

FINAL—Archaeological Monitoring Report for Revegetation Efforts at the Hakioawa Watershed, Kaho‘olawe, Hawai‘i

TMK: (2) 2-1-001:001 (por.)



Prepared For:

Kaho‘olawe Island Reserve Commission
811 Kolu Street Suite 201
Wailuku, Hawaii 96793



June 2015

Keala Pono 

Cover Photo: Volunteers in the planting corridor northeast of Site 887. Orientation is to the northeast. Photo by Steven Eminger.

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MANAGEMENT SUMMARY

Archaeological monitoring was conducted at the Hakioawa Watershed on the island of Kaho‘olawe in response to a revegetation program spearheaded by the Kaho‘olawe Island Reserve Commission. A total of 37 archaeological features were previously recorded in the revegetation project area. They consist mostly of surface scatters of midden, lithic debitage, and traditional Hawaiian artifacts. Archaeological monitoring was conducted during four site visits to the island that took place between August 2014 and February 2015.

Of the 37 features, 22 were affected either by natural erosion or by the revegetation program. Recommendations were made to mitigate adverse effects to the features, and some of them were implemented over the course of the monitoring, with positive results. In general, it appears that the revegetation program is bringing about more good than harm, as natural erosion is the main factor contributing to site degradation.

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INTRODUCTION

At the request of the Kaho‘olawe Island Reserve Commission (KIRC), Keala Pono Archaeological Consulting conducted archaeological monitoring at the Hakioawa Watershed on the island of Kaho‘olawe. KIRC is currently conducting revegetation efforts in areas where archaeological sites have been previously identified. The archaeological monitoring was designed to document the current condition of the archaeological sites and to ensure that the revegetation efforts do not affect the sites.

This work is guided by the archaeological monitoring plan for reducing excessive sedimentation in the Hakioawa Watershed (KIRC 2013). The monitoring plan outlines the history of the project:

Prior to KIRC’s restoration initiatives, attention to site erosion on Kaho‘olawe was in response to requirements of the National Historic Preservation Act (NHPA) and National Environmental Protection Act (NEPA). In 1976 through 1980, The United States Department of the Navy funded an island wide inventory survey as required by NHPA and NEPA (Hommon, 1980). This inventory provided baseline information for resource management planning as also required by federal laws. In 1981, a list of sites endangered by erosion was compiled by the Navy and emergency data recovery excavations were conducted (Hommon, 1982; Rosendahl et al., 1987). In 1982, a Management Plan was completed by the Navy which recommended the implementation of five erosion control actions that would impede and eventually stop site destruction. These included: 1) establish ground cover; 2) apply mesh netting to exposed banks; 3) reduce/remove feral goats; 4) re-channel surface runoff; and 5) apply sterile soil to badly eroding site areas (Ahlo and Hommon, 1982).

Recommendations 1-4 were followed to varying degrees with varied success by the Navy. Item 5 was not implemented. Goats (*Capris hirca*) were eradicated by 1993 and thousands of tamarisk (*Tamarix aphylla*) and ironwood (*Casuarina equisetifolia*) trees were planted in win rows across the top of Moa‘ulanui. Mesh netting was used only in limited applications, primarily where archeological salvage excavations occurred. Surface run-off control was attempted through placement of tire check dams in gullies. Additional revegetation and erosion control projects were undertaken by the Native Hawaiian Plant Society, the U.S. Army Corp of Engineers, NiFTAL, and the Protect Kaho‘olawe Ohana (KIRC 2004; Giambelluca et al., 1997). Archaeological mitigation in the form of moving materials out of direct impact areas was conducted for some of these projects. (KIRC 2013:2–3)

This monitoring report begins with a description of the project area and a historical overview of land use and archaeology in the area. The next section delineates methods used in the fieldwork, followed by the results of the archaeological monitoring. Project results are summarized and recommendations are made in the final section. Hawaiian words and technical terms are defined in a glossary at the end of the document.

Project Location and Natural Environment

Kaho‘olawe is the smallest of the eight major islands of the Hawaiian archipelago. The island measures roughly 7 by 11 miles (11.3 by 17.7 km) and covers a total area of approximately 45 square miles (116.5 km²). The entire island is noted to be a single *ahupua‘a* within the larger district, or *moku*, of Honua‘ula of the neighboring island of Maui. Within the island-*ahupua‘a* of Kaho‘olawe are nine smaller land divisions, or *‘ili*. Hakioawa is one of the nine *‘ili*, and it sits on the northeast side of the island. Elevation ranges from sea level at Hakioawa’s coastline to 1,483 feet (452 m) above sea level at the slopes of Lua Makika Crater on the summit of Pu‘u Moa‘ulanui.

The Hakioawa Watershed project area consists of 109 acres (44 ha) on the north side of Kaho‘olawe (Figure 1). It is part of TMK: (2) 2-1-001:001, which encompasses the entire island (Figure 2). One of 24 watersheds on the island, Hakioawa consists of 766 acres (310 ha) from Lua Makika to the coast. Water comes from the Pu‘u Moa‘ulanui slopes, where surface water flows downhill after heavy rains. Since Kaho‘olawe lies on the leeward side of Maui’s towering Haleakalā volcano, it receives a relatively small amount of moisture, approximately 25 inches (63 cm) of rainfall annually. The island gets roughly 70% of this rainfall between November and March mostly from southerly storms (KIRC 2013). The slope of Hakioawa’s landscape varies from 0 to 20° and the temperature ranges from 66° to 79° F. (19° to 26° C).

Kaho‘olawe’s placement in the Hawaiian archipelago puts it at the tip of a funnel that channels winds toward the island at speeds as high as 31 miles (50 km) per hour. These strong winds along with occasional gusts contribute to significant soil erosion. The wind erosion compounded with sheet flow erosion on the weathered hardpan preceded by a history of overgrazing from the ranching period and bombing by the military leaves Kaho‘olawe in a dire situation (KIRC 2013). The lack of good soil has displaced native flora, and this dearth of flora can only sustain a limited amount of fauna. Approximately 80% of the island is topped with saprolitic hardpan, barren soil, or alien vegetation. Much of the eroded sediment has had an impact on Kaho‘olawe’s coastal waters, and ocean surveys have exposed dangerous unexploded ordnance (KIRC 1995).

Specifically, the Hakioawa project area contains 16 of the island’s 32 soil types (Figure 3). The 16 soil types listed in the USDA/NRCS’s *Special Soil Survey Report for Island of Kahoolawe, Hawaii* (n.d.:75) are as follows:

- 1 Typic Torriorthents, badland-Typic Haplotorrox-Rock outcrop complex, 10 to 30 percent slopes
- 2 Typic Torriorthents, badland-Typic Torriorthents, eolian, complex, 5 to 25 percent slopes
- 4 Beaches, 0 to 5 percent slopes
- 5 Typic Haplotorrox, 5 to 15 percent slopes
- 6 Typic Haplotorrox, wind polished, 3 to 12 percent slopes
- 7 Typic Haplotorrox, wind polished, 12 to 20 percent slopes
- 9 Typic Torriorthents, eolian, 3 to 15 percent slopes
- 13 Typic Torrifluvents, 0 to 6 percent slopes
- 16 Typic Haplotorrox, windblown, 3 to 12 percent slopes
- 17 Typic Haplotorrox, windblown, 8 to 20 percent slopes
- 18 Typic Haplotorrox, black subsoil, 8 to 20 percent slopes, gullied
- 20 Rock outcrop-Lithic Torriorthents complex, 50 to 150 percent slopes
- 23 Lithic Torriorthents-Rock outcrop complex, 5 to 15 percent slopes
- 24 Lithic Torriorthents-Rock outcrop complex, 15 to 30 percent slopes
- 25 Rock outcrop-Lithic Torriorthents complex, 30 to 50 percent slopes
- 27 Typic Torriorthents, saprolite-Rock outcrop complex, 5 to 20 percent slopes

