

Archaeological Investigations of Keokea Beach Park
(TMK 5-3-01:16),
Niuli‘i *Ahupua‘a*, District of Kohala, Hawai‘i Island

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Chapter 1: Introduction

The site of Niuli‘i Stream, located within the boundaries of Keokea Beach Park in the *ahupua‘a* of Niuli‘i, was investigated in June of 2006 as part of the Hawai‘i Archaeological Research Program (HARP). Under the direction of Dr. Michael Graves and Julie Field (University of Hawai‘i Manoa), the 2006 season incorporated an archaeological field school, which was attended by a class of 18 undergraduate students. This field school was partially funded by the National Science Foundation, and was focused on the education of students in archaeological field methods, and also the investigation of human-environmental interaction in the windward portion of the district of Kohala. The purpose of the field work was to document the site’s archaeological features, and sample the associated sediments for datable (e.g., radiocarbon) organic materials. Samples of sediment from the site were also collected and may be analyzed at a future date by Peter Vitousek (Stanford) for relative nutrient content.

Fieldwork was carried out between June 19th and July 7th. Global position system (GPS) mapping was used to determine the geographic coordinates of the site. Agricultural features were cleared and mapped in detail with a total station, autolevel, and with tape and compass. Two features were selected for subsurface testing, and three excavation units were completed. Small amounts of wood charcoal were recovered and will be submitted for radiocarbon analysis in the future. An assortment of other artifacts were also recovered, consisting primarily of historic glass and metal nails, and fragments of volcanic glass.

The following section provides a brief description of the physical environment of Niuli‘i *ahupua‘a* and the Niuli‘i Stream locale. Historic data collected from several published work are included. This is followed by a summary of the field methods utilized during the course of the investigation. In the second chapter, a detailed overview of the excavations performed at the site is presented, along with the results of laboratory analyses. The final results and also the significance of the site are assessed in Chapter 3.

Background

Keokea Beach Park is located in the *ahupua‘a* of Niuli‘i, on the windward side of the District of Kohala, Hawai‘i Island (Figure 1). The park is connected to Rte 270 via a short road, which passes through the historic neighborhood of Niuli‘i, site of the 20th century Niuli‘i Sugar Mill. The parcel is listed in tax map keys as TMK 5-3-01:16, and it is located at 213093 Easting, and 2238932 Northing. The sites that were the subject of this study lie on both sides of Niuli‘i Stream, and follow the stream from the southern property boundary of the park to the mouth of the stream where it reaches Keokea Bay. A large *heiau*, Kuapalaha lies to the west of park atop a hill top, and the features of this site about the agricultural features within Keokea Beach Park. The bulk of Keokea Beach Park consists of a parking lot, small beach front, two picnicking pavilions, and a small swimming area protected by a riprap jetty. An improved bathroom and septic system were under construction in June of 2006. Keokea Beach Park is regularly used by the local community for picnicking, swimming, fishing, and surfing. The agricultural features located within the park are also visited by the local community, as they lie along the path to the *heiau*, and also along the path to nearby Kapanāia Bay.

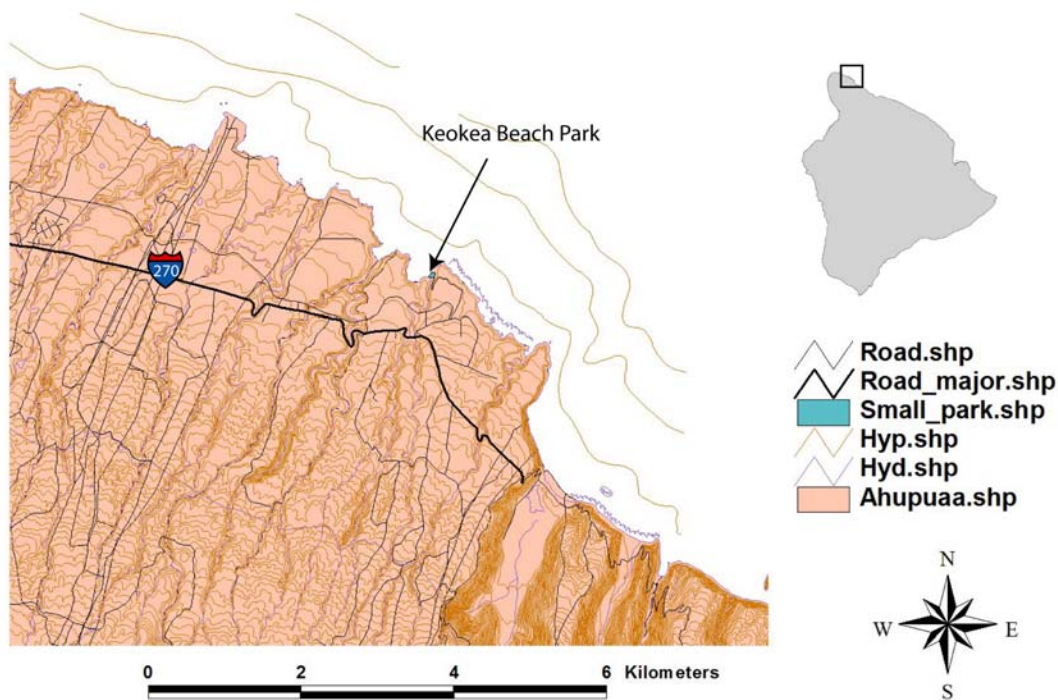


Figure 1. Map of Niuli'i region and location of Keokea Beach Park

Physical Region

The *ahupua'a* of Niuli'i is located on the windward side of the District of Kohala, located on the northernmost tip of Hawai'i Island. It abuts the *ahupua'a* of Makapala and Waiapuka, and together they encompass approximately 4129 square km, and running from the coastline to approximately 7 km into the interior. The *ahupua'a* of Makapala borders the area to the north and west, and the *ahupua'a* of Waiapuka lies to the south and east.

The area receives a significant amount of rain during the year, averaging around 59.46 inches at the coast, and 200 inches near Kahena in the Kohala Mountain range. In general, the bulk of the rain falls between November and March, and Niuli'i Stream serves as the major drainage for the *ahupua'a*. The topography of the region consists of gentle slopes and deeply incised gulches, with a coastline of high headlands, rocky points, and cobble-lined embayments. The oldest geological strata on Hawai'i Island, the Hawi and the Pololu formation, underlie the sedimentary deposits of the area.

Prior to Polynesian colonization, the landscape supported an endemic and indigenous mesic forest of *ohi'a* (*Metrosideros polymorpha*), *hala* (*Pandanus tectorius*), *hau* (*Hibiscus tiliaceus*) and *kukui* (*Aleurites moluccana*). Today, exotic vegetation predominates on all land forms. This includes ironwood (*Casuarina equisetifolia*), guava

(*Psidium guajava*), lantana (*Lantana camara*) and a variety of herbaceous climbing plants. In the historic period all of the open mauka region had been used for sugarcane cultivation, and native stands were largely extirpated. Isolated populations of these plants survived in the gulches. Other cultivated plants and trees such as breadfruit (*Artocarpus altilis*), mango (*Mangifera indica*), ti (*Cordyline fruticosa*), and *awapuhi* ginger (*Zingiber zerumbet*) were retained in association with gardens and house sites.

Oral History

Deep in the oral histories for the area, Pololu Valley was known to have been the residence of the gods Papa and Wakea (Tomonari-Tuggle 1988). Later accounts collected by Fornander (Fornander 1916-1920) indicate that the district of Kohala unified following a series of battles led by the chief of Niuli'i. Tomonari Tuggle suggests that this victory is representative of the dominance of the southern region of windward Kohala, encompassing the areas south of Wainaiia gulch, to Awini Valley, which lies to the south of Niuli'i *ahupua'a* (Tomonari-Tuggle 1988).

However, as the home district of Kamehameha the Great, the district of Kohala is best known for its earliest historic period. Oral traditions dating to this period describe his birth, upbringing, and later rise to power. Kamehameha was born near the northernmost point of the Kohala District, at the site of Kokoiki. During his childhood he lived in the valley of Awini. However, as a young man Kamehameha lived in the nearby district of Halawa, and was known to frequent the nearby beach at Kapanaiia to enjoy surfing and swimming (Kamakau 1991).

Land Use

The Kohala district was prosperous and densely populated in prehistory. Like much of Hawai'i, the population was dispersed across the landscape into small villages, and subsistence was based upon the cultivation of *kalo* (*Colocasia esculenta*) and *u'ala* (*Ipomoea batatas*) (taro and sweet potato), the gathering of native and introduced tree crops such as papaya (*Carica papaya*), bananas (*Musa sp.*), *ohi'a'ai* (*Syzygium malaccense*) (mountain apple), and fishing. In Kohala, farmers produced large amounts of *kalo* in the gulches, and also atop some of the ridge tops. In his visit through the area in the early 1800's, Ellis described the windward side of Kohala as 'kept in good order, and well stocked with potatoes and other vegetables' (Ellis 1969).

The introduction of European diseases in the 18th century resulted in a massive population decline in the Hawaiian Islands, including the windward portion of the Kohala District. A missionary census in 1832 recorded 8,014 individuals living in the area, and this number dropped to 6,175 over the next 3 years (Tomonari-Tuggle 1988). Populations were further dispersed following the land redistribution of the Great Mahele in the 1850s.

The cultivation of sugar cane in the region began with the creation of the Kohala Sugar Company in 1863. This company emerged under the influence of Euroamerican settlers in the region, in particular Rev. Elias Bond and James Wight. The first mill opened in the vicinity of Halaula, and a few years later a second mill was opened in Halawa. In 1876, Niuli'i Mill was opened near the study site, and began processing cane

from the local area. Local records indicate that much of the land was owned by native Hawaiians, but over time landowners became indebted to the mill owner, Judge C. F. Hart, and sold their land to pay off their debts (Stephenson 1977). Subsistence farming continued in small garden patches in the gulches, but all of the larger agricultural systems for the production of *kalo* and *u'ala* were abandoned and transformed into cane field by the late 1880s.

