade science curriculum for public schools here in Hawai'i so it was shown in schools throughout the state as well as for the public on PBS.

## Conclusion

In all I think that my success with this project had a lot to do with the support I had from the Moloka'i community. I was not greeted on the shore with shotguns like my predecessors of the 1970s. In fact, most of the people I came across were overly kind and helpful once I spent some time explaining who I was and what I was doing there. As a small community, they all had heard of the training program that took place in Kamalō the semester before and knew or were related to some of the students. I didn't know it at the time, but the investment I made to teach that class for just one semester made all the difference in being able to complete my dissertation research. But the success of the program went far beyond that.



In addition to the amount of archaeological documentation recorded by the students, other accomplishments are notable.

The program provided an opportunity for collaboration between the Moloka'i Rural Development Project, Maui Community College, the University of Hawai'i at Mānoa, Kamehameha Schools Bishop Estate, and the Society for Moloka'i Archaeology. Since this pilot program on Moloka'i began, other islands are now interested in starting similar projects.

The program also offered the opportunity to earn college credit for those who would not normally attend college and experience a college-level course, especially in a field that attracts high levels of interest in the community.

Most significantly, the program prepared students for entry-level archaeological jobs and future careers in the archaeological field. Students worked on a wide range of archaeological features from simple to complex and experienced working conditions of different environments, from dry Kamalō to wet Wailau. I believe that they are prepared for many situations they would typically encounter as an archaeological field technician in Hawai‘i.

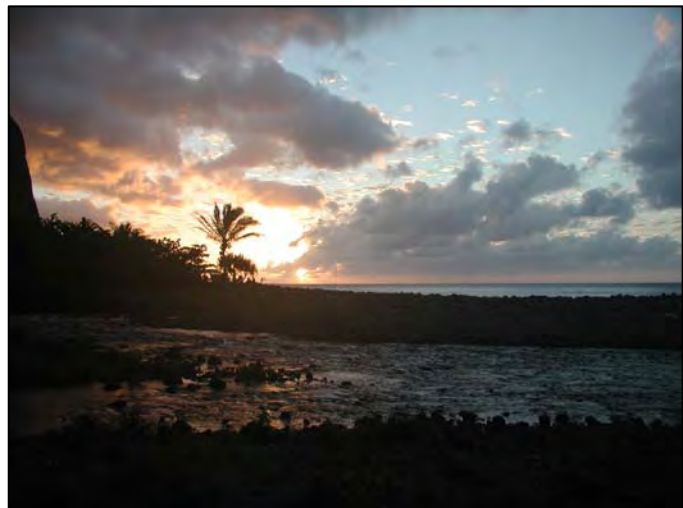


After completing courses in the program, students were hired by the National Park Service and several private archaeological firms, such as T.S. Dye & Colleagues, Akahele, SCS, and Garcia and Associates. Several students continue to work in the field and two were inspired to enroll in degree programs at the university. One has co-authored several publications with me on Moloka‘i archaeology. So involving the community is a win-win situation for everyone. I was able to get my research done, and community members were able to learn more about archaeology and receive training that led to employment opportunities.

Personally, the Molokai work was a really rewarding experience for me. I have always been a strong advocate for hiring local archaeologists, and through these projects we were able to train people who would normally not have the opportunity to learn how to do archaeology. I’m continuing this trajectory, with two projects in particular. The first is a collaboration between the UH Mānoa Applied Anthropology Program and Kamehameha Schools, where Dr. Bayman and I will be teaching a field school on the North Shore of O‘ahu. The class is designed for local and non-traditional students and will be taught on Saturdays so that people who have to work during the week will be able to participate.

The second project is a partnership between UH Hilo, Kamehameha Schools, and Garcia and Associates and will be run through the Hawaii Internship Program, with Kelley Uyeoka taking the lead. For this project we will be training Native Hawaiian Students during an archaeological inventory survey of Ahu a ‘Umi Heiau in the Saddle region of the Big Island. Each student will have their own research project, depending on what their specific interests are, and they’ll present the results of their research at the end of the program. So they’ll help me to complete my inventory survey and gain technical and research skills at the same time.

So hopefully I’ve been able to convey the rewards of working closely with the community during archaeological research. It





really benefits everyone, and I'm hoping that the Molokai work will inspire others to embark on similar kinds of programs.



For more information on the projects I talked about or to download my dissertation and any publications, news clips, and video associated with these projects, please visit my website at [RKealaG.com](http://RKealaG.com).