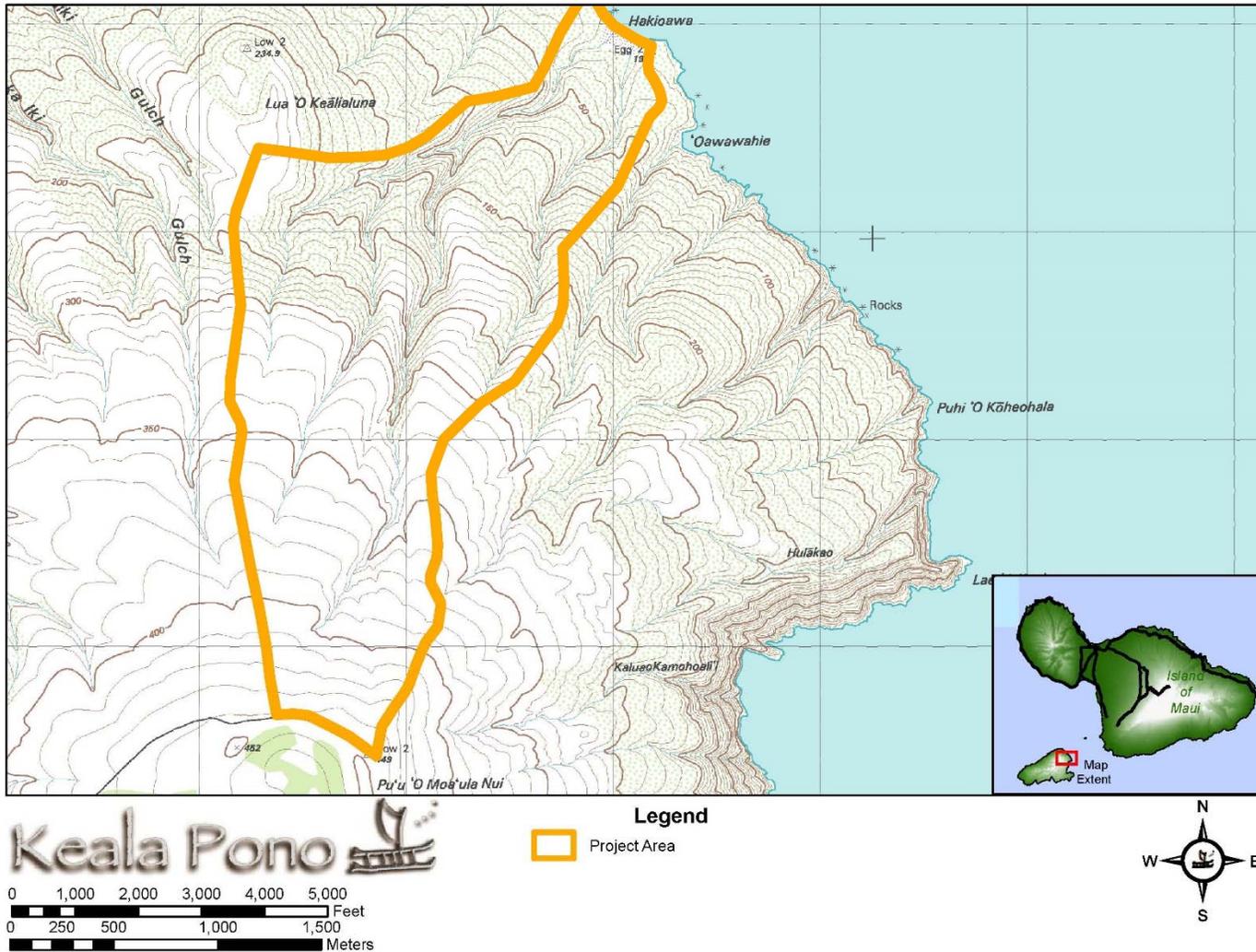


Figure 1. Location of the Hakoawa project area.

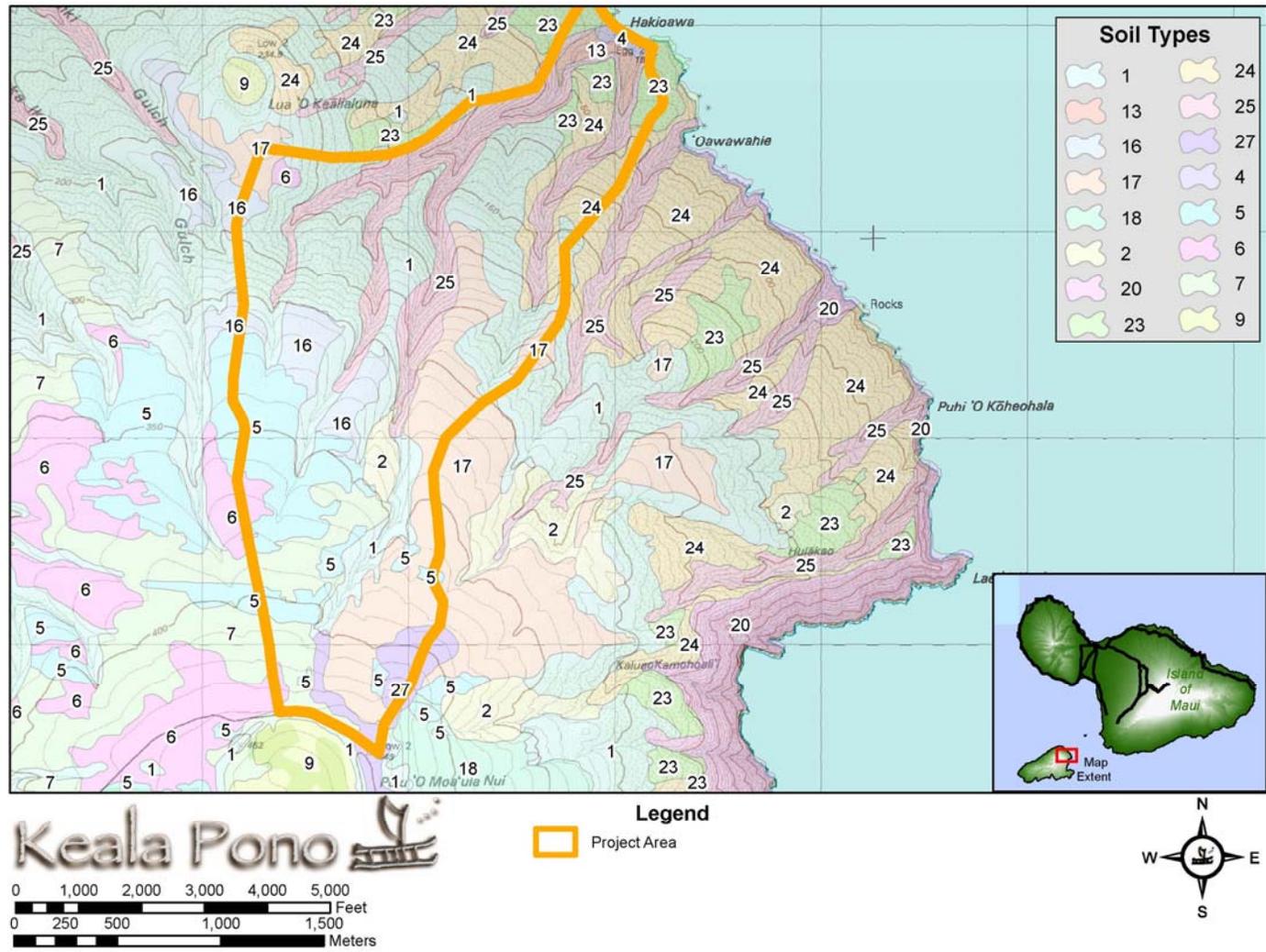


Figure 3. Soils within the Hakoawa project area (see text for descriptions).

BACKGROUND

Kaho‘olawe is a child of the sky father, Wākea. The island is one of the many body forms of Kanaloa, the deity associated with the ocean and all things of it, one of the four major Hawaiian gods. No other island in the Hawaiian chain has such a connection with the major deities.

Historically, Kaho‘olawe has a long and contentious past. Ranching and military use of the island brought about devastating changes to the natural and cultural landscape. The following is a discussion of the traditional and historic use of the island with a review of archaeological sites known for Hakioawa.

Kaho‘olawe in Traditional Times

Traditional accounts say that the island of Kaho‘olawe is the child of Wākea, the sky father. Some accounts say Papa is Kaho‘olawe’s mother; some say it is Hina. Tradition also places Kaho‘olawe as the setting for the exploits of many spirits, gods, and goddesses for it was one of their dwelling places. As the Hawaiian Islands became settled by mankind, those of the spirit world continued to dwell on Kaho‘olawe. Fornander published another account of the genesis of the island:

Kahoolawe is said to be the child of Keaukanai, the man, and Walinuu, the wife, from Holani; and the epithet of the island-child is “the farmer”—*he lopa*. Molokini has no separate settlers, but is called the navel-string—*iewe*—of Kahoolawe. (Fornander 1878:12)

Although the initial Polynesian settlement of the islands may have been as early as AD 200, Kaho‘olawe does not appear to be settled until AD 1000, with habitation along its coast (KICC 1993). Interior areas were not settled until around AD 1200 to 1400, however, and this coincided with an increase in the cultivation of dryland crops such as *‘uala*. Around the same time, Kaho‘olawe also seemed to gain importance as a training center for traditional navigation. Kaho‘olawe was known as the place of embarkation for voyaging to Tahiti as passed down through *mo‘olelo*:

When Kila was grown up he in turn sailed on an expedition to Tahiti, taking his departure, it is said, from the western point of Kahoolawe, for which reason that cape is to this day called Ke-ala-i-kahiki. (Malo 1903:26)

By the mid-17th century, the settlement at Hakioawa acquired prominence as the island’s religious and political center. Habitation sites, *heiau*, shrines, midden and lithic scatters, petroglyphs, and human burials are among the vestiges of pre-contact use of Hakioawa (Kirch 1985:150). In the latter half of the 18th century, Hawai‘i Island’s Chief Kalaniōpu‘u invaded Kaho‘olawe during his skirmishes against Maui’s Chief Kahekili. It appears that the island was not bountiful during this time:

On hearing of this new invasion, *Kahekili* sent troops to Kaupo, and apparently cleared the country of the invaders, for it is said that *Kalaniopuu* left Kaupo, and made his next descent on the island of Kahoolawe, and, not finding much booty there, steered for Lahaina, whither *Kahekili* and the Oahu auxiliaries hastened to oppose him. (Fornander 1878:156)

A few decades later, Kaho‘olawe was caught up in the warfare brought on by Hawai‘i Island’s Chief Kamehameha as he sought to unify the islands. Around the time of Kamehameha’s unification efforts, the first foreigners arrived in Hawai‘i, and the diseases brought by the foreigners along with the strain of interisland warfare drastically reduced Kaho‘olawe’s population. In addition, many of Kaho‘olawe’s inhabitants emigrated to other islands. By 1805, the island’s population stood at only 160 (KICC 1993).