The need for workers fueled the influx of migrants to the region during the late 1800s and early 1900s. Workers from Japan, China, Okinawa, Korea, and Portugal settled in the area, and were stationed in small camps on the plantation. The Niuli-Makapala area contained eight camps within the vicinity of the mill (Stephenson 1977). In 1906 the construction of the Kohala Ditch transferred water from Pololu Valley to Hawi, and also cut off the water from the intervening gulches. Additional camps were started in the region to tend the ditch. A railroad was also constructed that transferred the sugar from Niuli'i Mill to the port at Mahukona. For most of the inhabitants of Kohala, life centered around work at the mill or in the fields, with all goods bought at the local stores. Small parcels of land were leased for family gardens, and the gulches were often used for pasturing cattle. This lifestyle continued in the area until 1976, when the last mill in Kohala closed.

Previous Archaeology

The largest archaeological investigation in the region was conducted by David Tuggle and Myra Tomonari-Tuggle, who ran a series of archaeological field schools in Pololu, Honokane, and Honopue valleys in the early 1970s. Only a small number of publications resulted from this work (Tuggle and Tomonari-Tuggle 1980); however, the research was scrupulously done and resulted in a vast collection of detailed notes, unpublished reports, maps, and manuscripts. These documents are on file at the Department of Anthropology, University of Hawai'i Manoa. Although their research did not extend to Niuli'i, they documented a sequence of early deposits along the coastline of Pololu, (ca. AD 1200-1500) and a complex habitation and agricultural system in the interior of the valley. Undoubtedly, the chronology of Pololu reflects much of Kohala, with colonization and settlement of the landscape ca. AD 1000-1200.

Other archaeological investigations in the area include a survey of the Bond estate by Wolforth (Wolforth 2003), coastal areas in Waiapuka (Erkelens and Athens 1994a), and areas in association with the old mill of Halaula (Erkelens and Athens 1994b). Wolforth's report covers the land in association with the historic Girl's School on the Bond Estate, and also the prehistoric agricultural lands on 'Iole *ahupua'a*. The two reports by Erkelens and Athens focus on plantation-era properties, historic graves, and a late prehistoric early Hawaiian component.

Also of note is a survey map created for the Kohala Sugar Company, which details the location of *lo'i* within the gulches of Niuli'i, Makapala, and Waiapuka *ahupua'a*. This map was produced in 1935 by Lobenstein, and indicates the presence of agricultural features within what is now Keokea Beach Park.

Methods

The archaeological investigations at Keokea Beach Park were carried out between June 19th and July 7th. Julie Field, Ph.D., and Michael Graves, Ph.D. served as the principle investigators for the project, while Jesse Stephen, M.A., Brett Sheperdson, M.A., and Timothy Rieth, B.A. served as teaching assistants and crew chiefs. The 18 students that participated in the field school were mostly undergraduate students from the US Mainland, and also from the UH University System.

As these investigations were part of a field school, the work was performed at a slow pace, and emphasized student instruction and monitoring. The least invasive techniques for archaeological investigation were also emphasized, and to that end there was only a limited amount of excavation conducted at the site. Work began with several days of clearing vegetation, and this was focused for the most part on the sequence of large terraces on the west side of Niuli'i Stream. Overhanging *hau* branches, smaller plants, and climbing vines were cut and trimmed back from visible terrace walls, and placed into piles at the end of each terrace. The area was then surveyed for features, and a series of agricultural retaining walls were located on the eastern side of Niuli'i Stream. In addition, the remains of the 'auwai that had fed the terraces with water in prehistory was discovered at the far southern boundary of the park property.

The faces of each of the large terraces were profiled, and datum points established for feature mapping. In addition, the vertical profile of the terraces was recorded with the total station, which allowed for the generation of an elevation model for the site. Tape and compass mapping was used to plot in the features on the east side of Niuli'i Stream. All features were numbered, mapped, and described using feature forms.

Each terrace on the Western side of Niuli'i Stream was initially tested with a 3.5 inch auger, following a transect line that ran North-South. Tests were taken approximately every 5 meters, and sediment samples from each recognizably distinct sediment layer were collected for future analysis. Samples were described in the field using the texture-by-feel method (Thien 1979) and Munsell color charts.

Two locales were selected for more intensive subsurface testing, and three excavation units were completed. Test Unit (TU) 1 was placed atop Terrace 1, and at the foot of the faced wall for Terrace 2. The unit measured 1 x 2 m in area. TU 2 abutted TU1, and extended across a scatter of wall fall and possible floor cobbles on the surface of Terrace 1. This unit was also 1 x 2 m in diameter. Test Unit 3 was placed across a portion of the 'auwai, just south of the southern limits of Terrace 5. This unit was 1 m x 50 cm in area.

Test units were excavated with trowel and picks, and used arbitrary 10cm levels within natural layers. Plan view drawings and photos were taken at the end of each level. Artifacts that could be identified and collected in situ were plotted onto the plan view maps. All fill material was screened through 1/8th inch mesh, and any artifacts found in the screens were collected as a bulk sample for the level. Sediment characteristics were described using soil touch tests (Thien 1979), and Munsell color charts. Following each excavation, a stratigraphic profile was generated, and representative photographs were taken. Following the excavation, all sediment was replaced into the units, and corner datum stakes or nails were removed.

Following excavation, GPS coordinates were taken from the shoreline of Keokea Beach Park. These coordinates will be used to georectify the maps generated during

fieldwork into the regional GIS for Kohala.

Chapter 2: Results

This chapter presents the results of field mapping, feature descriptions, subsurface augering, and excavation at the site of Niuli‘i Stream. The site has been divided into two locales, the Western Terraces and the Eastern Terraces. The Western Terraces consist of six features; which extend across the site in a roughly linear fashion. The Eastern Terraces contain 10 features, all of which are located near the southern boundary of the Keokea Beach Park property line.

Field Mapping Results: The Western Terraces

Figure 2 depicts the configuration of the Western Terraces of Niuli‘i Stream. The terraces are oriented roughly North-South, and extend for approximately 144 meters.

Feature Descriptions

Terrace 1

Terrace 1 is a subrectangular terrace that is 29 meters in length, and approximately 11 meters wide. The north face of the terraces is 1.5 m high. The terrace trends north-south along an azimuth of 256° (Figure 3). The west wall of Terrace 1 has intermittent stacking and areas of erosion and collapse. The stacked portions are constructed of subrounded and subangular small basalt boulders and large cobbles. Tabular small boulders are interspersed. In general the walls consist of three to five courses with poor size sorting (different sizes interspersed randomly). The east edge has a few small areas of stacking, typically small cobbles with up to four courses), but the majority of this edge appears to have collapsed and the stones displaced down the ~1.5 – 2.0 meter slope to the stream bed.

The north wall of Terrace 1 has similarly been disturbed by erosion, foot traffic, and tree roots. There is a 1.5m long section of stacking with up to six courses of well sorted, rounded and subrounded small basalt boulders and cobbles. In unstacked areas along the edge is defined by a break and step. A modern footpath crosses the northwest corner of Terrace 1. Towards the southwest corner is a surface scatter of stone (Feature 1a), which was identified as a modern fire hearth constructed of wall fall.

Prior to clearing, the surface of Terrace 1 was vegetated with large *hau* trees, palm (possibly *Pritchardia arecina*) and small plants. Modern rubbish was scattered about the surface, and a deposit of cooked limpet shells (*‘opihī*) lay in a small depression in the southeast corner of the site. Surface sediment is silty/sandy clay (touch-tested).

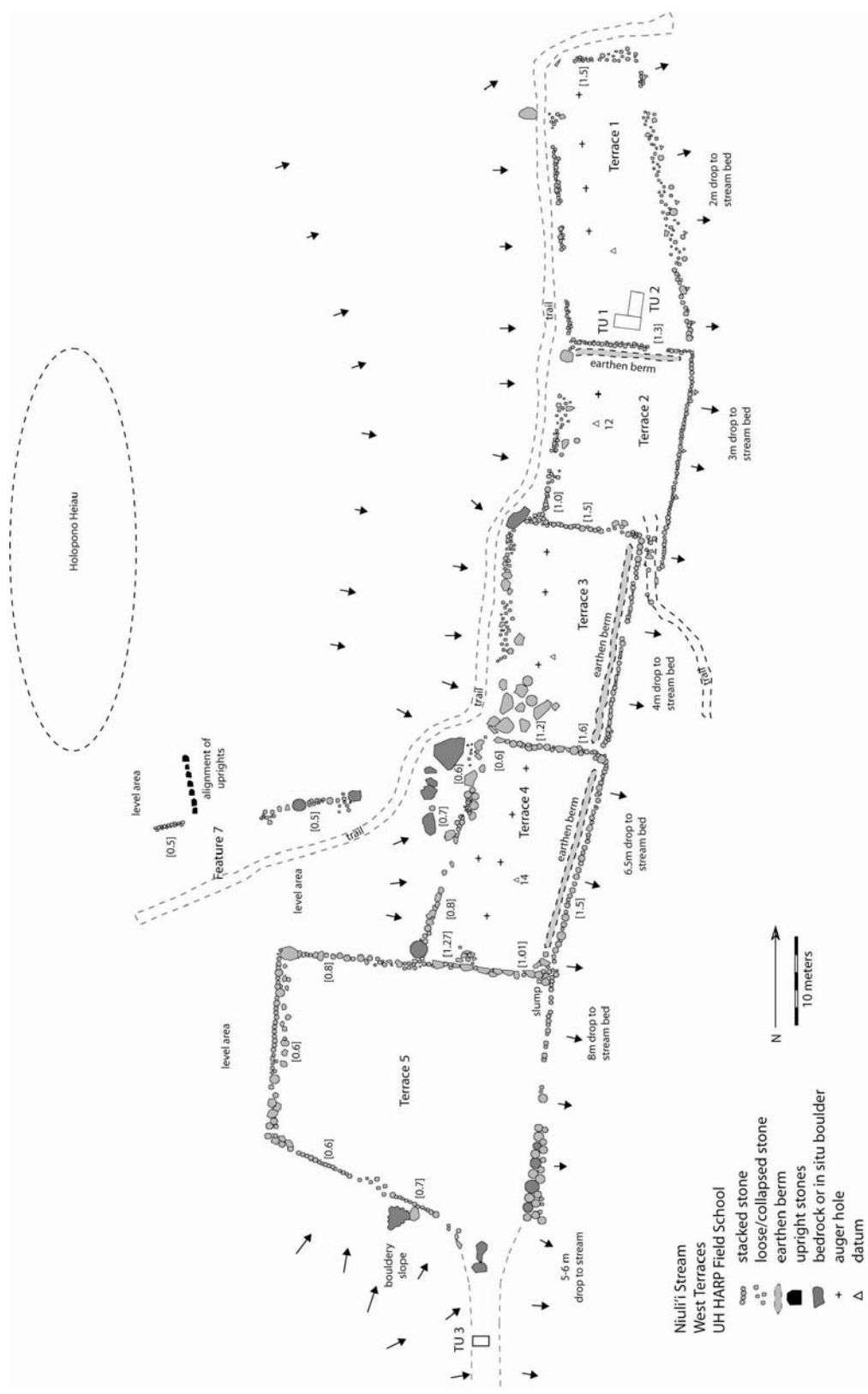


Figure 2. The Western Terraces of Niulii Stream.