Post-Contact History and Land Use

In the little more than two centuries since the arrival of Westerners to Hawai‘i’s shores, Kaho‘olawe has had a history remarkably different from the other main Hawaiian Islands. This is due largely in part to the influence of foreigners in the islands. Like Ni‘ihau, Kaho‘olawe supported the ranching industry rather than the sugar and pineapple enterprises that the rest of Hawai‘i is known for. But besides a history of ranching, only Kaho‘olawe was designated a place of exile for male criminals, and 80 years later, only Kaho‘olawe became an island-wide forest preserve. In addition, Kaho‘olawe was the only island that the U.S. government confiscated in its entirety for military purposes. As a result of the grass roots struggle to stop the military from using the island as a live-fire munitions target, Kaho‘olawe has become an important rally point of the native Hawaiian sovereignty movement. Kaho‘olawe, the smallest of Hawai‘i’s eight major islands, has survived a unique post-contact history and stands today as a significant symbol for the native Hawaiian people.

Early Contact Period

Kaho‘olawe’s sparse population is noted in its earliest documentation by Western explorers. The accounts of Cook, Vancouver, Freycinet, and Kotzebue convey images of a barren island with few or no residents. The early Westerners probably had their perceptions of Kaho‘olawe skewed because they skirted the lesser inhabited sides of the island. But in the end, Kaho‘olawe’s remote and isolated population served as a refuge for traditional practices and beliefs after the 1819 widespread abolishment of the traditional socio-religious system by Kamehameha II (KICC 1993).

Missionary Era

Coincidentally, a year after Kamehameha II’s defiance of the traditional religion, the first Puritan missionaries from New England arrived. Their work on Kaho‘olawe was part of the Maui mission under the direction of Reverend William Richards. Rev. Richards started his work on Kaho‘olawe in 1825, and in three years, he opened a school on the island which stayed in operation until 1838. In addition, with the kingdom’s pro-Protestant stance under the influence of Kamehameha II’s regent, Queen Ka‘ahumanu, passed an edict in 1829 which banished Catholics to Kaho‘olawe. Whether or not this edict made the island an important place in the kingdom’s criminal justice system, it eventually was designated to be a penal colony for native and non-native criminal men. Records show that in 1840, the penal colony numbered 80 individuals with a Maui native, Kinimaka, in charge. The colony was based on Kaho‘olawe’s northern shore at Kaulana Bay. It stayed in existence as a penal colony until 1853 when the Privy Council pardoned all exiles still living there (KICC 1993).

First Ranching Era

The dismantling of the penal colony in 1853 came after a radical change in the traditional land tenure system brought about by the Māhele of 1848. The Māhele designated Kaho‘olawe to be part of the kingdom’s government lands, and the King’s Privy Council decided to lease the island to others. Kamehameha V sent a team to survey the island in 1857 and 1858, and in April of 1858, a lease agreement was signed by Robert C. Wyllie. Wyllie turned Kaho‘olawe into a large sheep ranching operation. When Wyllie’s sheep were stricken with scabies the following year, he began to sublease the island to other ranchers. A government census in 1866 enumerated a population overwhelmingly made up of ranchers. By 1884, Kaho‘olawe’s ranching enterprises had ballooned to 9,000 goats and 12,000 sheep. The resultant overgrazing led to massive soil erosion. In the 1880s, the ranchers were the first to address the island’s erosion problem by planting new vegetation which included the introduced mesquite trees or *kiawe* (KICC 1993).

Overthrow and Annexation Period

In 1893, the Hawaiian monarchy was overthrown, and a government run by American and European foreigners took over. Five years later, their newly formed Hawaiian government managed to orchestrate the annexation of the Hawaiian Islands by the U.S. government. As a result, the government lands, which included Kaho‘olawe, were first taken by the newly formed Hawaiian government of 1893, and later transferred to U.S. federal control after the annexation. The U.S. put the management of Kaho‘olawe into the hands of Hawai‘i’s local pro-American territorial government. Under territorial management, the ranching operations on Kaho‘olawe continued until 1910, first with Benjamin Dillingham, then with Eben Low (KICC 1993).

Forest Reserve Period

By 1910, the Territorial Board of Agriculture had become concerned about the devastation caused by decades of overgrazing on Kaho‘olawe. A move was made to designate the island as a forest reserve. Territorial and federal officials discussed solutions for revegetation and wanted to use a reforested Kaho‘olawe to bring back the rains. However, the governor of Hawai‘i revoked Kaho‘olawe’s forest reserve status in 1918 after he realized that the federal officials were not going to provide financial support for the efforts. The island’s fate went to the Commissioner of Public Lands, and it was offered up for public lease again (KICC 1993).

Second Ranching Era

The Commissioner of Public Lands crafted a lease agreement whereby the lessee would have to keep his cattle to no more than 200, eliminate the goat population, and revegetate the land using *kiawe*. The lease stipulations were agreed to by Angus MacPhee in December 1918. MacPhee partnered with Harry Baldwin and formed the Kaho‘olawe Ranch Company, and their lease stayed in effect until 1952. The Kaho‘olawe Ranch Company established its center of operations on the north side of the island at Kuheia Bay. Operations were managed by Mr. and Mrs. Manuel Pedro and Hattie Ko‘opua, who raised their family there until 1941 when World War II forced the ranch’s closure (KICC 1993).

Military Era

Even before World War II, sources reveal that Harry Baldwin made a deal with the U.S. military to allow them to use Kaho‘olawe for practice bombing as early as the 1920s and 1930s. On May 10, 1941, Baldwin and MacPhee committed to a formal agreement with the military. The agreement, which accepted the request of the U.S. military to continue its bombing of Kaho‘olawe, was signed at a cost to the U.S. of \$1.00 per year. However, the contract became moot after the attack on Pearl Harbor when the military took complete control, martial law was declared, and all ranching operations on the island were shut down. Kaho‘olawe became the live-fire training grounds of the U.S. Navy, Marines, and Army forces; the Air Force was not separate from the Army at the time. After the war’s end, territorial officials began discussing ways to rehabilitate Kaho‘olawe to good health. However, the military continued to target the island with live-fire exercises. Finally in 1953, President Eisenhower signed Executive Order #10436 which kept Kaho‘olawe under the control of the Secretary of the Navy and allowed for continued military training on the island (KICC 1993).

The Return of Kaho‘olawe

Public sentiment against the military’s continued use of Kaho‘olawe became more vocal over the decades following the war. In September 1970, U.S. Senator Hiram Fong formally asked the Navy to stop their bombing of the island. The following year, Maui Mayor Elmer Cravalho and the local

organization, Life of the Land, sued to stop the bombing. Cravalho's case was dismissed, but the Navy was ordered to complete an Environmental Impact Statement (EIS) for their activities. From 1976 to 1977, the public organized numerous landings on Kaho'olawe's shores to protest the bombing. In 1976, Dr. Emmet Aluli and the Protect Kaho'olawe 'Ohana (PKO) filed a new lawsuit asking the Navy to correctly address environmental protection, historic preservation, and religious freedom concerns. As a result of that lawsuit, the Navy was required to inventory and protect all historic sites on the island in addition to generating their EIS. Tragically, in 1977 two members of the PKO, George Helm and James Kimo Mitchell, died during their efforts to protest the bombings.

The following year, the U.S. Navy and the State of Hawai'i outlined steps they would cooperate on to rehabilitate the island in their joint Memorandum of Understanding. In 1980, as a result of the Aluli/PKO lawsuit, the Navy was further mandated to clear ordnance, limit future bombing to a smaller area, start revegetation and soil conservation efforts, eradicate goats, and allow PKO access to the island. In 1981, also a result of the PKO lawsuit, the entire island became officially listed as a Historic District on the National Register of Historic Places. Finally in 1990, President George Bush halted the military's use of Kaho'olawe as a weapons range, and Congress created the Kaho'olawe Island Conveyance Commission to facilitate fulfilling the earlier mandates and returning Kaho'olawe to the State of Hawai'i (KICC 1993).

In 1994, a Memorandum of Understanding was signed by Governor Waihe'e, representatives of the Navy, and the newly formed Kaho'olawe Island Reserve Commission (KIRC). This memorandum recognized KIRC's administrative role over the island, PKO's stewardship role, and stipulated the Navy's return of Kaho'olawe to the State of Hawai'i in 10 years (KIRC-Navy 1994). Access control was finally returned to the State of Hawai'i in 2003.

Previous Archaeology

According to archaeological reports found at the State Historic Preservation Division (SHPD) in Kapolei, O'ahu, there has been relatively little archaeological work done on Kaho'olawe compared to other islands in the chain. As with other parts of the state, J.G. McAllister's pioneer efforts to identify archaeological and cultural sites on the island paved the way in 1933. McAllister stayed on the island for only one week, and he recorded 50 sites (1933). Following McAllister's work published in *Archaeology of Kahoolawe*, no records were found to document any archaeology done on the island for several decades. Perhaps this is due to the tight control and strict access imposed by the military administration. The recommencement of archaeological work on Kaho'olawe appears to reflect the birth of the grass roots movement to take the island out of military hands in the late 1970s and early 1980s. And in 1981, the entire island was listed on the National Register of Historic Places (NRHP).

At this time, intensive surveys were conducted for the U.S. Navy. Spanning four years, the surveys identified 544 sites, composed of 2,337 individual features (Hommon 1980a, 1980b; Barrera 1984). A settlement pattern model was developed for the island based on this research (Hommon 1980a). It divides Kaho'olawe into three zones. The Coast (Zone I) is a stretch of shoreline along the perimeter of the island that is 400 m wide or less. Most surface architecture is found within this zone, such as *heiau* and *ko'a*. Sites are most dense in Ahupū, Hakioawa, and Honokoa. Moving inland is Zone II, the Intermediate Settlement Zone. Archaeological sites are generally scarce in this region. Beyond this is Zone III, the Inland Settlement Zone. This zone is characterized by archaeological sites concentrated on the eastern interior uplands. Many of the sites are remnants of fire features or activity areas. Marine shell midden, basalt and volcanic glass debitage, and other artifacts are often associated with the sites. Adze quarries at Pu'u Mōiwi are another site type located within Zone III. Some of the quarry areas are extensive, with basalt debitage and adzes in various stages of manufacture evident on the surface.

A chronological sequence has also been developed for the island (Hommon 1980a). It consists of four phases. Phase I, from ca. AD 1000–1400 is when the island was first settled and small communities were set up, initially in the Coastal Zone and later expanding inland. Population was low during Phase I. Phase II spanned from AD 1400–1550. This was a time of a substantial shift in the distribution of Kaho‘olawe’s population, likely triggered by population growth and rapid agricultural development in the island’s interior. It has been posited that vegetation clearing and burning for sweet potato cultivation and other crops initiated environmental degradation of the island at this time (Hommon 1980a:59). During Phase III, from AD 1550–1650, there was a rapid decline in population in the island’s interior and more nucleated settlement at Hakioawa. This was probably in response to the environmental changes brought about by cultivation of the inland region. Finally, Phase IV, from AD 1650–1779 saw complete abandonment of the interior, with a small population of roughly 60 coastal residents on the entire island at the time of Western contact.

More recent work on the island was conducted in association with unexploded ordnance clearing in the 1990s (e.g., Hammatt et al. 1996; Hammatt et al. 1999; Hammatt et al. 2001). Work consisted of archaeological assessment, survey, site documentation and protection, as well as data recovery. The entire island was surveyed, and nearly 1,500 historic properties were recorded and protected during clearance of unexploded ordnance.

Cultural Resources in the ‘Ili of Hakioawa

Regarding the island of Kaho‘olawe, Kirch states that “the largest single concentration of sites is at Hakioawa Bay, facing Maui, where two gulches with intermittent streams converge at a large beach suitable for canoe landing” (1985:150). The NRHP inventory form for Site 356 lists this as the “politico-religious center of the island.” Focusing on the project area, 24 known archaeological sites consisting of 37 features have been identified in the vicinity of the revegetation efforts (Figure 4). The following site descriptions are based on information compiled by KIRC (n.d.).

Site 150

Two features of Site 150, Features G and H, are described for Hakioawa. Feature 150G consists of several surface scatters of mostly large, medium, and small fine-grained basalt flakes. There are also volcanic glass flakes present and evidence of tool production. Of the artifacts identified at this feature, there are eight adze preforms, an adze, two coral abraders, two hammerstones, a biface, a basalt awl, an *‘ulu maika*, and three miscellaneous artifacts.

Site 401

A total of seven features of this site, 401E–K, are described for the Hakioawa project area. Feature E of Site 401 is a scatter of fractured basalt, basalt flakes, volcanic glass flakes, waterworn cobbles, branch coral and head coral fragments, and shell midden (*Cellana*, *Thaididae*, and *Cypraea* spp.). Of the artifacts identified at this feature, there are two adze preforms, a hammerstone, and a basalt scraper.

Feature H of Site 150 consists of three cultural material scatters: H1, H2, and H3. The scatters of fine-grained basalt flakes, fractured basalt, volcanic glass flakes, and marine shell pieces are situated at the top of Moaulanui’s crater rim. The portion of the scatter that is on the north of the road is considered to be part of Site 401. Artifacts at Feature H of Site 150 consist of a hammerstone, a biface, a basalt bread-loaf sinker, and ten adze preforms.

Feature F of Site 401 is a scatter of fractured basalt and basalt flakes, and of shell midden (*Cellana*, *Thaididae*, and *Cypraea* spp.). Artifacts include a hammerstone, a biface, and two basalt cores.

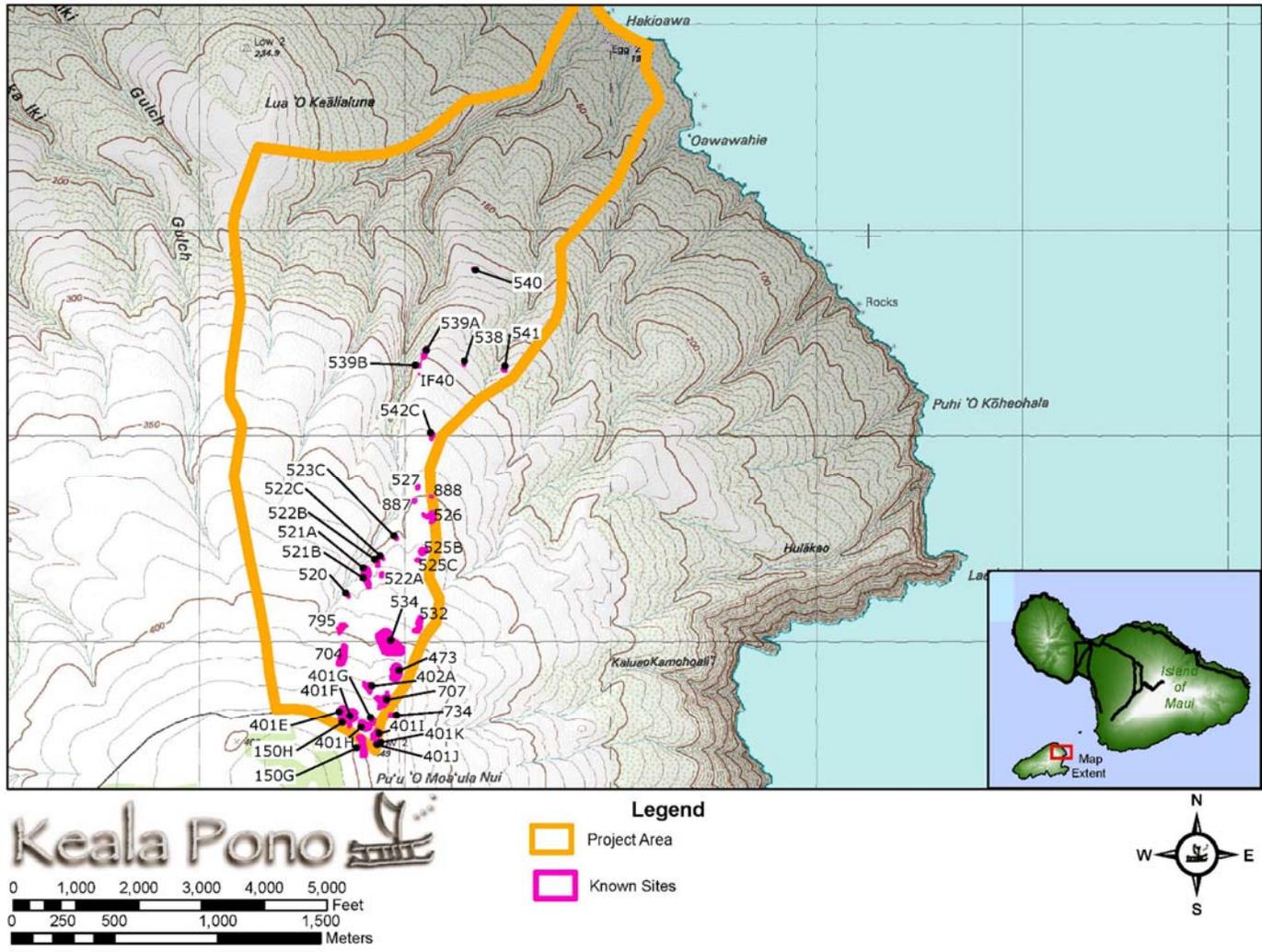


Figure 4. Known archaeological sites in proximity to revegetation efforts.

Feature G of Site 401 is a surface scatter of cultural material. An adze preform and a basalt biface are the artifacts that were recorded.

Feature H of Site 401 is another scatter of cultural material. Of the artifacts identified at this feature, there are two hammerstones, an adze preform, an *'ulu maika*, and a miscellaneous artifact.

Feature I of Site 401 is a surface scatter of cultural material. The artifacts identified at this feature consist of an adze, an adze preform, a coral abrader, three basalt cores, and four hammerstones.

Feature J of Site 401 is another surface scatter. Cultural material includes fractured basalt, basalt flakes, basalt cores, volcanic glass fragments, and shell fragments (*Cellana* sp.). Artifacts consist of a basalt core and a hammerstone.

Feature K of Site 401 is another scatter of cultural material. Artifacts include an adze, two basalt cores, and two hammerstones.