Figure 3. View of Terrace 1, West Terraces of Niuli'i Stream. View is to south, with face of Terrace 2 wall in background. Figures in the right rear of the photo are standing atop Feature 1a.

Feature 1a

Feature 1a is an oval scattering of boulders and cobbles. It is approximately 4 meters in length, and 3 meters in width, and the single stacking of stones rises to 28 cm above the surface. Feature 1a is located in the SW corner of Terrace 1, and is approximately 30 meters west of Niuli'i Stream, and 50 meters south of the shoreline of Keokea Bay. It is associated with wall-fall from the face of Terrace 2, and is only 2.3 meters north of this wall (Figure 4).

The cobbles are water-worn as well as terrestrial. Some of the stones have been stood on their ends, and there are a number of stones with burned surfaces. Fill includes fire-cracked rock, charcoal, and fire-stained sediment. Feature 1a was disturbed by campfire activity during the field season (on the weekend of 6/25/2006), and several of the rocks were moved from their original locations and assembled into a fire ring. Overall, the condition of this feature is severely disturbed.

It is possible that this feature is a historic (most likely within the last 50 years) *imu* or fire pit. This functional determination is based on the presence of modern rubbish on the surface of the feature, including a plastic spoon, bottle glass, and a rubber flip-flop

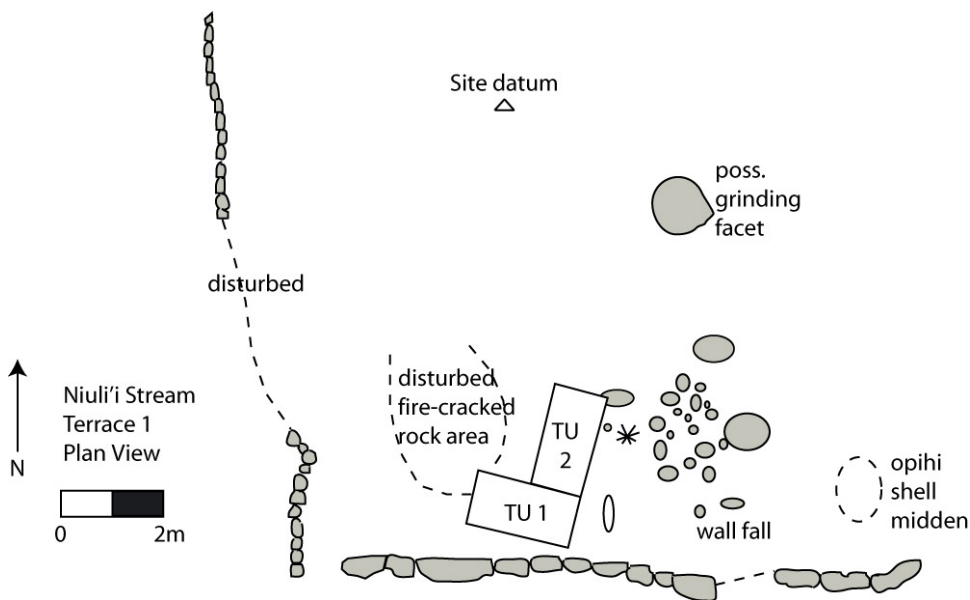


Figure 4. Map of the surface features on Terrace 1. Feature 1a is indicated by the dotted lines demarking the disturbed fire-cracked rock concentration.

sandal. However, the large amount of fire-cracked rock on the surface suggests that an earlier-aged feature may be present beneath the surface.

Terrace 2

Terrace 2 is a rectangular terrace that extends for 19.4 meters, and is 12.5 meters wide. The entire terrace lies along an azimuth of 7° (Figure 2). The west edge of the terrace has few intact stacked sections, and these portions exhibit up to six courses of stacked cobbles, most of them of large size and rounded. The east edge has a stone facing up to approximately three courses (< 1 meter). This edge is intermittent, although many areas have slumped and collapsed (the stream bed is approximately 2.5 to 3.0 meters below the terrace edge). Of note is the fact that the east facing extends beyond (south) of the NE corner of Terrace 3; that is, it does not abut the corner, but rather forms a narrow tier for approximately 5 meters below the east face of Terrace 3. No distinct earth berm is present along the east edge. However, a berm is present (approximately 10-15 cm high, and 30-75 cm wide) along the top of the north edge.

The north edge of Terrace 2 is constructed of many large boulders, some greater than 1 meter in dimension (Figure 5). It stands at approximately 1.3 meters high. In places the retaining wall is constructed of 2 courses of large boulders (this is primarily along the western side), while other areas have up to 5 courses stacked with boulders at the base and large cobbles and small boulders as the upper courses. The northeast and northwest corners have slumped, and there is an area of collapse approximately 1 meter long towards the northeast corner.

Prior to clearing, Terrace 2 was vegetated with *hau*, palm, and fern. Visibility of the ground surface after clearing was very good.

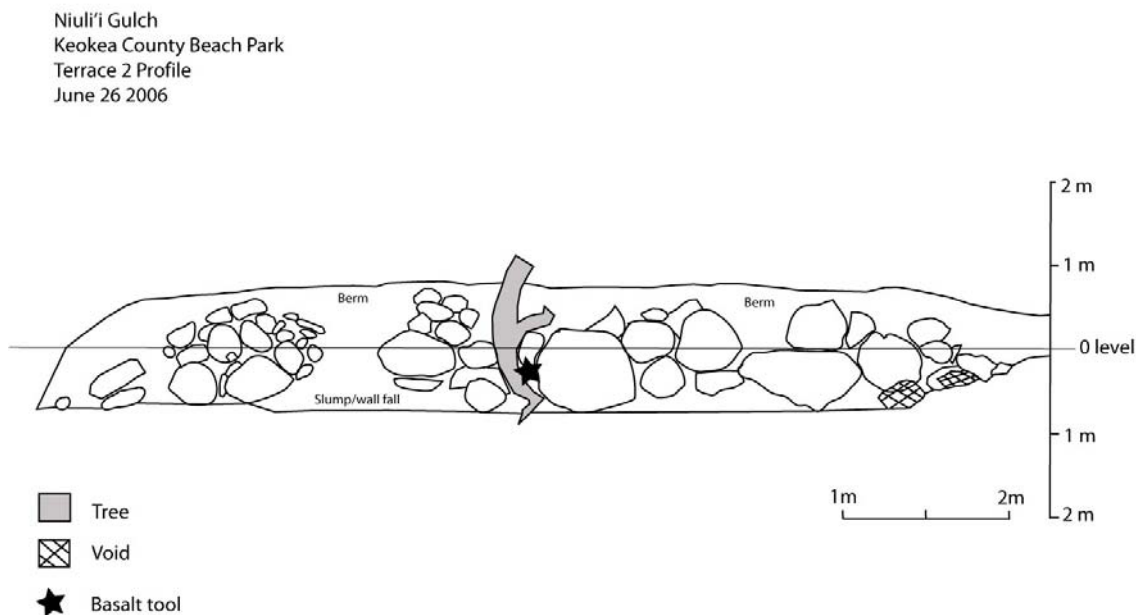


Figure 5. North face of Terrace 2.

Terrace 3

Terrace 3 is a rectangular terrace that extends for 24 meters, and is 12 meters wide. The entire terrace lies along an azimuth of 6° (Figure 2). The west retaining wall is constructed of primarily large subangular boulders with small, stacked, subrounded boulders and large cobbles. The west wall has the most damage (primarily collapse), as it is at the base of the slope and the trail runs above and parallel to it.

The east edge has a slight earthen berm and approximately 1-4 courses of stacked, subrounded cobbles and small boulders immediately below the terrace edge. The stream bed is approximately 4.5 meters below the terrace edge.

The north retaining face is constructed of large boulders (greater than 1 meter in dimension) with smaller boulders and cobbles stacked between (Figure 6). It stands at 1.5 meters above the surface of Terrace 2. The west half of this face has more large boulders with more stacking of small stones than in the east half. A section towards the center of the wall has collapsed.

Terrace 4

Terrace 4 is a rectangular terrace that is 24 meters in length, 12 meters wide, and lies along an azimuth of approximately 15° . The eastern edge of the terrace consists of a stacked retaining wall approximately 3 courses high, which forms a 50° drop down to the stream bed. There is a slight earthen berm of approximately 10 cm height, and 50 cm width along the east edge. The wall material is evenly sorted and composed of large basalt cobbles. A portion of this face is obscured by vegetation. The western edge consists of intermittent stacking and large boulders retaining a slight slope. This edge has collapsed in areas, but portions of the stacking ranged from evenly sorted to sorting from small at base to large boulders at the top.