Site 402

Feature A of Site 402 is recorded within the Hakioawa project area. It consists of a scatter of fractured basalt, basalt flakes, and shell midden. The scatter is situated on the west side of a gully and amid hummocks. On the northeast side of one of the hummocks is a fire pit consisting of charcoal, fire cracked rock, and reddened fire-altered soil. The fire pit is 50 cm long by 12 cm thick, and it is situated 50 cm below the surface.

Site 473

Site 473 is a high-density scatter of fractured basalt, basalt flakes, volcanic glass flakes, volcanic glass cores, branch coral fragments, head coral fragments, and marine shell midden. Of the artifacts identified at this site, there is a basalt awl, two adze preforms, three basalt scrapers, four basalt cores, five coral abraders, seven hammerstones, and three miscellaneous artifacts.

Site 520

Site 520 consists of a scatter of fractured basalt, basalt flakes, volcanic glass flakes and cores, waterworn basalt cobbles, and shell midden. The scatter is situated on an eroded hardpan at the head of Hakioawa Gulch. A basalt biface was the only artifact recorded.

Site 521

Two features of this site, 521A and B, are described for Hakioawa. Feature A of site 521 is a scatter of fractured basalt, basalt flakes and cores, volcanic glass flakes and a core, waterworn basalt pebbles, coral fragments, and shell midden (*Thaididae* and *Cellana* spp.).

Feature B of Site 521 is a scatter of fractured basalt, basalt flakes and cores, volcanic glass flakes and cores, waterworn pebbles, coral fragments, and shell midden (*Thaididae*, *Cellana*, *Cypraea*, and *Peritus* spp.). Artifacts include two volcanic glass cores and six basalt cores. At the west end of the site is a hummock containing two separate visible charcoal lenses.

Site 522

Three features, A–C, are described for Site 522 in Hakioawa. Feature 522A is a scatter of fractured basalt, basalt flakes and cores, volcanic glass flakes and cores, coral fragments, and shell midden

(*Thaididae* and *Cypraea* spp.). Of the artifacts identified at this feature, there is an adze preform, a volcanic glass core, a basalt awl, and a retouched basalt flake.

Feature B of Site 522 is a scatter of fractured basalt, basalt flakes and cores, volcanic glass flakes and cores, and shell midden (*Thaididae*, *Cellana*, and *Cypraea* spp.). Artifacts consist of a biface, a bread loaf sinker, two retouched flakes, two basalt hammerstones, two volcanic glass cores, and three basalt cores.

Feature C of Site 522 is a scatter of fractured basalt, basalt flakes, coral fragments, and shell midden (*Cypraea* spp.). Evidence of water erosion on this feature is shown by the many pieces of fractured basalt situated downslope in gullies that run through the site. A polishing stone and a basalt awl were the artifacts recorded.

Site 523

Feature B of Site 523 is located within Hakioawa. It consists of a scatter of basalt, volcanic glass, and other cultural material. Artifacts include two basalt awls and a coral abrader.

Site 525

Two features of this site, 525B and C, are described for the project area. Feature B of Site 525 is a scatter of fractured basalt, basalt flakes, and shell midden (*Thaididae* and *Cypraea* spp.). Artifacts identified at this feature are two coral abraders, two adze preforms, and four basalt cores.

Feature C of Site 525 is a scatter of volcanic glass flakes, basalt flakes, and fractured basalt.

Site 526

Site 526 consists of a scatter of fractured basalt, basalt flakes, and shell midden (*Cypraea*, *Cellana*, *Thaididae*, and *Cassis* spp.). Artifacts consist of a cowrie shell lure, a basalt core, two basalt awls, two basalt hammerstones, and two coral abraders.

Site 527

Site 527 is a scatter of fractured basalt, basalt flakes and cores, volcanic glass flakes and cores, coral fragments, shell midden (*Cypraea* and *Thaididae* spp.), and a waterworn pebble. The scatter consists of a 4 m by 4 m concentration of fractured basalt flanked by two smaller concentrations of volcanic glass flakes on the north and south. Artifacts include two volcanic glass cores, two basalt cores, and two basalt awls.

Site 532

Site 532 is a scatter of fractured basalt, basalt flakes, and shell midden (*Cypraea* and *Cellana* spp.). It is situated on the eastern slope of Moa'ulanui. Of the artifacts identified at this site, there is a basalt awl, a basalt breadloaf sinker, a basalt adze, two coral abraders, three basalt hammerstones, and eleven basalt cores.

Site 534

Site 534 is a scatter of fractured basalt, basalt flakes, volcanic glass, and marine shell midden. Artifacts include a scraper/utilized flake, two coral abraders, two basalt cores, two basalt awls, three hammerstones, three adzes, and four adze preforms.

Site 538

Site 538 consists of a surface scatter of small fractured basalt cobbles and a small basalt flake.

Site 539

Two features of this site, 539A and B are described for Hakioawa. Feature A of Site 539 is a scatter of basalt flakes and porous fractured basalt.

Feature B of Site 539 is a surface scatter of fractured basalt and two basalt flakes.

Site 540

Site 540 is a scatter of fractured basalt and basalt flakes. An awl and '*ulu maika* made of basalt were identified.

Site 541

Site 541 is a scatter of fractured basalt, basalt flakes, volcanic glass flakes, and shell midden (*Cypraea* and *Thaididae* spp.). There is a visible charcoal lens possibly from a fire pit on a hummock on the southern part of the site. Of the artifacts identified at this site, there are three basalt awls, a broken adze, and a fragment of an adze grinding stone.

Site 542

Feature C of Site 542 is located within the Hakioawa project area. It consists of a scatter of fractured rock, basalt flakes and cores, volcanic glass flakes and cores, coral fragments, and shell midden (*Cellana*, *Cypraea*, and *Thaididae* spp.). Artifacts consist of an adze preform, a basalt awl, a basalt hammerstone, a basalt core, three volcanic glass cores, two coral abraders, and an '*ulu maika*.

Site 704

Site 704 is a surface scatter of fractured basalt, basalt flakes, volcanic glass flakes, coral fragments, and marine shell midden.

Site 707

Site 707 is a scatter of fractured basalt, basalt flakes, volcanic glass flakes, and shell midden (*Thaididae*, *Cellana*, and *Cypraea* spp.). Artifacts include a biface, a volcanic glass core, a hammerstone, two basal awls, and three coral abraders.

Site 734

Site 734 is a scatter of fractured basalt, basalt flakes, basalt cores, and shell midden (*Thaididae* spp.). Artifacts consist of a hammerstone and an adze preform.

Site 795

Site 795 is a scatter of fractured basalt, basalt flakes and cores, volcanic glass flakes and cores, and shell midden (*Cellana* and *Thaididae* spp.). Artifacts include a basalt adze preform and a basalt awl.

Site 887

Site 887 is a scatter of fractured rock, basalt flakes and cores, volcanic glass flakes, coral fragments, shell midden (*Cypraea* and *Thaididae* spp.), and a waterworn pebble. Artifacts consist of a basalt core and a basalt awl.

Site 888

Site 888 is a scatter of fractured basalt, basalt flakes, volcanic glass flakes, and volcanic glass cores. Of the artifacts identified at this site, there is a basalt core, a basalt awl, and a basalt hammerstone.

IF 40

IF 40 was not assigned a site number because it is an isolated surface find, or individual find (IF). No published data was found for the artifact and exactly what it is remains undetermined.

Summary of Background Research

Kaho‘olawe’s nickname, The Target Island, is a testament to the thoughts this name evokes. Instead of a nickname that reflects its sparsely vegetated terrain, its windswept coasts, or some other aspect of the physical landscape or seascape, its nickname references its recent military presence. Yet, since time immemorial Kaho‘olawe has had an important role in traditional Hawaiian cosmology. Throughout the centuries of initial settlement from other Pacific Islands, Kaho‘olawe welcomed and nurtured its inhabitants and their descendants. By the time of Western contact, generations of *po‘e Kaho‘olawe* or Kaho‘olawe peoples had developed an intimate relationship with the island. Even after Protestant missionaries and ranching businessmen made their way there, the Kaho‘olawe people adapted to the newcomers. It was not until the 20th century that any and all Hawaiians on Kaho‘olawe were forced to permanently move elsewhere in the wake of the U.S. military’s plans for the island. Despite decades of no civilian population, Kaho‘olawe retains the memory of its original people through its countless cultural material scatters, traditional agricultural and ceremonial features, and numerous other archaeological sites. Since the military returned the island to the State of Hawai‘i, Kaho‘olawe has entered the 21st century as a focal point for native Hawaiian issues. Plans have now moved forward to rehabilitate the island through community efforts and to use Kaho‘olawe as a learning center for future generations. Archaeological research has identified 37 features in the vicinity of the revegetation efforts in Hakioawa. They are mostly surface artifact scatters of varying density, made up of material such as marine shell midden, basalt and volcanic glass flakes and other artifacts.

METHODS

Archaeological monitoring took the form of four four-day site visits between August 2014 and February 2015. Windy McElroy, PhD conducted the first site visit from August 19–22, 2014. Dietrix Duhaylonsod, BA completed a site visit from October 14–17, 2014. Steven Eminger conducted the November 18–21, 2014 site visit. Leischene Calingangan, BA, completed the final site visit on February 10–13, 2015. The total number of monitoring days during this period was 12 days, as the final day of each trip was spent preparing for the journey home. Windy McElroy, PhD, served as Principal Investigator, overseeing all aspects of the project.