Nuili'i Gulch
Keokea County Beach Park
Terrace 3 Profile
22 June 2006

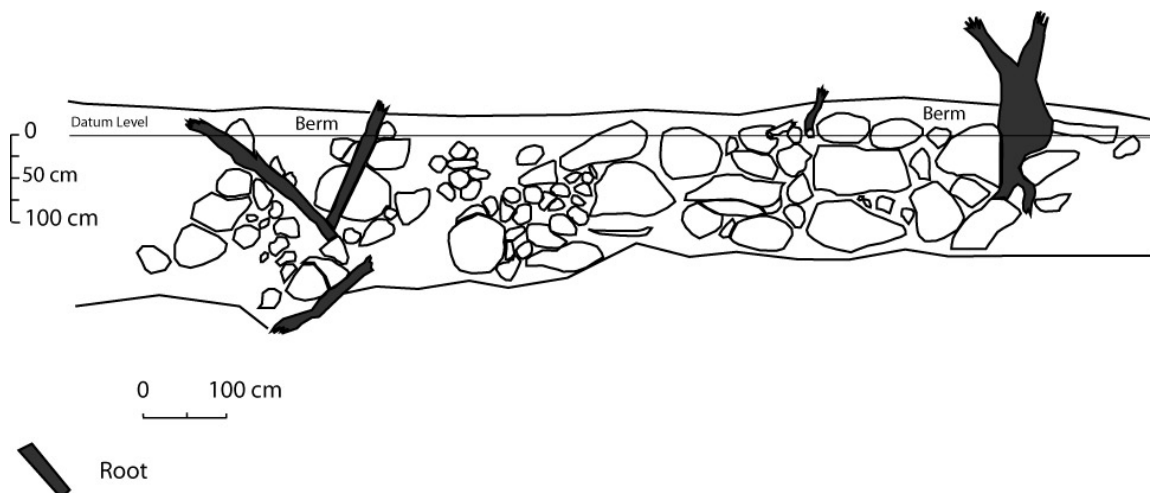


Figure 6. North face of Terrace 3.

The north retaining face incorporates several large boulders over 1 meter in dimension. The west half of this face is almost solely these boulders, while the east half incorporates smaller boulders (30-50 cm) and cobbles. The top of this face is capped by 1-2 courses of large cobbles (approximately 20 cm) (Figures 7, 8).

The east and north faces are in good condition with minimal collapse, although the northeast corner of the terrace (juncture of north and east retaining walls) has slumped. It appears that despite the slumping this corner was intentionally rounded as opposed to forming a sharp right angle. Vegetation on the surface of Terrace 4 was very dense, and consisted of tall grass, lantana, *hau*, guava, and various vine plants. The surface was very visible after clearing.

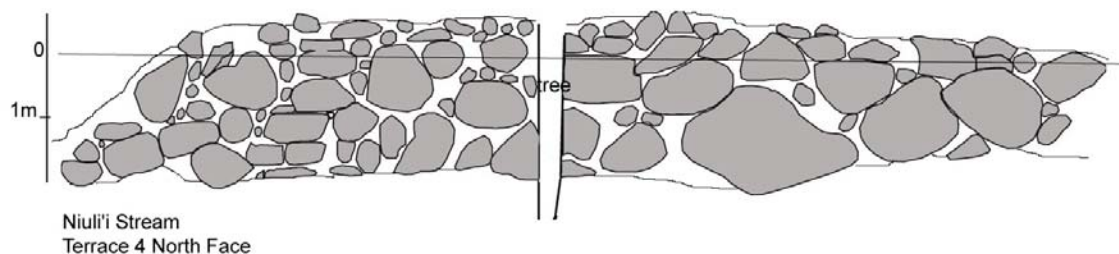


Figure 7. North face of Terrace 4.



Figure 8. View of surface of Terrace 4, with north face of Terrace 5 in background.

Terrace 5

Terrace 5 is a roughly square terrace that extends for approximately 29 meters in length, and 27 meters in width (Figure 2). This terrace is located at the foot of Kuapalaha Heiau, and was also not aggressively cleared in order to preserve the integrity of the *heiau* boundary. It is heavily overgrown with philodendron, *hau*, fern, and palm. Due to this condition, the description of the stone-faced terrace edges is less complete than that for Terraces 1-4.

Terrace 5 is edged on its southern side by a faced natural embankment, which contains rock features indicative of tractor pushing/dumping from the opposite side of the property. To the west, the edge of Terrace 5 consists of stacked stone walls with between 2 and 4 courses. This wall lies on slightly sloping terrain, and stands at .60 meter high. The eastern wall consists of very large boulders (greater than 1 meter in dimension) and more than 3 levels of stacked courses. The eastern side of this edge of the terrace drops down to the stream at a steep angle.

The eastern portion of the north wall abuts Terrace 4, and rises to a height of 1.27 meters above the surface. This wall consists of 4-5 courses of stacked stone, all of which are of small size (Figure 9). The western portion of the terrace straddles a rise in the slope, and extends as a straight wall of .80 cm high.

Feature 6

Feature 6 consists of the *'auwai* that extends into the Niuli'i Stream site from the adjacent property of Mrs. Nani Svenson (Figure 3). This feature was covered by dense vegetation, but after clearing the path of the *'auwai* was clearly visible as a linear depression that runs along the western cliff face of the Niuli'i drainage. In addition, the eroding substrate that forms the cliff face appears to have been cut back, providing the path for the *'auwai* at an elevation of approximately 10 meters above the current stream bed.

Although the feature extends beyond the property boundary for Keokea Beach Park, it appears to be several dozen meters long, and approximately 1-2 meters wide. Upon its entrance into Terrace 5, the path of the *'auwai* abuts two large boulders, which may have slowed the water as it entered the terrace.

A single excavation was conducted across the width of Feature 6 (Test Unit 3). The details of this excavation are described in the following section.

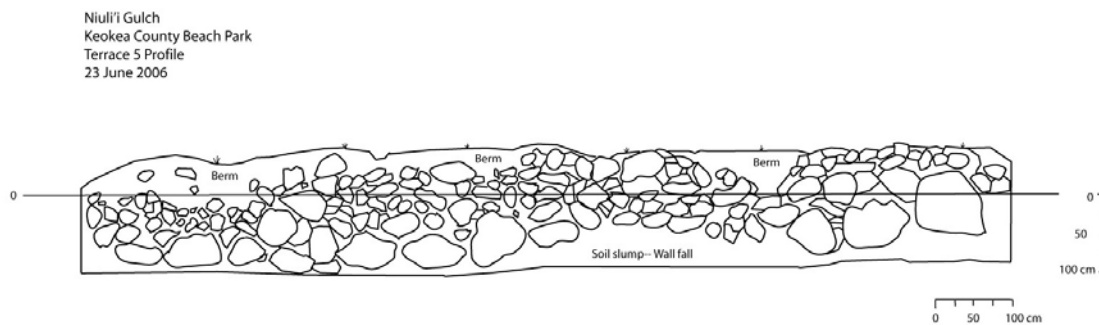


Figure 9. North face of Terrace 5.

Feature 7

Feature 7 consists of a T-shaped alignment of stones that lies to the east of Terrace 5, and which lies directly south of Kuapalaha Heiau (Figure 2). One section of the feature consists of a row of upright boulders, which extend in a north-south axis (346°) for approximately 6.5 meters. There are seven uprights in the row, and they average 50 cm in height. These stones have been faced, and their flat sides are oriented east/west.

The adjacent alignment of stones runs perpendicular to the uprights, and extends for approximately 17 meters. This alignment is set at an azimuth of 80° . This alignment incorporates several large boulders, as well as stacked courses of medium sized basalt cobbles.

This feature was heavily vegetated with tall grass, lantana, and other brushy plants. As it was thought that this feature was part of the outer boundaries of the *heiau*, it was not aggressively cleared. Additional features thought to constitute the *heiau* lie to the north and west of Feature 7.

Field Mapping Results: The Eastern Terraces

The eastern terraces of Niuli'i Stream were encountered following extensive survey and vegetation clearance. This vegetation included palm, philodendron, ficus, hibiscus, wild *kalo*, coconut sprouts, and other vines. Visibility of the ground was very poor, and heavy vegetation clearance is required to reveal additional features that may lie to the north of the mapped terraces. The Eastern Terraces lie atop a relatively narrow bench between the base of a steep slope (east) and the stream bank (west). The recorded features are located slightly upriver from the extent of the Western Terraces (approximately 65 meters from the coast), and extend for approximately 49 meters in a north-south direction (Figure 10). Ten features were recorded within the Eastern Terraces, and these are displayed within Figure 11. In general, the features of the Eastern Complex are irregularly shaped and incorporate local bedrock and large in situ boulders. The southernmost feature continues past the boundary for Keokea Beach Park, suggesting a continuation of the terraces onto Mrs. Nani Swenson's property. Of note, these terraces were not recorded on the 1915 Loebenstein map.

Feature 1

Feature 1 is formed by a stone retaining wall and alignment of large boulders, creating a level surface that measures approximately 9 x 12 meters (Figure 10). The retaining wall is oriented parallel to the stream on a roughly N-S axis, measuring 9.5 meters. Construction of the wall consists of multiple courses (approximately 2-5) of stacked subangular and subrounded cobbles and boulders that rise to a height of .55 to 1.5 meters. A few are composed of a tabular fine grained basalt. Bedrock outcrops and extremely large boulders have been incorporated by stacking across and between. The stacked stones are relatively uniform in size, ranging from 10-30 cm, with occasional large boulders. None of the stones are dressed or placed upright.