Archaeological monitoring was guided by a SHPD-approved monitoring plan (KIRC 2013). The purpose of the plan was to “provide guidelines and procedures for archaeological support to ensure that ecosystem restoration and erosion control measures have a beneficial effect on the archaeological sites located within the Hakioawa watershed restoration project area...” (KIRC 2013:1). As stated in the plan, the goals of the archaeological monitoring were to “monitor the condition of sites that are being impacted by erosion; and...to monitor the activities and results of the revegetation program, and provide assistance in that undertaking” (KIRC 2013:14).

Revegetation work included moving irrigation lines, placing mulch material in planting corridors, constructing wattles, and securing sandbags and gabions (Figures 5 and 6). No subsurface ground disturbance was conducted.

The scale in all field photographs is marked in 10 cm increments. The north arrow on all maps points to magnetic north. Throughout this report rock sizes follow the conventions outlined in *Field Book for Describing and Sampling Soils*: Gravel <7 cm; Cobble 7–25 cm; Stone 25–60 cm; Boulder >60 cm (Schoeneberger et al. 2002:2-35). No material was collected and no laboratory analyses were conducted.



Figure 5. Moving a water line along the access road. View is to the north.



Figure 6. Volunteers extending the wattles at Site 704 to prevent artifacts from eroding downslope. View is to the east.

RESULTS

Over the course of the four site visits, 34 of the 37 archaeological features were examined. Sites 532, 540, and 541 were not visited because there was no revegetation activity occurring in the vicinity of the sites. A total of 22 features were affected either by natural erosion or by the revegetation program. (Table 1). Recommendations were made to mitigate adverse effects to the features, and some of them were implemented over the course of the monitoring, with positive results. In general, it appears that the revegetation efforts are inducing more good than harm, as natural erosion is the main factor contributing to site degradation. Nevertheless, there are areas in which the revegetation program can improve with regard to archaeological site protection, and these are noted in the recommendations (see Table 1). Details on the current condition of archaeological features, effects on the features, and recommendations are discussed in the following paragraphs.

Site 150

Feature G and H of Site 150 consist of several surface scatters of cultural material. Feature G is located outside the area of revegetation, however several irrigation lines from previous revegetation projects are going through the feature. Very sparse cultural material was noted during the site visit.

Feature H of Site 150 was not impacted by revegetation activity but is located near areas where revegetation efforts are occurring. Very scattered cultural material was noted on either side of the road (Figure 7).

Site 401

A total of seven features of this site, 401E–K, are described for the Hakioawa project area, all surface scatters of cultural material. Features E and I are not being impacted by vegetation efforts but are located nearby. They all consist of very sparse surface material (e.g., Figure 8). Feature F is also not being impacted but is nearby revegetation activity areas. This feature consists of sparsely to moderately scattered cultural material (Figure 9).

Feature 401G is outside the area currently being revegetated, although irrigation lines from a previous undertaking run through the feature and swales made of *kiawe* branches wrapped in sheets are nearby (Figure 10). Sparse cultural material was observed at the site.

Feature 401H consists of very sparse cultural material. An irrigation line cuts directly through the site (Figure 11). Installation of this line was not monitored, but cultural material was moved from the direct route of the line by KIRC staff and volunteers. This was done in response to recommendations from SHPD so that cultural material would not be damaged by the line.

During the final site visit in February 2014, it was noted that Features 401J and K were affected by the revegetation program, as they are now overgrown and could not be located. This result of the revegetation activity was expected and actually hoped for so that erosion can be controlled. No mitigation recommendations are offered for these features.

Site 402

Feature A of Site 402 is recorded within the project area. It consists of a scatter of fractured basalt, basalt flakes, and shell midden. Sparse cultural material was observed at the feature, and it was not being impacted by revegetation activity (Figure 12).

Table 1. Mitigation Data for Features/Sites

Feature/Site	Impacts	Recommendation
150G	Disrupted by irrigation lines from previous undertakings	None
150H	None	None
401E	None	None
401F	None	None
401G	Disrupted by irrigation lines from previous undertakings	None
401H	Disrupted by irrigation lines from current revegetation activity, cultural material moved	None
401I	None	None
401J	Overgrown by vegetation	None
401K	Overgrown by vegetation	None
402A	None	None
473	Fire feature affected by natural erosion	None
520	Affected by natural erosion	Barriers in ravines, move at-risk cultural material
521A	None	None
521B	Affected by natural erosion	Barriers in ravines, move at-risk cultural material
522A	Affected by natural erosion	Wattles, sand bags
522B	Affected by natural erosion	Wattles, sand bags
522C	Affected by natural erosion	Wattles, sand bags
523B	None	None
525B	Disrupted by vegetation bundles during current revegetation activity	Better supervision/more detailed instructions for volunteers
525C	None	None
526	Affected by natural erosion	Wattles
527	Undetermined; boundaries of site uncertain	Delineate exact boundaries and keep activity outside
532	None	None
534	None	None
538	Affected by natural erosion	Wattles, sand bags
539A	Disrupted by irrigation lines from current revegetation activity, cultural material moved	Move boundary markers to encompass a larger area
539B	Affected by natural erosion	Barriers at edge of ravine, move at-risk cultural material
540	None	None
541	None	None
542C	Disrupted by irrigation lines from current revegetation activity	Better supervision/more detailed instructions for volunteers

Table 1. (Cont.)

Feature/Site	Impacts	Recommendation
704	Disrupted by irrigation lines from previous undertakings and affected by natural erosion; cultural material moved during current attempt to curb erosion	Move/extend wattles
707	Disrupted by irrigation line moved by hurricane winds	Secure irrigation line better
734	Affected by natural erosion	Wattles, sand bags
795	Disrupted by irrigation lines from previous undertakings	
887	None	None
888	Affected by natural erosion; cultural material moved	Wattles
IF 40	N/A	N/A



Figure 7. Feature 150H, north side of the road, facing west. White pieces are marine shell, and a waterworn cobble is above the scale.



Figure 8. Feature 401E, plan view. Marine shell and lithic material are shown.



Figure 9. Feature 401F cultural material, facing southeast.



Figure 10. Feature 401G *kiawe* swales, facing west.



Figure 11. Feature 401H irrigation line on the west side of the feature, facing north. No cultural material is near the line, as it was moved to a safe location.



Figure 12. Feature 402A, facing southeast. A basalt flake is in the foreground and marine shell midden can be seen in the background.

Site 473

Site 473 is a high-density scatter of fractured basalt, basalt flakes, volcanic glass flakes, volcanic glass cores, branch coral fragments, head coral fragments, and marine shell midden. The cultural material is scattered around a hummock, and is still very dense (Figure 13). A fire feature was observed eroding from the south side of the hummock. The fire feature is composed of blackened earth with visible charcoal fragments and fire-cracked rock. It appears to be eroding from natural causes and was further and further degraded with subsequent site visits, almost to the point of complete destruction (Figures 14–16). A possible new feature of Site 473 was identified just downslope of the fire feature. It consists of basalt flakes and fractured basalt cobbles and stones (Figure 17). The fire feature and the rest of the site were not affected by revegetation activity, although a modern *ahu* and burial platform are located nearby (Figures 18 and 19).

Site 520

Site 520 consists of a fire pit and a scatter of fractured basalt, basalt flakes, volcanic glass flakes and cores, waterworn basalt cobbles, and shell midden. The cultural material scatter is relatively sparse and is eroding downslope outside the original boundaries of the site and into deep ravines on the north, west, and east. No revegetation efforts are being conducted near the site, and the erosion is occurring through natural processes. The fire pit was not found. Recommendations were made that the site should be protected by installing barriers along the ravines on the north, west, and east to capture cultural material before it is lost. Cultural material near the edges of the ravines were recommended for collection and placement toward the center or south side of the site, since context has already been lost due to erosion. Following the November 2014 site visit, wattles were placed near the edge of the cliff and sandbags positioned in the gullies. This was inspected during the February 2015 visit, and erosion has been noticeably curbed due to these efforts (Figures 20 and 21).



Figure 13. Dense scatter of cultural material at Site 473, facing southwest.



Figure 14. Fire feature at Site 473, facing north. Taken on August 20, 2014.



Figure 15. Fire feature at Site 473, facing north. Taken on October 15, 2014.



Figure 16. Fire feature at Site 473, facing north. Taken on February 11, 2015.



Figure 17. Possible new feature of Site 473, facing northeast. The fire feature is on the side of the hummock in the background.



Figure 18. Modern *ahu* near Site 473, facing northwest.



Figure 19. Modern burial platform near Site 473, facing west.



Figure 20. Site 520 erosion control measures implemented, facing southeast. Note the buildup of sediment on the upslope side of the barrier, indicating that erosion is being curbed.



Figure 21. Site 520 erosion control measures implemented, facing west. Note the buildup of sediment on the upslope side of the barrier, indicating that erosion is being curbed.

Site 521

Two features of this site, 521A and B, are described for Hakioawa, both surface scatters of cultural material. Both Features A and B are not affected by the revegetation program and there are no irrigation lines nearby. The scatter at Feature A is sparse, but at Feature B it is fairly dense and is eroding into the ravine below due to natural processes (Figure 22). This site should be protected by installing barriers downslope along the edges of the ravine to capture cultural material before it is lost. Cultural material near the edges of the ravine may also be collected and placed in a safe location within the site, since context has already been lost due to erosion.