A portion of the center of the wall has collapsed. Interestingly, this collapse includes multiple large boulders that are larger than the other stacked stones. An area approximately 5 x 3 m in size immediately north and adjacent to the north end of the wall

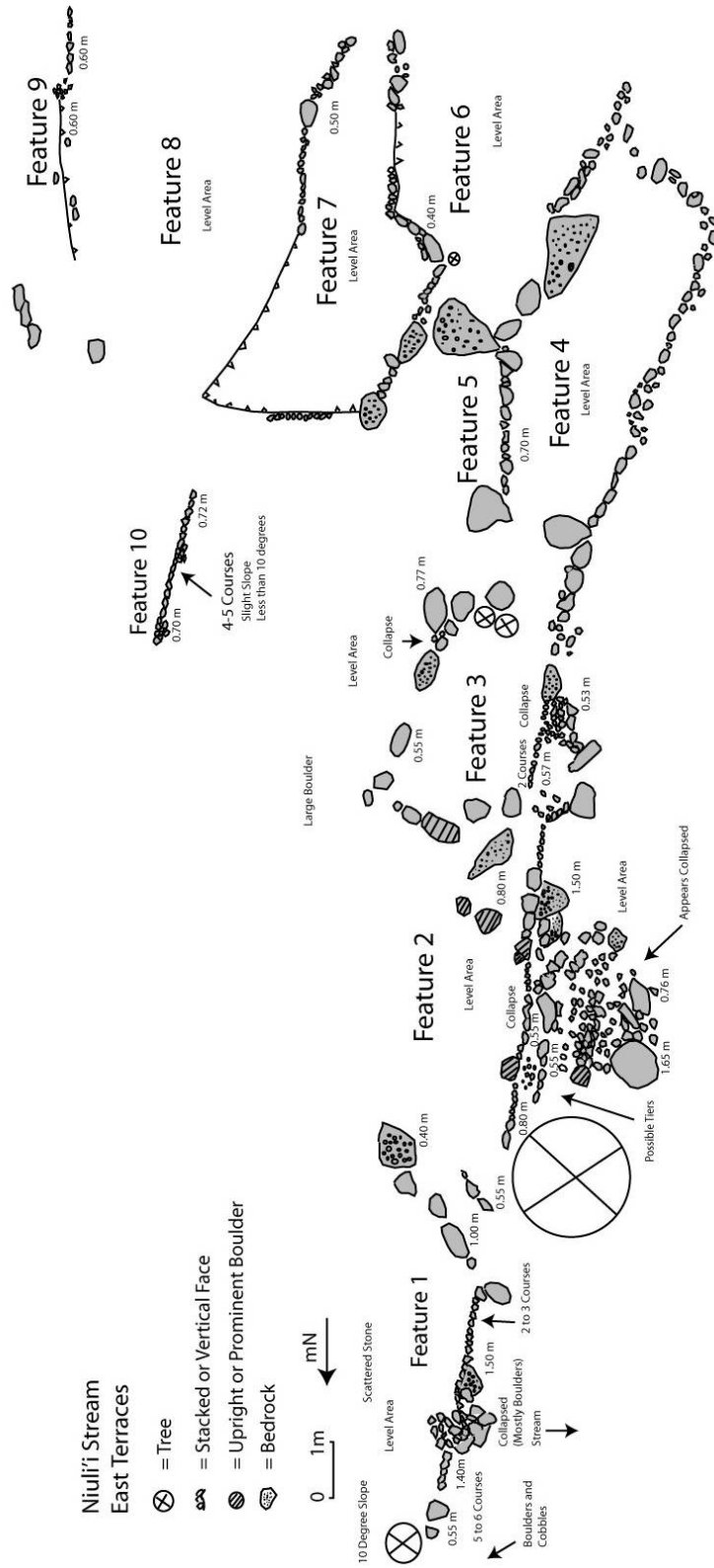


Figure 10. East Terraces of Niuli'i Stream.

is covered with boulders and cobbles that appear to be a collapse or displaced extension of the wall. The collapse was likely caused by tree roots and erosion. The south end of the retaining wall includes a bedrock exposure.

From this point an alignment of large boulders/bedrock exposures is oriented southeast (150°) thus forming the southern edge of the terrace. It is likely that the natural location of the boulder/bedrock were taken advantage of for the feature's construction. The terrace surface has scattered cobbles and boulders, but no distinct internal features or architectural elements.

This feature is probably not part of an irrigated agricultural system due to the fact that it is topographically unsuited and of high elevation. It is possible that this feature is a residential terrace, although there are no structural remains such as paving to indicate this use.

Feature 2

Feature 2 is a stone retaining wall with possible lower tiers that creates a level surface (Figure 10). The tiers have a loosely triangular shape and encircling a large boulder. The primary retaining wall is made of 6-7 courses of angular and rounded basalt cobbles and boulders, ranging in size from 60-80 cm. This feature contains several uprights on the top course forming a low, flat face. The lower tiers are mainly comprised of relatively small angular and tabular basalt cobbles with several large boulders interspersed throughout. Towards the south end, the retaining wall is built around and on top of a large basalt outcrop, and ends in a large bedrock boulder.

The construction and materials are distinct from Feature 1, in particular the larger sized boulders used in the feature. The upper retaining wall is composed of randomly sorted stone, mainly large boulders with small cobbles interspersed. The southern end increases in the number of courses (up to 7). The lower three courses are made of cobbles approximately 50 cm in size, while the upper three are all made of stones ranging from 10-20 cm. The top most course is made of several large boulders.

Immediately below (west) of the retaining wall is a roughly triangular area of stone. This area appears to have been tiered. The first tier below the retaining wall would have been approximately 80 cm wide with a 50 cm step down to a lower tier. The potential tier edges are not distinct due to collapse. The area located above (to the east) is relatively flat with a few small cobbles and boulders. On top of the terrace, the south border of the feature is faced by a discontinuous line of large boulders and bedrock running at approximately 110° east from the retaining wall. The upper terrace and the lower tiers are separated by an alignment of boulders.

Although the retaining wall in Feature 1 and Feature 2 are not currently connected, they run along the same azimuth and are separated by a large tree with several boulders contained in its roots. Most likely these features were connected prior to the growth of the tree

The function of this feature is likely to have been some form of non-irrigated agriculture, due to the lack of irrigation, and the position of this feature above the stream. It may also have been a residential area, as the stone alignments form a flattened platform that could have been inhabited.

Feature 3

Feature 3 is composed of a stacked stone retaining wall (two courses of subangular basalt cobbles positioned in between large in situ boulders and bedrock) (Figure 10). There is some slumping and collapse along this edge. It is approximately 14 meters long and 9.5 meters wide, and rises to a height of .35-1.0 meters. It lies along an azimuth of 12°. The level area above and to the east of this face is approximately 133 square meters, and is bounded to the north, east, and south by rough alignments of large boulders. Overall, Feature 3 appears to be a relatively low, three sided enclosure.

This feature is probably agricultural, as no internal features or artifacts suggest its use as a residential structure. It is unclear if this feature was part of an irrigated agricultural system; no *'auwai* is visible.

Feature 4

Feature 4 is formed by a long retaining wall and level ground to the east. It is parallel to the stream and roughly situated along a N-S axis (210°) (Figure 10). It is 12 meters long and 3-5 meters wide, and rises to a height of 1.5 meters. It incorporates large, in situ boulders as well as stacked courses of smaller rocks. For the most part, the position of the large, in situ boulders determined the shape of Feature 4. The areas that use stacked rocks are collapsed, making it difficult to determine the precise number of courses. However, the rocks are not dressed or placed in an upright position.

This feature may have been used for agricultural production, as there are no artifacts or features to suggest its use as residence. The lack of any irrigation features suggest that it was used for dry land production.

Feature 5

Feature 5 consists of a retaining wall and level area (Figure 10). It is approximately 6 meters long, 4 meters wide, and rises to a height of 1.5 meters. Although the walls are relatively short, it runs north-south (180°). As with the other features in this area, the wall incorporates large in situ basalt boulders and stacked courses of smaller rocks. None of the rocks are dressed or placed upright. There are two evident courses which are also partially collapsed. The level area within the enclosing walls is approximately 28 square meters in size.

There are no artifacts or features to suggest that this feature was residential. Therefore, it is most likely that this feature was used for cultivation, but not for irrigated cultivation due to the lack of any *'auwai* in the area.

Feature 6

Feature 6 incorporates a retaining wall and a level area to the east (Figure 10). It is approximately 10.5 meters long, 7 meters wide, and reaches a height of .4 meters. It runs north-south, along an azimuth of 180°. Feature 6 is an enclosure that is formed by alignments of stacked rock and large in situ boulders. The stacked areas appear to have consisted of two courses, although much of the stacking has collapsed. A large boulder that forms part of the west wall also abuts Feature 4 and 5.

As with the other features in this area, Feature 6 was potentially used for non-irrigated agricultural production. There are no artifacts or features to suggest that Feature 6 was used as a residence.

Feature 7

Feature 7 consists of a retaining wall enclosure that extends for approximately 14 meters (Figure 10). This wall is bounded on the north by an earthen bank and a section of stacked basalt, which rises to an elevation of .4 meters. The eastern edge is similarly created by an earthen bank and section of stacked basalt cobbles. The walls have 2-3 courses and are made of medium to small sized basalt cobbles and boulders. Portions of the wall are collapsed. Feature 7 curves slightly, but is generally along an azimuth of 180-230°.

No structural remains or artifacts indicate any residential use on this Feature. Most likely it is the result of non-irrigated agricultural activities.

Feature 8

Feature 8 consists of a 13 meter long retaining wall that is adjacent to a large, level surface (Figure 10). The feature lies along an azimuth of 210°, and consists of a stacked wall, 3-6 courses high. The rocks within the wall are small and angular, with a large in situ boulder located approximately 10.5 meter from the north end of the feature. Portions of the wall are collapsed.

The level area within the enclosed space of Feature 8 contains several large boulders that do not appear to be arranged for a specific use. No structural remains or artifacts indicate any residential use on this Feature. Most likely it is the result of non-irrigated agricultural activities.

Feature 9

Feature 9 is a retaining wall that is 8 meters in length, and encloses a level area of approximately 5 square meters (Figure 10). This level area ends in a steep upward slope at the east edge. This feature also borders Nani Svenson's property to the south east. The wall of Feature 9 is mostly collapsed, consisting of angular basalt rock of small-medium size. Rocks increase in size to the north end of the feature. There are no distinct features or artifacts to indicate use, but it is most likely that the enclosed surface was used for non-irrigated agriculture.

Feature 10

Feature 10 consists of a retaining wall and an area of level ground to the east (Figure 10). The retaining wall extends for approximately 5.5 meters, and encloses an area of approximately 6 square meters. The wall consists of stacked angular rocks of medium size, most of which are rectangular and flat. The wall stands at 4-5 courses, but has an area of collapse near the center.

No structural remains indicate residential use; the feature is most likely associated with non-irrigated agriculture.

Test Excavation 1 Results

Test Excavation 1 was located atop of Terrace 1 of the Western Terrace sequence (Figure 2). It was positioned at the foot of the northern retaining wall of Terrace 2, and also beneath two large boulders that were stacked, indicating that they were not in situ boulders that had been utilized during the construction of the wall. The goal of this excavation was to investigate the surface of Terrace 1, and also dig beneath the foot of the northern wall of Terrace 2 and retrieve datable charcoal samples that were deposited during the construction of the wall. Achievement of this goal would provide an absolute date for the construction of Terrace 2, and also aid in generating a chronology for the archaeological resources of Niuli'i Stream.

Test Unit 1 measured 2 x 1 meter, and its long axis was oriented on 180°. Until a depth of 25 cmbs, the unit was excavated by hand using trowels and whisk brooms. After 25 cm depth, the excavation was continued with a mattock and shovel. All sediment except a surface layer of wall fall from Terrace 2 (directly above the unit) was screened through 1/8th inch mesh. The excavation followed natural layers, and divided these layers into arbitrary 10 cm levels.

The initial 20 cm of excavation in TU 1 encountered a clayey silt with heavy root intrusions and small-medium size basalt cobbles (Figure 11). A lens of gravel and

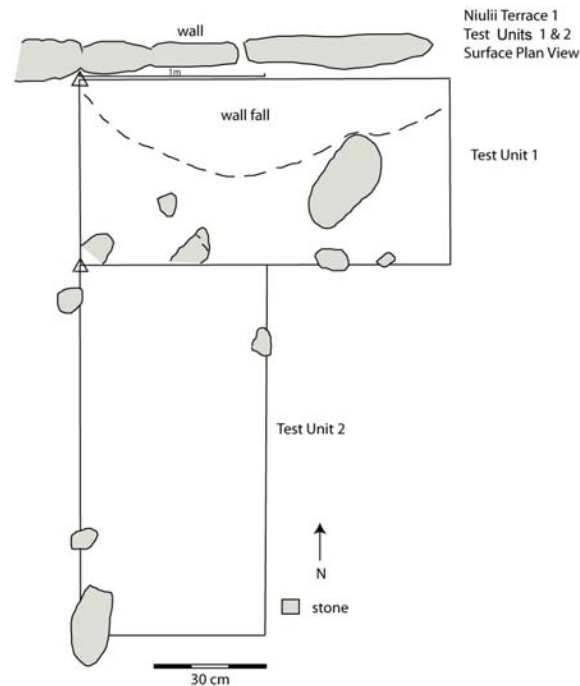


Figure 11. Surface plan of Test Units 1 and 2.

pebbles was encountered at approximately 18 cmbs near the southern end of the unit, and this was documented in sketch and photo, but did not continue to a deeper layer. Several historic artifacts were encountered, including 2 metal buttons from historic denim

clothing, fragments of historic glass, and metal nails. Charcoal and a fragment of volcanic glass were also recovered (Table 1).

After 20 cmbs the sediment transitioned to a more cobbly, gravelly deposit, but this did not appear to be waterworn 'ili'ili paving. Large cobbles were also encountered in the excavation, including a very large boulder in the western end of the unit that is likely to have been wall fall from Terrace 2. Artifacts from 10-20 cmbs included fragments of historic glass, a button, volcanic glass, and charcoal. After 20 cmbs the deposit continued to contain a high amount of rocks and pebbles, however, all historic and cultural materials were absent from the deposits, except for a small amount of charcoal.

After 25 cmbs the excavation was halted in the western portion of the unit, leaving only the eastern 1 x 1 active. Excavation continued in this unit with a mattock and shovel until a depth of 38 cmbs (Figure 12, 13). Cobbles and gravel were thick at this depth, and it was determined that this layer was likely substrate and sterile. The excavation then shifted to a horizontal excavation under the wall of Terrace 2. This focused on the base of the lowest stones in the northern wall of the Terrace, and dug in approximately 20 cm into the base of the wall (Figure 14). Only a small fragment of charcoal (Cat. # 45) was recovered.

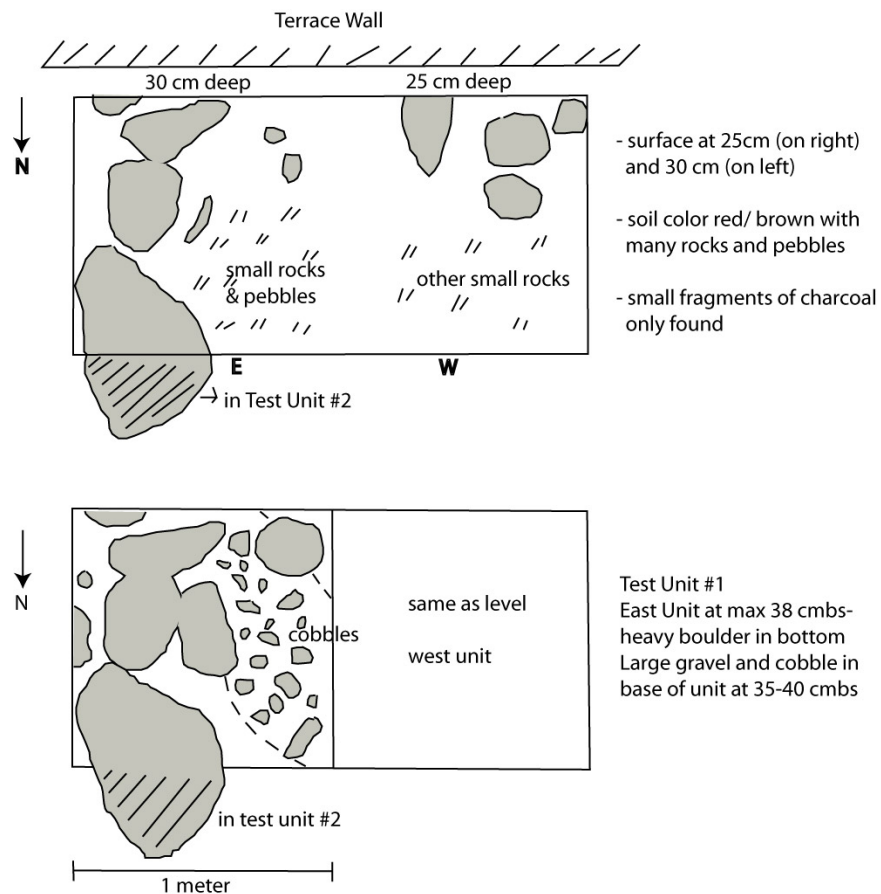


Figure 12. Test Unit 1 excavation plan views, 25-38 cmbs.



Figure 13. Test Unit 1 at 35cmbs, view to the north.

Table 1. Artifact catalog from Test Unit 1.

Catalog #	Site Name	Unit	Layer	Level	Material
24	Niuli'i Stream	TU1	I	1	charcoal
23	Niuli'i Stream	TU1	I	wall fall	charcoal
25	Niuli'i Stream	TU1	I	1	bottle glass, metal nail
26	Niuli'i Stream	TU1	I	1	volcanic glass
36	Niuli'i Stream	TU1	I	3	charcoal
45	Niuli'i Stream	TU1	I	Beneath terrace wall	charcoal



Figure 14. View of Test Unit 1, with excavation under the base of the north face of Terrace 2.

Following the excavation, the southern wall of the unit was photographed and profiled (Figures 15, 16). Although the fill material was predominantly silty clay with pebble inclusions, layers 1 and 2 were identified and marked in the profile. Layer 1 had a higher concentration of angular gravels than the surrounding matrix, and may represent a base fill material that was related to agricultural production on the terrace (such as a gravel floor for a lo'i bed). Layer 2 was a cobbly, pebbly layer, with very little sediment. Most likely this layer represents the natural rocky substrate of the terrace.



Figure 15. Photo of the south wall profile of Test Unit 1.

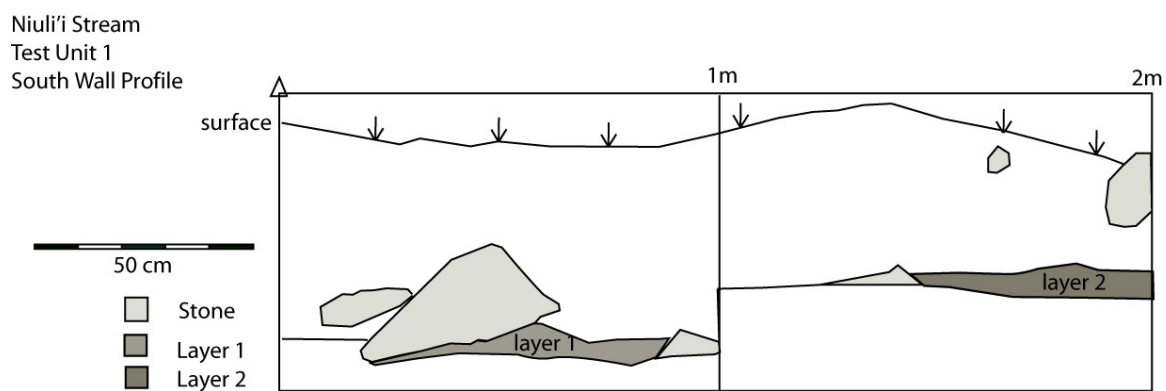


Figure 16. South wall profile of Test Unit 1.