Site 522

Three features, A–C, are described for Site 522, all scatters of cultural material. Feature A of Site 522 exhibits a moderate density of cultural material; Feature B a moderate to low density; and Feature C a low density. Cultural material is eroding down the slope due to natural processes. Revegetation activities are not impacting any of the features, however at Feature A an irrigation line is nearby but stops before entering the site. There are no irrigation lines near Features B or C. KIRC staff have demarcated the boundaries of all features with blue painted wood so that volunteers are cognizant of the boundaries. Cultural material is being washed downslope in heavy rain because of high levels of runoff on the hardpan in this area. It was recommended that wattles are installed upslope of Feature A, between Features A and B, between Features B and C, and downslope of Feature C. It was also recommended to place additional sandbags in the deep gullies along the hillside. These tasks were completed during the October 2014 site visit under the supervision of an archaeological monitor (Figure 23).

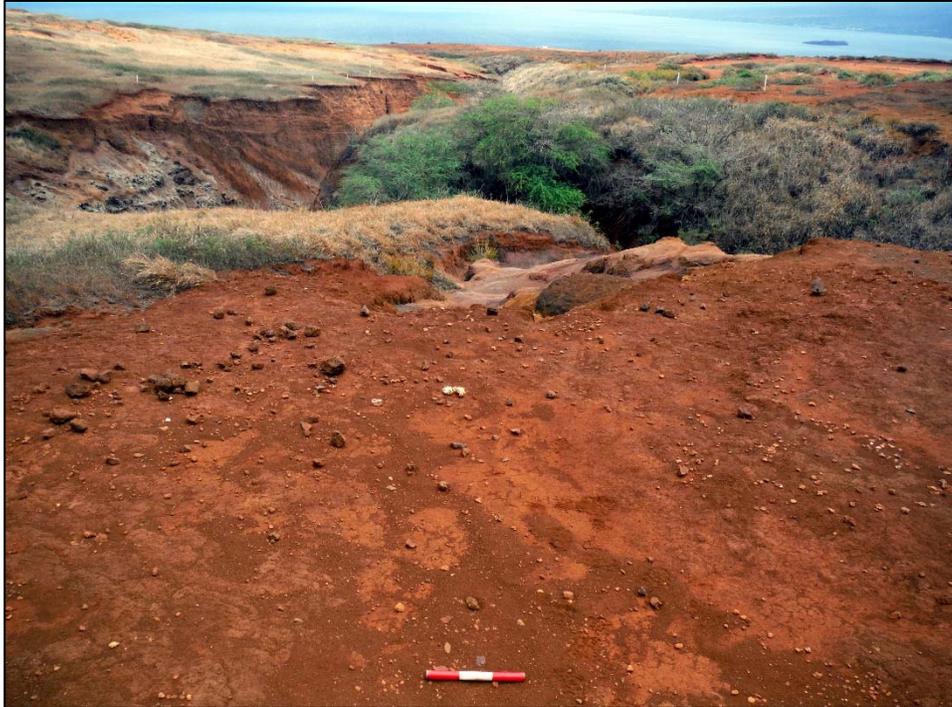


Figure 22. Feature 521B surface scatter eroding into the ravine. View is to the north.



Figure 23. Construction of a wattle between Features 522A (right of wattle) and 522B (left of wattle). View is to the southeast.

Site 523

Feature B of Site 523 is located within the project area. It consists of a scatter of basalt, volcanic glass, and other cultural material, including a coral abrader. This feature is not in the vicinity of the revegetation efforts and is not being impacted. The scatter is still moderately dense and appears as previously described (Figure 24).

Site 525

Two features of this site, 525B and C, are within the project area, both surface scatters of cultural material. Cultural material was fairly dense, with marine shell midden (Figure 25), fine quality and lesser quality basalt flakes/debitage, and coral files observed. Cow bone was strewn about Feature 525C (Figure 26). Vegetation restoration was intrusive at Feature 525B, with vegetation bundles inadvertently placed within the feature boundaries, within the limits demarcated by the painted blue wood (Figure 27). When the archaeological monitor arrived during the August 2014 site visit, she instructed the volunteers to stay outside the wooden markers so that surface artifacts would not be mistakenly trampled or moved. The volunteers complied graciously. It was recommended to KIRC staff to better supervise volunteers working near archaeological sites and/or provide more detailed instructions for volunteers to stay outside site boundaries. Feature 525C was not affected by revegetation activity and no irrigation lines are located in the vicinity.



Figure 24. Feature 525B surface scatter, facing south. The coral abrader is wrapped in blue flagging tape in the background.



Figure 25. Marine shell on erosional pedestal at Feature 525C. View is to the west.



Figure 26. Cow bone at Feature 525C, plan view.



Figure 27. Vegetation bundles with the limits of Feature 525B. View is to the northeast.

Site 526

Site 526 consists of a scatter of artifacts, fractured basalt, basalt flakes, and shell midden. The scatter observed at this site was fairly dense (Figure 28). Among the materials observed were coral files, marine shell midden, including conch shell fragments (Figure 29), and fine grained basalt, including at least one polished flake. The material is situated around a hummock, with the bulk of material downslope to the east and south, obviously displaced by erosion. Irrigation lines are nearby but stop at the site boundaries (Figure 30), which are marked by blue wooden pieces set at intervals. It is recommended that wattles are placed downslope of the site to help contain the erosion.

Site 527

Site 527 is a scatter of artifacts, fractured basalt, basalt flakes and cores, volcanic glass flakes and cores, coral fragments, shell midden, and a waterworn pebble. A fairly sparse scatter of cultural material was observed, with a large number of coral fragments. The site boundaries are marked with blue wood, and irrigation lines with planting mounds do not enter the buffer (Figure 31). The planting lines extend on both sides of the site (north and south). It is possible, however, that this site extends past the marked boundaries. It is recommended that the exact boundaries of the site are delineated and revegetation efforts kept outside.

Site 532

Site 532 is a scatter of artifacts, fractured basalt, basalt flakes, and shell midden. This site is located far to the northeast of the current revegetation efforts. It was not visited because there is no activity occurring in the vicinity of the site.



Figure 28. Various cultural material at Site 526, plan view.



Figure 29. Conch fragment at Site 526, plan view.



Figure 30. Site 526, facing southwest. Note the irrigation line with planting mounds in the distance.



Figure 31. Site 527, facing south. Note artifacts in the foreground and the irrigation line with planting mounds in the distance, stopping outside the site boundaries.

Site 534

Site 534 is a scatter of artifacts, fractured basalt, basalt flakes, volcanic glass, and marine shell midden. The scatter observed was large and fairly dense (Figure 32). Revegetation activity is not occurring nearby and there were no visible impacts to the site.

Site 538

Site 538 consists of a surface scatter of small fractured basalt cobbles and a small basalt flake. It currently consists of a low to medium density scatter. The site is not being affected by vegetation activity but is eroding naturally (Figure 33). Wattles or sandbags may help curb the erosion.

Site 539

Two features of this site, 539A and B are described for the project area, both scatters of cultural material. Feature 539A was observed as a fairly dense scatter of cultural material. On the south side of the feature, an irrigation line with no planting mounds runs through the site. KIRC staff moved cultural material away from the path of the line before it was installed, although some was missed (Figure 34). On the north side of the feature, an irrigation line with planting mounds cuts through the site (Figure 35). No cultural material was observed along this northern line. The feature boundaries are demarcated with blue wooden pieces, although cultural material was observed very close to these boundaries (Figure 36). It is recommended that the wooden markers are moved further away from the feature to encompass a larger area.



Figure 32. Portion of Site 534, facing east.



Figure 33 Site 538, showing erosional gullies and gulch in the distance. Orientation is to the northeast.



Figure 34. Basalt flake along the southern irrigation line at Feature 539A, plan view.



Figure 35. Northern irrigation line and planting mound that run through Feature 539A.



Figure 36. Northern portion of Feature 539A, facing south. Note the lithic material just beyond the scale, the blue wood pieces that demarcate the feature boundaries, and the irrigation line and planting mounds in the distance.

Feature 539B was observed as a small scatter of sparse cultural material. The feature is close to a ravine and cultural material may be eroding downslope (Figure 37). The feature boundaries are marked in blue wood pieces, and irrigation lines were placed upslope, away from the feature. It is recommended that barriers are installed along the edge of the ravine on the north to capture cultural material before it is lost. Cultural material near the edges of the ravine may also be collected and placed in a safe location within the site, since context has already been lost due to erosion.

Site 540

Site 540 is a scatter of artifacts, fractured basalt and basalt flakes. This site is located far to the north of the current revegetation efforts. It was not visited because there is no activity occurring in the vicinity of the site.

Site 541

Site 541 is a scatter of artifacts, fractured basalt, basalt flakes, volcanic glass flakes, and shell midden. This site is located far to the northeast of the current revegetation efforts. It was not visited because there is no activity occurring in the vicinity of the site.

Site 542

Feature C of Site 542 consists of a scatter of artifacts, fractured rock, basalt flakes and cores, volcanic glass flakes and cores, coral fragments, and shell midden. Feature C covers a large area but is not particularly dense with cultural material. Two irrigation lines with planting mounds run through the feature (Figure 38). A few artifacts are close to the lines, but the only damage observed was a broken piece of coral (Figure 39). It is possible, however, that the mounds were placed atop cultural material that is now obscured. It is recommended that site locations and their boundaries are clearly conveyed to the field crews so that cultural resources are not disturbed during future revegetation efforts.

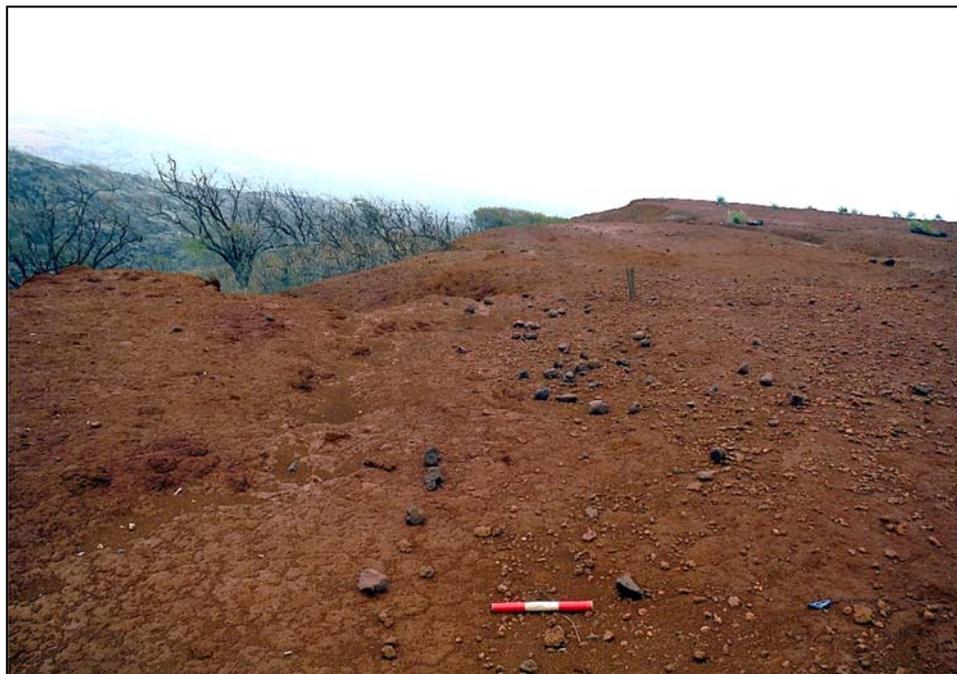


Figure 37. Feature 539B, facing north.



Figure 38. Irrigation line and planting mound running through the center of Feature 542C. Orientation is to the west.



Figure 39. Disrupted coral at Feature 542C near an irrigation line, plan view.

Site 704

Site 704 is a surface scatter of fractured basalt, basalt flakes, volcanic glass flakes, coral fragments, and marine shell midden. Cultural material is currently very dispersed at this site, and only a small portion of the site extends into the project area. Irrigation lines from a previous undertaking run through the site (Figure 40), and natural erosion is also impacting the cultural material by washing it downslope. It was recommended that the east-west wattle on the south boundary is moved to prevent gullying and that the two other wattles downslope are extended. This was done during the October 2014 site visit, and five basalt flakes that were in the path of the wattles were moved closer to the interior of the site.

Site 707

Site 707 is a scatter of artifacts, fractured basalt, basalt flakes, volcanic glass flakes, and shell midden. There is currently a sparse scatter of material, and the usual revegetation activities did not impact the site. However, a hurricane that brought severe winds to the island just before the August 2014 site visit blew the main irrigation line into the site (Figure 41). This line normally runs along the access road and would not have impacted the site in typical conditions. The line was moved back to the road during the August 2014 site visit. It is recommended that the irrigation lines are better secured, perhaps with sandbags, so they remain in place during strong winds.

Site 734

Site 734 is a scatter of artifacts, fractured basalt, basalt flakes, basalt cores, and shell midden. It currently consists of a low to medium density scatter. The site is not being affected by vegetation activity but is eroding naturally downslope (Figure 42). Wattles or sandbags may help control the erosion.



Figure 40. Basalt flake near irrigation line at Site 704, facing south.



Figure 41. Irrigation line at Site 707, facing northeast.



Figure 42 Site 734, showing erosional gullies. Orientation is to the east.

Site 795

Site 795 is a scatter of artifacts, fractured basalt, basalt flakes and cores, volcanic glass flakes and cores, and shell midden. The site is still a relatively dense cultural material scatter (Figure 43). Most of the site is within the boundaries of a prior undertaking, and irrigation lines from that undertaking run through it. The current undertaking is not impacting the site.

Site 887

Site 887 is a scatter of artifacts, fractured rock, basalt flakes and cores, volcanic glass flakes, coral fragments, shell midden, and a waterworn pebble. There is currently a low density of cultural material at the site. Revegetation activity took place during the November 2014 site visit and was monitored by the archaeologist. The site was not impacted, and volunteers stayed outside the site's boundaries (Figure 44).

Site 888

Site 888 is a scatter of artifacts, fractured basalt, basalt flakes, volcanic glass flakes, and volcanic glass cores. The site is currently sparsely scattered with cultural material. Its boundaries are marked with blue wooden pieces. Revegetation activity is not impacting the site, however natural erosion may be washing material downslope. Several basalt flakes were found in and adjacent to the planting corridor west of Site 888. The flakes were collected and relocated approximately 2 m upslope to within the site boundaries. The flakes were left in a pile to denote their artificial context (Figure 45). It is recommended that wattles are placed downslope of the site to help contain its material.



Figure 43. Site 795, facing south.



Figure 44. Volunteers working near Site 887 and staying clear of the site. Orientation is to the east.



Figure 45. Basalt flakes relocated to Site 888, plan view.

IF 40

IF 40 was not assigned a site number because it is an isolated surface find, or individual find (IF). IF 40 was depicted just south of Feature 539B in a site map in the archaeological monitoring plan (KIRC 2013:9) and in an earlier report (Hammatt et al. 2001). No published data was found for the artifact and exactly what it is remains undetermined. Several attempts were made to locate the item during the site visits, and a small scatter of fractured basalt was found in the area where IF 40 should be. The scatter consists of roughly 20 cobbles. It is not certain if this is in fact IF 40, however, as no flakes, cores, or other more readily identifiable artifacts were found. It is possible that the fractured cobbles came from one of the planting mounds nearby (Figure 46). Given the uncertainty for identification of this site, impacts cannot be determined and recommendations cannot be made.



Figure 46. Fractured basalt cobbles that may or may not be part of IF 40, with planting mound in the distance. Orientation is to the west.

SUMMARY AND CONCLUSION

Archaeological monitoring was conducted at the Hakioawa Watershed on the island of Kaho‘olawe in response to a revegetation program spearheaded by the Kaho‘olawe Island Reserve Commission. A total of 37 archaeological features were previously recorded in the revegetation project area. They consist mostly of surface scatters of midden, lithic debitage, and traditional Hawaiian artifacts. Archaeological monitoring was conducted during four site visits to the island that took place between August 2014 and February 2015.

During the site visits, some of the revegetation activity was monitored, including moving irrigation lines, placing mulch material in planting corridors, constructing wattles, and securing sandbags and gabions, with no subsurface disturbance taking place. The archaeological features were examined and any effects to the features noted, whether it was from natural causes or from past or current revegetation activity. Recommendations were made to KIRC staff to mitigate adverse effects to the archaeological features. In several cases the recommendations were implemented over the course of the monitoring and positive results were documented.

Of the 37 archaeological features, 11 were affected by natural erosional processes and another 11 were affected by revegetation efforts. Most of the latter were disturbed by intrusive irrigation lines either from the current program or from previous ones. Two of the features were affected by vegetation overgrowth, which is a positive impact that will help to curb erosion.

Interestingly, a fire feature was identified at Feature 473, exposed on the side of an eroding hummock. The feature was identified during the first site visit in August 2014, and by the last visit in February 2015 the feature had almost vanished completely due to natural erosional processes. This is just one testament to the rapid and devastating impacts that erosion is inflicting on the barren landscape in Hakioawa, underscoring the urgent need for revegetation of the landscape.

It is clear that mitigation, such as creating barriers to impede cultural material from moving downslope, will help to save the artifact scatters in the project area. At-risk cultural material may also be moved to a safe location, as it has already lost its primary context at most features. Continued efforts to *mālama* the archaeological sites of Kaho‘olawe will help to preserve them for future generations and complements ongoing programs to rehabilitate the island.

GLOSSARY

<i>ahu</i>	A shrine or altar.
<i>ahupua'a</i>	Traditional Hawaiian land division usually extending from the uplands to the sea.
debitage	Waste by-products of stone tool manufacture.
<i>heiau</i>	Place of worship and ritual in traditional Hawai'i.
<i>'ili</i>	Traditional land division, usually a subdivision of an <i>ahupua'a</i> .
<i>kiawe</i>	The algaroba tree, <i>Prosopis</i> sp., a legume from tropical America, first planted in 1828 in Hawai'i.
<i>ko'a</i>	Fishing shrine.
<i>Māhele</i>	The 1848 division of land.
midden	A heap or stratum of refuse normally found on the site of an ancient settlement. In Hawai'i, the term generally refers to food remains, whether or not they appear as a heap or stratum.
<i>moku</i>	District, island.
<i>mo'olelo</i>	A story, myth, history, tradition, legend, or record.
<i>po'e</i>	People, population, group.
<i>'uala</i>	The sweet potato, or <i>Ipomoea batatas</i> , a Polynesian introduction.
<i>'ulu maika</i>	Stone used in the <i>maika</i> game, similar to bowling.

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