Test Excavation 2 Results

Test Excavation 2 was located atop Terrace 1 of the Western Terrace sequence, and abutted Test Unit 1 (Figure 2). It was positioned along a North-South axis, and extended across a scattering of wall-fall that may have also incorporated a pre-existing terrace surface. The goal of this excavation was to investigate the subsurface deposits of Terrace 1.

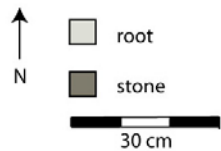
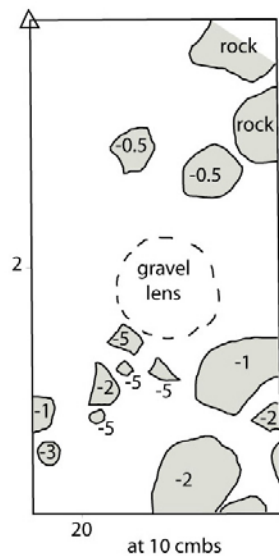
Test Unit 2 measured 2 x 1 meters, and its long axis was oriented on 0°. Until a depth of 25 cmbs, the unit was excavated by hand using trowels and whisk brooms. After 25 cm depth, the excavation was continued with a mattock and shovel. All sediment was screened through 1/8th inch mesh. The excavation followed natural layers, and divided these layers into arbitrary 10 cm levels.

The surface of TU 2 consisted of a rooty 'A' horizon of silty clay with few pebble inclusions (Layer 1). The central portion of the unit contained a lens of heavy gravel that extended to a depth of 15 cmbs. The large cobbles that were scattered throughout the unit are mostly wall-fall in origin, and several large boulders were also embedded in the northern and western portions of the unit (Figure 17). Artifacts recovered in the first 20 cmbs included historic glass, volcanic glass, charcoal, *kukui* nutshell, historic chicken bone, and two historic denim jean buttons (Table 2).

Between 20 and 30 cmbs the deposit transitioned to a more cobbly, gravelly deposit (Layer 2) (Figure 18). No features were encountered, but the large rocks at the edges of the unit were left in situ. The lens of gravel located near the center of the unit was further investigated, however, the angularity of the fragments were not suggestive of 'ili'ili paving. Artifacts recovered up to a depth of 30cmbs included volcanic glass, charcoal, historic glass, and a lithic fragment that may have been modified.

After 30cmbs, the unit was divided and excavation continued in the southern 1 x 1. Using a mattock and shovels, excavation continued in this unit to a max depth of 40 cmbs. A few fragments of charcoal were found between 30 and 40cmbs, but no other cultural deposits or features (Figure 19).

Niulii Stream
Terrace 1, TU2
Level 1 (0-10 cmbs)



Elevations taken from datum and line level in NW corner of unit.

Niulii Stream
Terrace 1, TU2
Level 2 (20 cmbs)

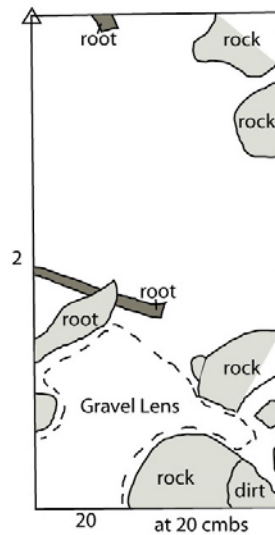


Figure 17. Plan views of Test Unit 2 at 10 and 20 cmbs.

Table 2. Artifact catalog from Test Unit 2.

Catalog #	Site Name	Unit	Layer	Level	Material
22	Niuli'i Stream	Test Unit 2	I	1	shell and <i>kukui</i> nutshell
30	Niuli'i Stream	Test Unit 2	I	1	<i>kukui</i> nutshell, snail shell
29	Niuli'i Stream	Test Unit 2	I	1	charcoal
28	Niuli'i Stream	Test Unit 2	I	1	volcanic glass
27	Niuli'i Stream	Test Unit 2	I	1	historic glass
21	Niuli'i Stream	Test Unit 2	I	1	chicken bone
33	Niuli'i Stream	Test Unit 2	I	2	charcoal
34	Niuli'i Stream	Test Unit 2	I	2	volcanic glass
32	Niuli'i Stream	Test Unit 2	I	2	metal button
31	Niuli'i Stream	Test Unit 2	I	2	charcoal
35	Niuli'i Stream	Test Unit 2	I	2	metal button
43	Niuli'i Stream	Test Unit 2	I	3	lithics
40	Niuli'i Stream	Test Unit 2	I	3	historic glass
39	Niuli'i Stream	Test Unit 2	I	3	charcoal
38	Niuli'i Stream	Test Unit 2	I	3	volcanic glass
37	Niuli'i Stream	Test Unit 2	I	3	lithics
44	Niuli'i Stream	Test Unit 2	I	4	charcoal

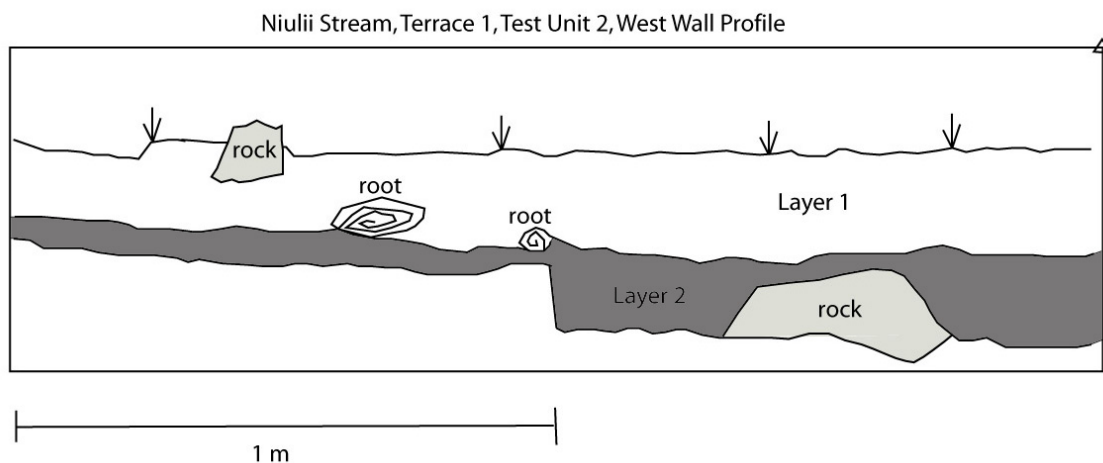


Figure 18. Stratigraphic profile of the west wall of Test Unit 2. Vertical provenience was not recorded during the drawing of this diagram.



Figure 19. View of Test Unit 2 at 40 cmbs, facing north.

Test Excavation 3 Results

Test Excavation 3 was located within the path of the 'auwai that feeds into the southern end of Terrace 5 on the western side of Niuli'i stream (Figure 2). The goal of this excavation was to produce a vertical profile of the 'auwai channel, and perhaps also collect deposits and charcoal that may have resulted from the flow of water in the 'auwai channel. The unit was 2 x 1 meters in size, and was oriented roughly east-west. Excavation utilized trowel and whisk broom, and deposits were screened through 1/8th inch mesh. Natural stratigraphy was followed and documented, and arbitrary levels of 10 cm were also used within the natural layers.

The initial surface deposit consisted of a thick layer of roots, bark, and leaves. The sediment was analyzed with a touch test, and determined to be a clayey loam, with 20-25% rock inclusion. Erosion from the substrate above (which had been cut back to form the 'auwai path) consisted of weathered subangular rocks, fragments of which had dropped into the surface deposit (Figure 20). By 10cmbs, a lens of loose, dark colored clay had been encountered in the center of the unit, trending in a roughly NW to SE direction. As the excavation continued, this layer expanded in depth and size. The excavation unit was halved laterally at this point, and excavation focused on the north half of Test Unit 3 only. The softer central layer, which was described as being dark and organic rich, continued as a vertical deposit to a depth of 30 cmbs. On either side of this deposit lay a layer of highly compacted brown silt.

The walls of Test Unit 3 were profiled, and samples of sediment were collected for future analysis. No artifacts were encountered during the excavation, however, the character of the sediment, as well as the stratigraphic profile of the unit, are indicative of the presence of a prehistoric 'auwai in this area (Figures 21, 22).

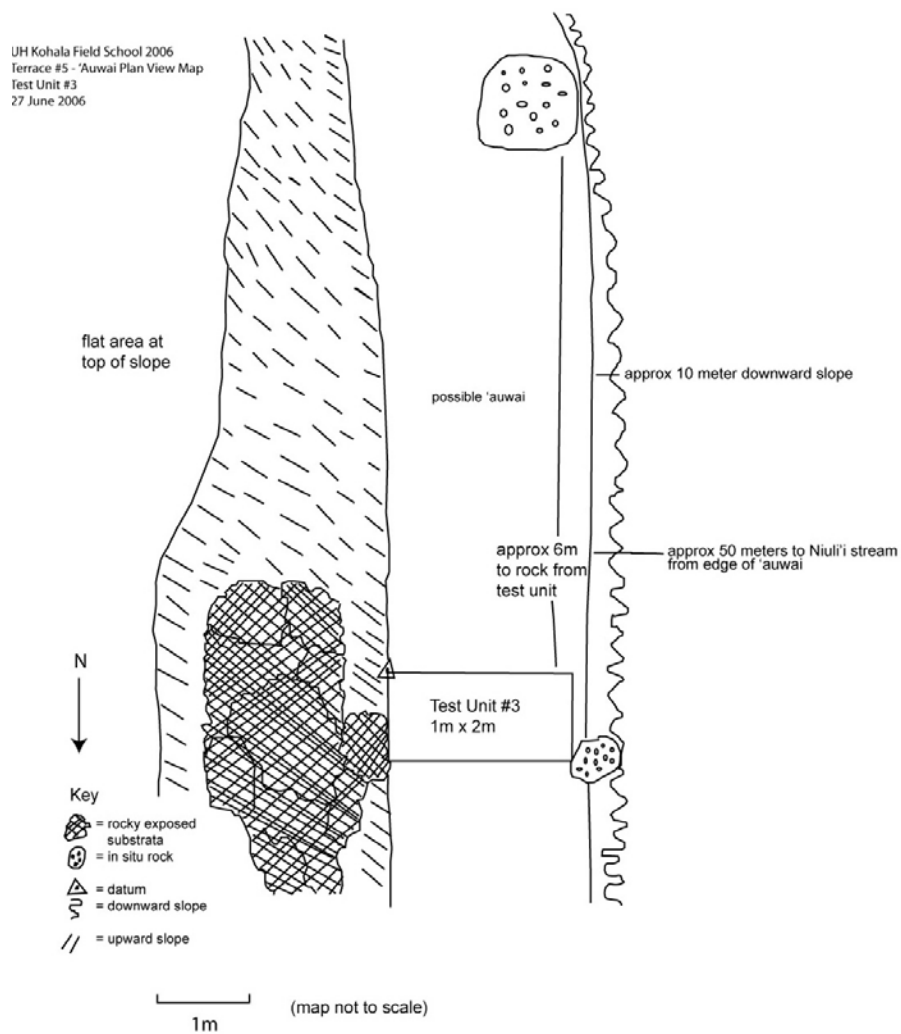


Figure 20. Sketch map of the location of Test Unit 3, along the path of the 'auwai for the Western Terraces.

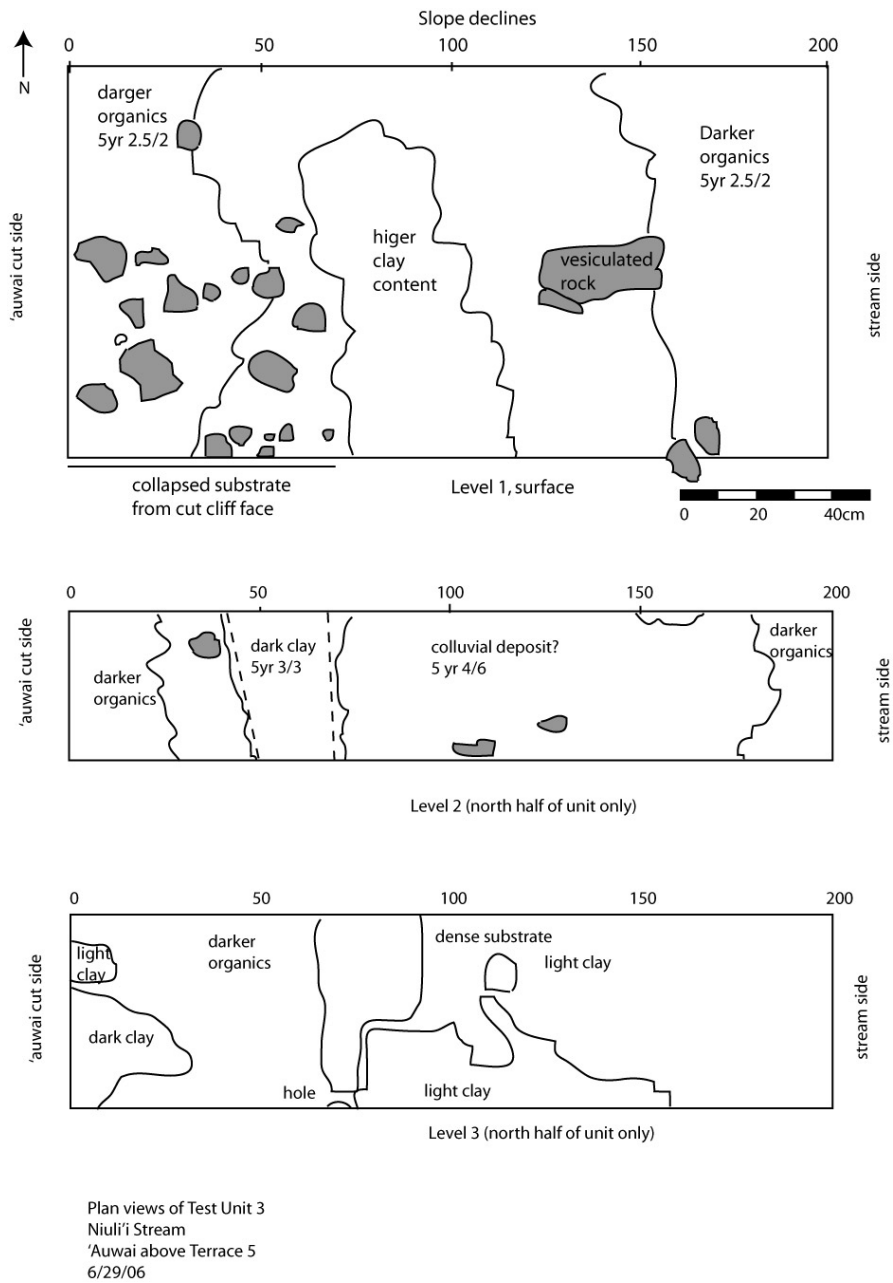


Figure 21. Plan views of Test Unit 3 at levels 1, 2, and 3.

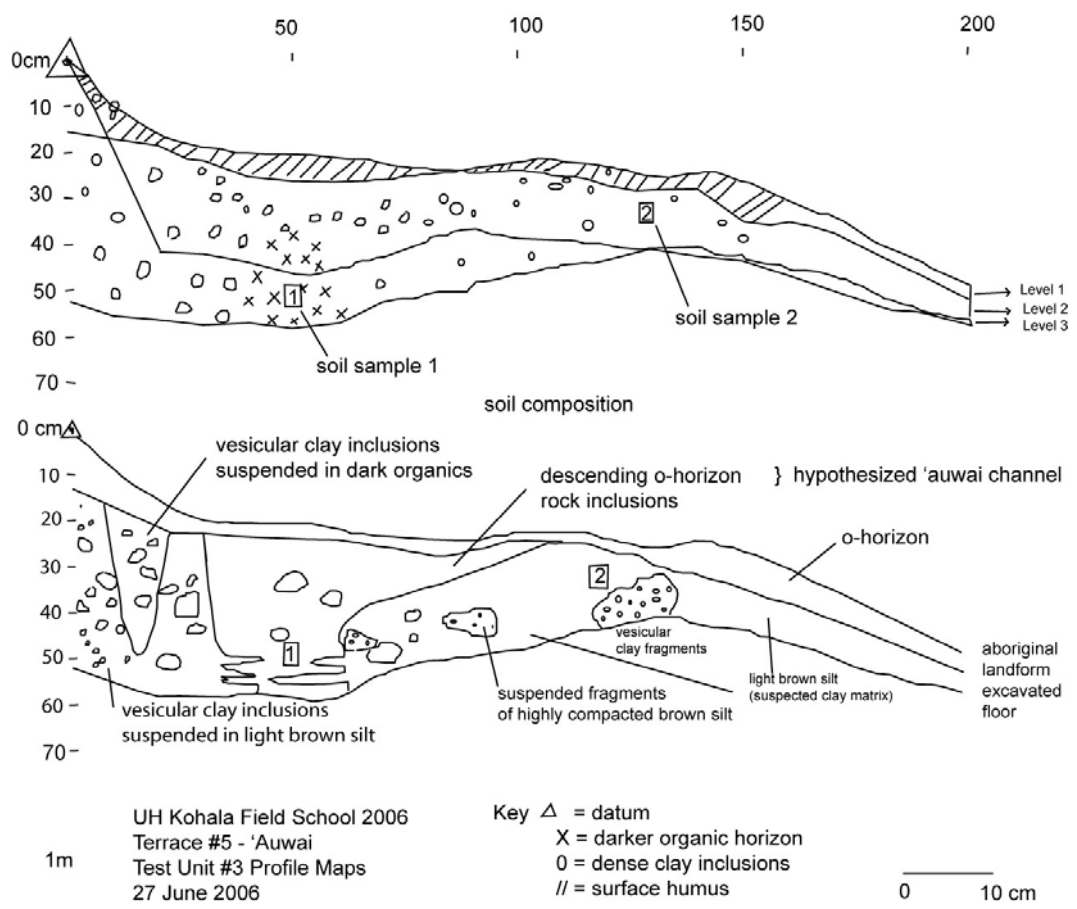


Figure 22. Profile of Terrace # 5 'auwai deposit, from Test Unit 3.

Radiocarbon dates for deposits at Niuli'i Stream

A single fragment of charcoal was recovered from level 4 of Test Unit 2, at a depth of 40 cmbs. This test unit was located at the foot of the 2nd of the large terraces on Niuli'i Stream, but was not directly beneath the terrace wall. Therefore, this fragment represents charcoal debris that collected in the pebbly floor of the lo'i when the lo'i land was being cleared and constructed.

This fragment of charcoal was identified by Gail Murikami of the IARII Wood Charcoal laboratory as a fragment of 'ohi'a lehua wood (*Metsideros polymorpha*). This fragment was then submitted to Beta Analytic for radiocarbon dating, which produced a determination of 260 +/- 40. With calibration, the calendar age for this charcoal is AD 1520-1960 (at 1 sigma).

As the terraces at Niuli'i contained no historic artifacts in the deeper deposits, it seems likely that they pre-date the contact period (ca. 1780). Thus the terraces were probably built sometime between AD 1520 and 1780.

Chapter 3: Conclusion

As a result of testing and mapping at Niuli'i Stream, the terraces appear to have been constructed sometime between AD 1520 and 1780. Although there is no date for the associated Kuapalaha Heiau, we surmise that the large terraces on the western side of the stream were associated with this heiau, due to the fact that the terraces are of large and consistent size.

Furthermore, the Niuli'i Terraces are part of a much larger system, which extends southwards into the property of Mrs. Nani Svendsen. Recent research in the Waikani Gulch, which feeds directly into Niuli'i Stream, has documented an even more extensive system of terraces (McCoy and Graves 2007). Further research and dating of other irrigated lo'i in Windward Kohala is forthcoming.

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